

HEALTHY PEOPLE LIBRARY PROJECT

American Association for the Advancement of Science

Asthma and Allergies



The Science Inside

Asthma and Allergies: The Science Inside

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American Association for the Advancement of Science

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INTRODUCTION: ASTHMA AND ALLERGIES

Nothing is more essential to our well-being than the ability to breathe. Most of us breathe in and out all day long without even giving it a thought. Yet millions of people in the United States are not so lucky. They suffer from asthma or allergies. For people with asthma, taking a breath can be extremely difficult. For people with allergies, the air they breathe can be filled with substances that cause discomfort or worse.

Asthma is a chronic lung disease in which air passages get inflamed. When this happens, airways narrow and it is difficult for air to move from the nose and mouth to the lungs. In the United States, this disease affects millions of people, many of them children. In fact, asthma is the most common chronic childhood disease, affecting 1 out of every 20 children. The number of people with asthma has been increasing since the 1980s. The disease affects people of all ages and races and both sexes. However, asthma is more common in children than adults. It is also more common in African Americans and Hispanics than whites.



An **asthmatic**, or a person with asthma, responds differently to certain substances than a person who does not have the disease. For an asthmatic, these substances become triggers. A **trigger** is a factor that can bring on the symptoms of asthma or make the condition worse. For an asthmatic, triggers can include household or industrial chemicals, tobacco smoke, dust, changes in weather, and exercise. Exposed to a trigger, an asthmatic might experience tightness in the chest, coughing, **wheezing**, and shortness of breath.

Although asthma is common, it can be controlled and treated. It is important for an asthmatic

Asthma affects 1 out of every 20 children.

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to avoid contact with any trigger known to cause symptoms. A person with asthma should get continuous medical care and see a physician regularly. A doctor can measure lung function and capacity and recommend medication to reverse and prevent airway swelling and obstruction. If the symptoms are managed well, an asthmatic can enjoy a normal life.

Like asthma, allergies also affect millions of people. An **allergy** is the body's overreaction to certain substances, called **allergens**. An allergic person responds differently to allergens than does a person with no allergies. Some of the most common allergens include dust mites, cockroach droppings, animal dander, grass, insect venom from stings, medications, and certain foods. An allergic reaction can range from sneezing and itching to swelling of the throat and loss of consciousness. As with asthma, allergic reactions can be severe and even fatal.

A person with allergies should avoid allergens that are known to cause symptoms. People who have experienced severe allergic reactions should be under the care of an **allergist**—a physician who

specializes in the treatment of allergies. Before establishing a treatment program, an allergist will conduct tests to determine which allergens are triggers for a particular patient. The allergist may recommend or prescribe medications that can reduce sensitivity to certain substances. **Allergen immunotherapy** can also be used to reduce sensitivity. A person undergoing allergen immunotherapy receives injections containing small amounts of the allergen to which he or she reacts over the course of several years. This treatment helps the person build immunity to an allergen. Ultimately, this can mean that an allergic reaction does not occur at all.

Fortunately, there are many promising areas of research on allergies and asthma. Scientists are working to discover what causes asthma and allergies, how to prevent them from occurring, and how to treat them. But it is also vital that everyone who suffers from asthma or allergies have a basic understanding of these ailments. This book contains information that will help asthmatics and allergy sufferers take charge of their own health so that they can lead full, active lives.

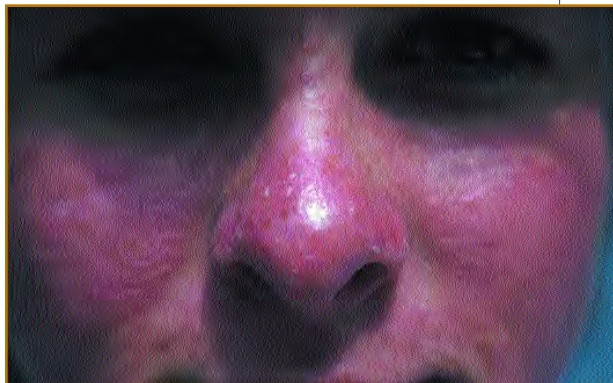


Part 1: What Is Asthma?

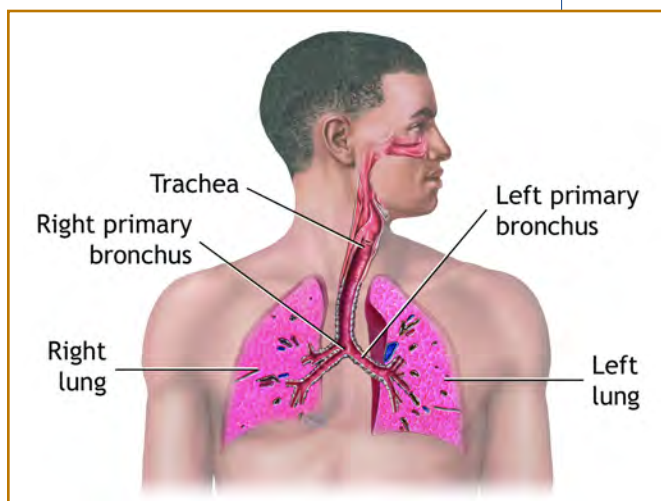
Healthy breathing

Healthy breathing is effortless. A person who is breathing normally will not be aware of the process. Every minute of every day, the lungs expand and contract 15 times. This process allows the blood to deliver oxygen to red blood cells and to take away carbon dioxide.

Air enters the nose, where it is warmed and moistened. Then, it enters the **trachea**, a single tube that is the beginning point of the airways. The trachea divides into two narrower tubes called **bronchi**. Each bronchus is a way into the lungs. As the air travels through the lungs, it moves through progressively smaller tubes called **bronchioles**. At the tip of the last bronchiole it enters, the air comes into contact with hundreds of millions of tiny air sacs called **alveoli**. These sacs take in oxygen from the air in exchange for carbon dioxide. Eventually, the lungs will exhale the carbon dioxide.



For the exchange of oxygen for carbon dioxide to take place, the **diaphragm**, a sheet of muscle that separates the chest from the abdominal cavity, must contract. When the diaphragm contracts, a partial-vacuum effect occurs around the lungs, causing them



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particles, the mucus is carried by **cilia** (which look like tiny hairs) from the bottom of the lungs to the throat. Once the mucus reaches the throat, it is either swallowed or coughed out. If the mucus is not cleared, viruses, bacteria, and other impurities can collect in the lungs and cause infection or illness. Healthy lungs are grayish pink in color. Lungs that are damaged by pollutants can become blackened.

If your breathing is not healthy or normal, it might be due to allergies or even asthma. Allergies have been linked to asthma, so it is not unusual to find that a person suffers from both. These disorders can be treated, and sometimes the symptoms can even be prevented. With proper medical care and changes in behavior or environment, someone who suffers from allergies or asthma can breathe comfortably and live an active life.

to expand. When the lungs expand, air pressure in the chest cavity is lower than the air pressure outside. This difference in pressure causes air from the outside to fill the lungs. Each time this happens, approximately 1 pint of air enters the lungs.

When you exhale, the diaphragm relaxes. When the lungs deflate, carbon dioxide is forced out. While this entire process is taking place, mucus in the air passages is trapping any foreign materials that have entered your body with the air. After the mucus traps these

Problems associated with asthma

Asthma is a chronic lung disease that makes breathing difficult. For an asthmatic, breathing becomes difficult for a variety of reasons. Airways can become inflamed, restricted, or blocked, so that very

little air can travel to and from the lungs. The air that does get through these narrowed passages can cause a high-pitched or whistling sound called wheezing. The chest can also become tight or constricted, requiring the person to use more effort just to breathe. This is called labored breathing.

If a lot of viscous (thick) mucus is released in the airways, it can produce coughing. As the body tries to clear the mucus from the airways, a rattling sound often occurs. If the airways become plugged with mucus, the lungs can fully or partially collapse. This collapse can be caused by a number of conditions, from prolonged bed rest to pneumonia, and can be seen on a chest X ray. Unfortunately, when a collapsing lung is found—especially in combination with a rattling sound heard in the chest—asthma can be misdiagnosed as bronchitis or even pneumonia. Antibiotics are often prescribed for bronchitis and pneumonia, but these medications are not effective against asthma.

The symptoms of asthma

People with asthma experience symptoms that can include coughing, wheezing, congestion, and tightness in the chest. Most of

these symptoms are usually associated with colds or infections. That is why it is important to notice when they reoccur for no apparent reason. When this happens, it could mean that you have asthma. Although asthma symptoms might resemble cold symptoms, they must be treated differently.

A viral infection, such as a cold, might make it hard to sleep at night for a few days. Nighttime asthma is very different. It can make getting proper rest nearly impossible for a long period of time. Some asthmatics have symptoms every night. People with nighttime asthma often have to sleep sitting upright in order to breathe. If these symptoms are disregarded as cold symptoms, then they will not be treated properly. A serious lack of rest can have dangerous consequences, especially for a developing child.

Symptoms of asthma are usually measured by their severity, frequency, and response to treatment. The National Institutes of



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Health has defined the following severity levels for asthma: mild intermittent, mild persistent, moderate persistent, and severe persistent. Those with the milder form of the disease might have brief episodes once a week.

Asthmatics with the most severe form of the condition have symptoms that won't go away, attacks that easily become crises, very little lung capacity, and restricted physical activity.

Whether symptoms appear to be mild or severe, it is crucial that they be evaluated. Even if you seem to experience symptoms only after exercise or during the night, an examination by a physician can be the first step in getting relief. For someone who has lived with the symptoms for a long time, the chest tightness and breathing difficulty can seem

almost normal. Having problems with breathing, however, is never normal or healthy.

Even some less common symptoms of asthma require emergency help. If an asthmatic suddenly starts to sweat, seems lethargic (or dazed), appears fatigued, or has difficulty speaking, he or she should be taken to an emergency room. If the person has severe difficulty breathing, intense coughing, a racing pulse, or **cyanosis** (nail beds or lips that are bluish in color), these are also signs of an emergency.

The causes of asthma

Scientists still do not know exactly what causes asthma. Researchers are investigating a number of possibilities, including

Severity Levels for Asthma

MILD INTERMITTENT—About half of all asthma patients fall into this category, which is characterized by fewer than two or three asthmatic episodes per week and no difficulty sleeping at night. No continuous control treatment is necessary.

MILD PERSISTENT—Patients typically have tightness and wheezing weekly, but relatively normal lung function overall. One controlling medication is sufficient to manage the illness.

MODERATE PERSISTENT—Daily episodes characterize this stage, but the flare-ups are manageable with two medications.

SEVERE PERSISTENT—Episodes occur daily, despite therapy with more than two controlling medications.

(Adapted from http://www.nih.gov/news/NIH-Record/03_04_2003/story06.htm)

Part 1: What Is Asthma?

smog, lack of exercise, obesity, too much exposure to indoor allergens, and even a lack of exposure to viruses and bacteria in childhood, which could weaken the immune system. It is likely that a number of factors combine to cause asthma.

Scientists do know that many people with asthma also have allergies, such as hay fever or eczema, or a family history of allergies. Others, however, have no history of allergies or evidence of allergic problems. Asthma also seems to run in families. If one parent has asthma, his or her children are more likely to have asthma. If both parents have asthma, there is a 40% chance that their children will develop the disease. Although several people in the same family may have asthma, the severity of their symptoms may not be the same. Even if identical twins have asthma, one twin might have a more severe case of it. Scientists do not know why this is so.

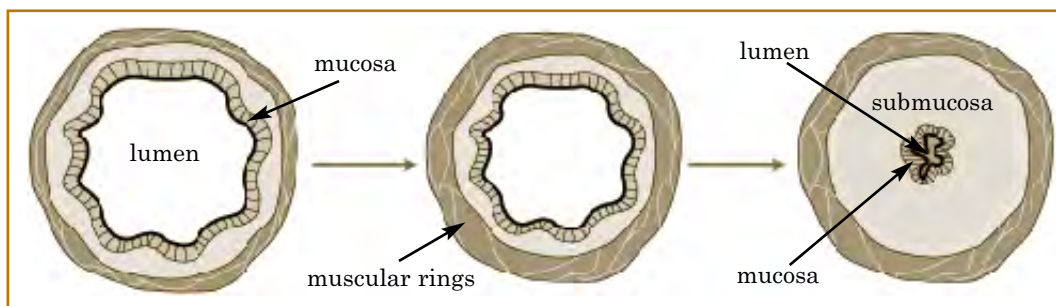


Although the exact causes of asthma may not be known, scientists do know a great deal about what happens inside the body when an asthma attack occurs. Specifically, three changes occur inside the airways in the lungs of people with asthma. The first change is inflammation (or swelling), which leads to constriction and sensitivity.

Airway inflammation happens when the **mucosa** (or bronchial mucous membrane) swells. The inflamed tissues make a thick mucus, which is difficult to get rid of and can often produce coughing. This inflammation then

Many children who have asthma come from families in which their relatives also have asthma.

This illustration shows the effects asthma has on a bronchiole. (left) Normal bronchiole; (middle) muscular rings contract and thicken, decreasing lumen size; (right) mucosal layers and their connective tissue, the submucosa, thicken, further closing the lumen, which fills with thickened mucus.



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What Causes Occupational Asthma?

Direct exposure to irritants. Substances such as hydrochloric acid, sulfur dioxide, and ammonia can trigger occupational asthma in those exposed to them. Commonly used in the petroleum and chemical industries, these irritants are particularly harmful to people with a history of respiratory disorders.

Allergic reactions from long-term exposure. A worker's immune system might take months or years before developing a reaction to a particular substance, but the symptoms can be quite severe. Everyday, common substances can trigger symptoms. A veterinarian can develop occupational asthma from exposure to animal proteins. A health care worker can suffer from asthma symptoms in reaction to the powder that lines latex gloves.

Accumulation in the body. Over time, workers who inhale certain substances can experience asthma symptoms because of a buildup of naturally occurring chemicals in their bodies. For example, an insecticide that is used in farming can cause acetylcholine to build up in a farm worker's body. This buildup can cause airway muscles to contract, resulting in an asthma attack.

leads to **bronchoconstriction** (or **bronchospasm**), in which the smooth muscle that surrounds the airways contracts too much, narrowing the airways and making it difficult to breathe. In people with asthma, inflammation also leads to sensitivity. This means that the airways are overly sensitive (or **hyperresponsive**) to even minor irritants. Such irritants can include tobacco smoke, air pollution, the common cold, or even cold air. If an asthmatic also has allergies, he or she can be overly sensitive to pollen, animal dander, or dust, for example.

Asthma can be triggered by both allergic and nonallergic reactions to various factors. Most asthma attacks are of the allergic variety, resulting from exposure to triggers such as animal dander and mold. These triggers exist in both indoor and outdoor environments. An asthma attack can result from high levels of pollen in the air or from cockroach droppings in household dust. A simple allergy skin test can help determine some of the triggers that cause the symptoms. (For additional information on triggers, see the section "Causes of Allergies" on page 22.)

Nonallergic asthma can be triggered by exposure to viral infections, shifts in air temperature, physical exertion, chemicals, med-

ications, or foods. Viral infections can bring on asthma especially in young children. When someone catches a cold, the nose, airways, throat, and lungs often feel irritated. This irritation can trigger asthma symptoms. A condition called **sinusitis**—in which the hollow cavities located behind the eyes and nose get inflamed—can cause asthma. Sinusitis can bring on wheezing, headaches, coughing, sinus pressure or pain, and postnasal drip. During an attack of sinusitis, excess mucus drains into the nose, throat, and bronchial tubes. This drainage can trigger or aggravate asthma.

Gastroesophageal reflux disease (GERD), a condition in which stomach acid flows up through the **esophagus**, affects many people who suffer from asthma. The symptoms of GERD include severe heartburn, belching, frequent coughing, hoarseness, and asthma at night, as well as after meals and exercise. Some asthma symptoms are relieved by medications prescribed for GERD.

Another type of nonallergic asthma is called **exercise-induced asthma**. It is triggered by strenuous physical activity. Intense, prolonged breathing through the

mouth can lead to coughing or tightness in the chest. Exercising in cold, dry air can also make breathing difficult.

Asthma symptoms that develop because of exposure to fumes, gases, dust, or other substances in the workplace are called **occupational asthma**. This type of asthma can develop in an asthmatic or in someone with no history of the condition. The symptoms of occupational asthma can continue even after the worker is no longer exposed to the substance that triggered the initial reaction. The symptoms can include a runny nose and eye irritation, as well as difficulty breathing. Occupational asthma symptoms often grow worse as the workweek progresses, get better over the weekend, and then



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Occupational asthma is the most common form of work-related lung disease in the United States.



resume when the person returns to work. Smoking can also worsen symptoms, as can being exposed to secondhand smoke.

A worker can be exposed to trigger substances for months or years before symptoms arise. Often, the symptoms of occupational asthma are misdiagnosed as bronchitis. This is dangerous because it can lead the worker to return to the environment that caused the symptoms. Continued exposure to triggers can be quite harmful. Employees are not the only people who can be affected by harmful substances in the workplace. Asthma can also occur in people who live near factories that release trigger substances into the environment. Leaving an asthma-inducing work environment within one to two years of the initial illness can reverse occupational asthma. For workers with the disease who smoke, research shows that those who leave the

unhealthy work environment and quit smoking are more likely to recover fully than is a worker who changes jobs, but continues to smoke.

In developed countries, occupational asthma has become the most common form of work-

related lung disease. According to the American Academy of Allergy, Asthma, and Immunology, up to 15% of asthma cases that have been diagnosed in the United States have some connection to job-related factors. In certain industries, the rate of occupational asthma is quite high. In some manufacturing companies, exposure to particular chemicals needed for producing plastics and foam has resulted in symptoms in 10% of exposed workers. Inhaling a single enzyme that is used to make washing powder has triggered asthma in 25% of exposed workers. In the printing industry, regular exposure to gum acacia, which is used in color printing, has produced asthma symptoms in 50% of the workers exposed to it.

An asthmatic can also experience an attack as a result of taking particular medications. Some of the most common medications that trigger asthma symptoms are

Part 1: What Is Asthma?

aspirin and **nonsteroidal anti-inflammatory drugs (NSAIDs)**, such as ibuprofen. In fact, according to the American Academy of Allergy, Asthma, and Immunology, up to 19% of adult asthmatics have sensitivities to aspirin or NSAIDs. Medications called **beta-blockers**—which are taken to address heart disease, high blood pressure, glaucoma, or migraines—can prompt asthma attacks as well.

In about 6–8% of children, certain foods and food additives can bring on asthma symptoms. Some of the most common products that trigger asthma attacks are milk, eggs, peanuts, tree nuts (for example, walnuts or almonds), soy, wheat, fish, and shellfish.

It is important to note that anxiety alone cannot give some-

one asthma. However, emotional factors can make asthma symptoms worse or attacks more frequent. For example, if a person is under stress, he or she will probably feel more fatigued. This fatigue can increase the number of asthma symptoms or make them more intense. An anxious person might be more likely to hyperventilate, which can worsen asthma symptoms.

How asthma affects the body

In general, if asthma symptoms are addressed early and managed consistently, there is little risk of significant damage. Each asthmatic episode does take a toll on the body, so it is best to try to prevent symptoms whenever possible.



Breathing in smoky air from a fire can worsen asthma symptoms because smoke carries very small particles that can build up in your lungs. If you have asthma and live in an area where wildfires are common, you should talk to your doctor about a plan for smoky days.

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When an asthma attack occurs, a person experiences more than just difficulty breathing. The inflammation and obstruction of the airways, both of which commonly occur during an asthma attack, can be associated with permanent changes in the body. The airways can become permanently narrowed. Usually, airway obstruction does not cause any serious damage to the lungs, heart, or other organs. However, severe asthma attacks can lead to permanent damage or even death. During such an episode, an asthmatic can lose consciousness or suffer brain damage because too little oxygen reaches the brain. This is one of the reasons that it is vital to seek medical help as soon as possible when a severe asthma attack occurs.

When people suffer from exercise-induced asthma, their symptoms often appear after only brief periods of activity. Their airways tend to be overly sensitive to sudden changes in temperature and humidity. When people exert themselves, they often breathe cold, dry air in through the mouth. This does not allow the natural warming and humidifying action of the nose to take place. People with exercise-induced asthma tend to develop a reduced capacity to add moisture and warmth to the air before it reaches the lungs.

In addition, they have more difficulty exercising in environments where air pollution and pollen are common.

How asthma affects lifestyle

Asthma affects daily life in many ways. Often, an asthmatic must restrict activities to avoid exposure to trigger substances and factors. An asthmatic must be cautious when taking a new medication, tasting a new food, or entering a new environment. A person with chronic asthma must remember to take daily preventative medications on time. When going out, many asthmatics must arm themselves with “rescue” medications for use in case of an attack.

Frequently changes must be made to an asthmatic’s home or work environment to make breathing easier. Sometimes, bedroom carpeting and drapes, which can be home to dust mites, should be removed. If the parents of an asthmatic child smoke, they should quit. If a factory worker develops occupational asthma from a substance in his or her work area, the person should change job locations or professions.

For many people, a common cold is just a brief annoyance. For an asthmatic, this minor infection can produce asthma symptoms.

Asthma and Pregnancy

Studies have shown that pregnancy can worsen asthma symptoms, most often in the late second and early third trimesters. During the last four weeks of a pregnancy, women frequently report experiencing fewer symptoms. If asthma is managed properly throughout a pregnancy, a woman will rarely experience symptoms at the time of labor and delivery.

One reason that asthma symptoms might worsen during pregnancy is connected to GERD. When the stomach becomes compacted to make room for a baby, heartburn and acid reflux can result, making asthma symptoms worse. Sinus infections, viral respiratory infections, and increased stress can also worsen asthma symptoms during pregnancy.

Asthma in pregnant women is treated in the same way that asthma is treated in others. What is most important is that it be treated. If it is not, there can be dangers for both the mother and the child. When an asthmatic first discovers that she is pregnant, she should make an appointment with her allergist or primary care physician to discuss treatment. Like any other asthmatic, a pregnant asthmatic should avoid any substances or factors that are known to trigger symptoms.

Sometimes a patient and a physician must weigh the risks of unmanaged asthma against the risks of taking medication during pregnancy. Generally, it is considered far more important to control asthma symptoms. There are asthma medications that can be taken safely throughout pregnancy. Most inhaled medications are safe for pregnant women. Oral medications should be avoided unless absolutely necessary.

Generally, allergy shots are safe for a pregnant woman who was receiving them before conceiving. A woman should not start receiving allergy shots for the first time while pregnant. Sometimes, an allergist will lower the dosage in the shot to prevent an allergic reaction. These reactions are rare, but can be dangerous to a baby.

If a pregnant woman's asthma is not managed properly, serious complications can result. If not enough oxygen reaches the mother's blood, then not enough oxygen reaches the baby's blood. This deficiency can threaten the baby's growth and survival. A developing baby needs to receive a constant supply of oxygen. A baby born to a mother with unmanaged asthma can have a lower birth weight.

With some medicines, physicians are not sure whether asthma medications can be transferred to a baby through breast milk. Medications such as theophylline, beta agonists, cromolyn sodium, and steroids do not seem to be dangerous to nursing babies. To manage allergy symptoms, a nursing mother can safely use prescription antihistamines and decongestants.



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Influenza (the flu) can bring on more severe symptoms for a person who suffers from asthma. It is very important for asthmatics to avoid exposure to these viruses whenever possible. It is wise for asthmatics to get yearly flu vaccines. If an asthmatic is exposed to a cold or the flu, rest and proper nutrition can help to prevent the symptoms from escalating to asthma.

Often, asthmatics have difficulty when they exert themselves in ways that require deep breathing. Sports such as soccer, basketball,

and long-distance running, which demand continuous exertion, are more likely to trigger asthma symptoms. By contrast, sports like wrestling, gymnastics, baseball, and surfing require brief bursts of energy, which do not seem to aggravate asthma as often. Those who suffer from exercise-induced asthma are likely to find walking, slower-paced biking, hiking, and downhill skiing easier than the preceding sports. With treatment and careful training, an asthmatic can participate in almost any sport.



Benefits of Exercise

Exercise offers many physical and emotional benefits, especially for people who suffer from allergies or asthma. Exercise improves cardiovascular fitness, muscle strength, and stamina. Physical activity improves circulation throughout the body and one's general energy level. As a result of increasing physical activity, the body uses oxygen more efficiently and the respiratory system strengthens. Exercise elevates the mood and reduces stress. For people with allergies or asthma, the physical benefits of exercise improve their general health. In particular, it can help them breathe easier because more blood and oxygen reach the lungs. Exercise can ease the stress and anxiety that are often associated with asthma attacks. People with asthma should talk with their doctor before beginning a new exercise program, particularly a strenuous one.



Racing to Victory over Asthma and Allergies

As a competitive swimmer, Tom Dolan couldn't have designed a better body for himself. At 6 feet, 6 inches tall, with arms that seemed to stretch the width of a pool lane, he wasn't exactly a welcome sight to his opponents.

But what no one could see was that inside Dolan's imposing physique was an athletic flaw: lungs plagued by severe asthma and allergies. At times during his training workouts, Dolan would labor for breath and

even black out in the water. His college coach always kept an inhaler right next to the pool. But instead of quitting, Dolan kept training harder and swimming faster—until he made it to the U.S. Olympic team.

When he came home from the Olympics in Atlanta in 1996, it was with a gold medal—and he landed on the covers of *Sports Illustrated* magazine and a Wheaties box. He went back in 2000 to Sydney, Australia, and this time he did even better, capturing a gold and a silver.

"I had no superhuman qualities that helped me to overcome asthma, except the fact that I had a big heart and wouldn't allow myself to be beaten down by asthma," says Dolan. He also possesses an iron will: When he broke his arm at age 11, he wore a special foam cast and dragged his arm through the water as he swam countless laps.

Dolan's competitive spirit is legendary in his family. To get him to drink milk as a child, his father would simply pour two glasses and say, "Race you!"

But at times, asthma seemed like the one opponent that could really give Dolan trouble in the pool. Although doctors often prescribe swimming as an ideal exercise for asthmatics (because the humidity and warmth of the water can make breathing easier), it's with the understanding that asthmatics will swim slow, steady laps. The level of training Dolan underwent to take on the top swimmers in the world was so intense that some doctors worried that he could risk his health.

Dolan, continued on next page

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“When I was in high school, a lot of doctors told me not to swim,” says Dolan, who took up the sport at age five because his older sister was a swimmer and he wanted to beat her. “They were worried about all the chemicals in the pool affecting my allergies and asthma. I really had the worst of both worlds in terms of athletics. The harder and more intense my training was, the worse my asthma became. And in the fall, with tree mold, and the spring, with pollen, my symptoms got worse.”

When Dolan was in college, he found a doctor who specialized in asthma and who put him on a carefully monitored treatment regime. That helped Dolan’s symptoms immeasurably—as his row of gold and silver medals prove.

Dolan recently retired as a competitive swimmer and is now living in Arlington, Virginia, while he interviews with various corporations and prepares for a second career as a businessman. It’s a sure bet he’ll be successful in whatever he does—and, in a strange way, Dolan says he owes some of his confidence to asthma.

“One of the most frustrating things for young people with asthma is that there are only so many things that are in your control. You can’t control the heat and humidity and the air quality,” Dolan says. “For an athlete in an elite part of the game, we like to control everything. So asthma gave me a lot of perspective on the fact that swimming is just a sport and there are a lot of things out there that are more important. For all the troubles asthma gave me, it also gave me a lot on the other side to make me stronger.”

Part 2: What Are Allergies?

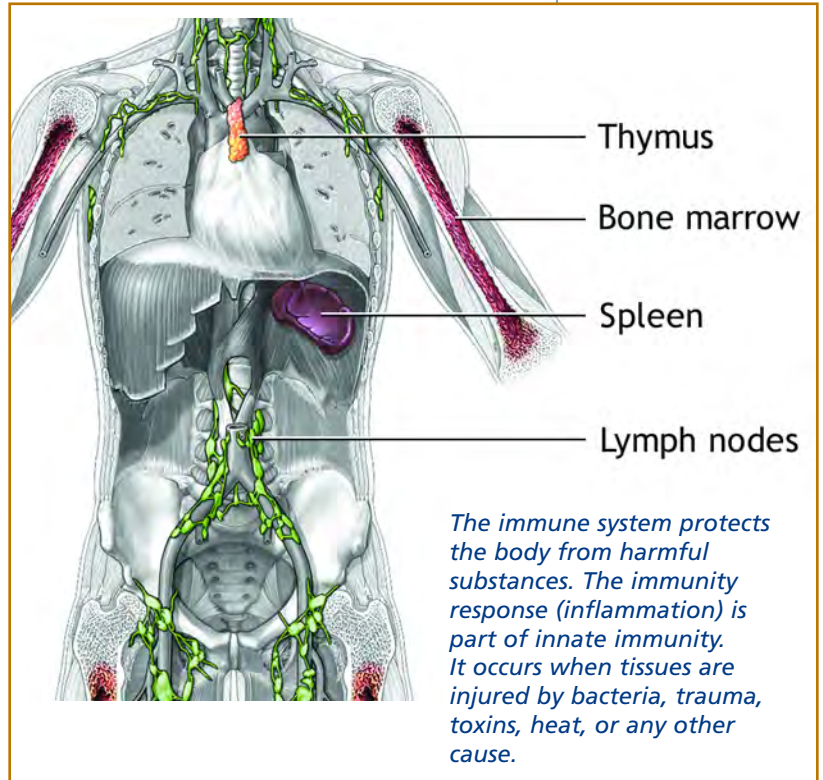
Healthy immune system

The immune system is so complex that some of the way it works is not yet understood. What scientists do know is that a healthy immune system battles infectious agents in an effort to keep the body free of disease. When a disease-producing organism invades the body, the white blood cells (called **leukocytes**) form a kind of army that gathers together to prevent infection. Leukocytes also work to repair any damage done by an invader.

Just as there are a variety of foreign materials that act as invaders (viruses, bacteria, parasites, and fungi), there are many types of white blood cells.

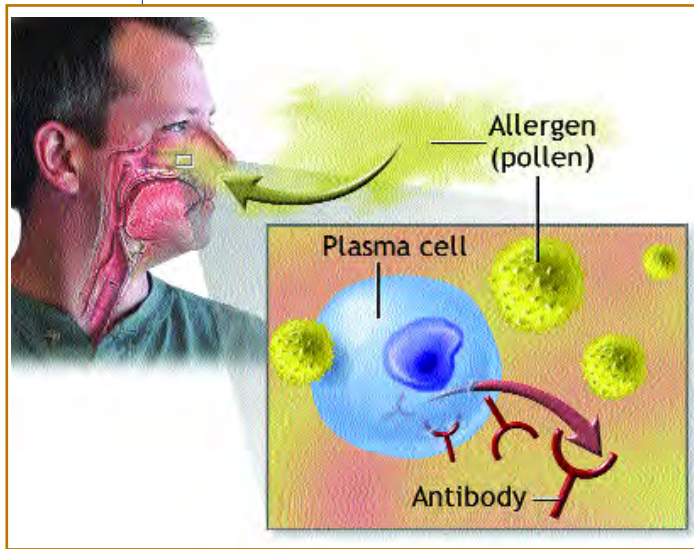
Different ones have different functions. One type, called **neutrophils**, ingests bacterial invaders and produces the chemicals that destroy them. Whatever the type, white blood cells work together to help produce the body's immune response.

White blood cells are assisted by **lymphocytes**—cells that play the



most prominent role in helping the body create a natural resistance to disease. There are two types of lymphocytes: B cells and T cells. **B lymphocytes** produce **antibodies** that do battle with **antigens**, the foreign substances that are created by an invader. When an invader enters the body, its antigens alert the immune system to the invader's presence.

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When antibodies target the invader, they also send messages to white blood cells to join the battle. **T lymphocytes** attack cells that are foreign or that are infected by a virus. They do this by generating antibodies that fight off the foreign particles found in invading cells. Their attack also includes digesting the invaders or releasing chemicals that can destroy them. Another job of the T cells is to help the body accept—without overreacting to—the chemicals that are found in allergy shots.

Among the substances that the immune system encounters are allergens, which can trigger allergic reactions in many people. Some of the most common allergens are pollen, mold, and animal dander, as well as cockroach and

house dust mite droppings. Scientists do not know why some substances are allergens for some people and harmless for others.

The body has two main ways of protecting itself. **Innate immunity** is the body's first line of defense. It includes the barriers that keep antigens from entering your body, such as the skin, mucus, stomach acid, the cough reflex, and enzymes in tears and skin oils. An antigen that gets past these barriers then has to face other parts of the immune system, such as certain white blood cells that “eat” microorganisms and dead or damaged cells. Inflammation, or swelling, is also part of innate immunity. Blood vessels leak fluid into damaged tissues. This swelling keeps foreign substances away from other body tissues.

Active (acquired) immunity is slightly different, occurring when the body responds to a foreign invader such as a virus. In active immunity, the body responds to an antigen and builds a defense that is specific to that antigen. In other words, the first time the body comes in contact with a foreign invader, it creates antibodies that attack only that invader. The next time the same antigen enters the body, the

immune system is already prepared to fight it. In a sense, the immune system “remembers” the antigen.

When a body has a healthy immune system, some invaders can be conquered before they create the condition that leads to disease. The damage from other invaders that succeed at first can be minimized and repaired. When an immune system is not healthy, it is not able to work as well in fighting off these invaders. In some cases, an immune system becomes so compromised that it shuts down and is unable to fight off or contain any disease-producing organisms.

Problems associated with allergies

A person with allergies has an immune system that overreacts to substances that do not produce symptoms in most people. Substances that are otherwise harmless, such as animal dander or dust, can trigger a severe allergic reaction in a person who is sensitive to them. For these people, animal dander and dust become allergens. A person with allergies might experience sneezing, wheezing, coughing, or an itchy feeling in the throat.

Allergic rhinitis (hay fever)

is an inflammation of the mucous membranes of the nose. It is caused by the same types of substances that trigger allergies. Outdoor triggers include grasses, trees, and weeds. Indoor triggers include mold, animal dander, and cockroach droppings. Treatments such as allergen immunotherapy, medications, and, of course, avoiding the triggers can provide some relief. If not properly treated, a person with rhinitis can develop sinusitis.

There are two forms of sinusitis, a condition characterized by an inflammation of the sinuses, a plugged-up nose, a feeling that the face is swollen, toothache, tiredness, and fever. One type is called **chronic sinusitis**. This condition is often caused by bacterial infections and can be a cause of chronic cough. Another

The animal dander from pets can trigger an allergic reaction in a person who is sensitive to it.



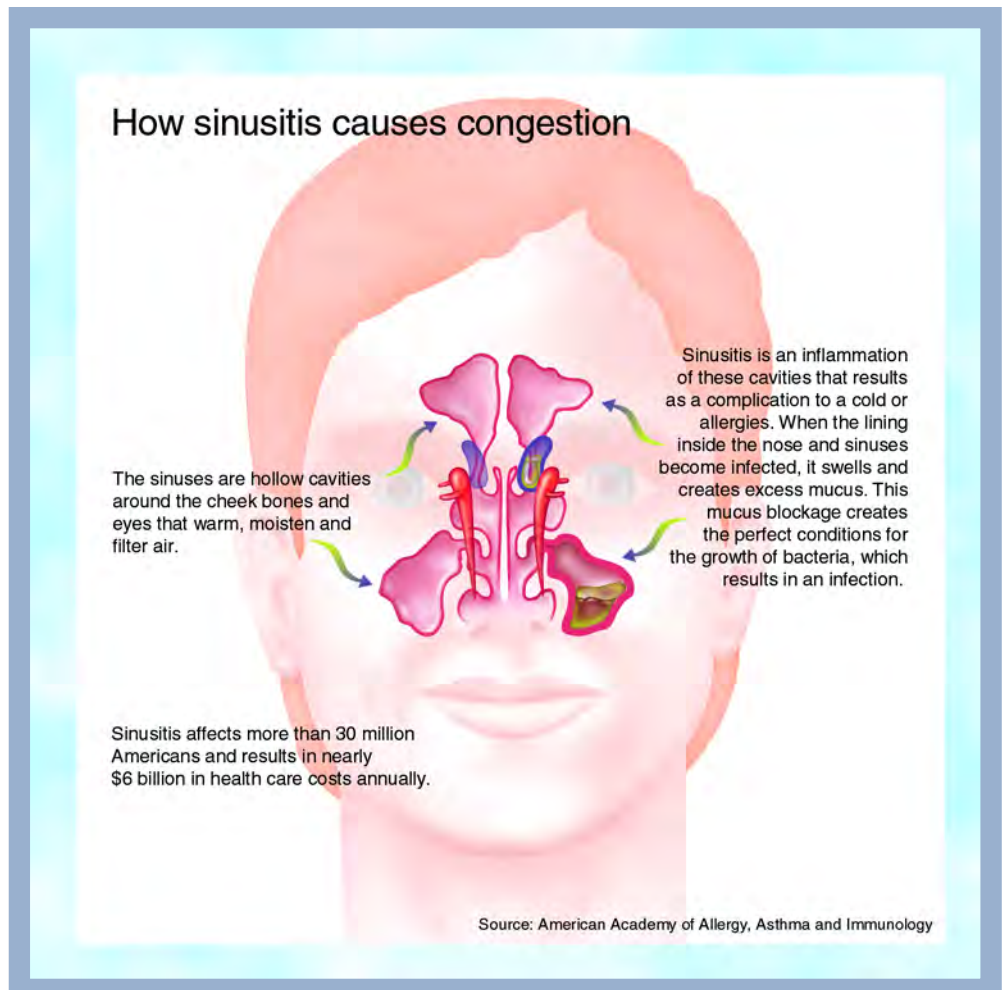
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type is called **acute sinusitis**. Also caused by bacterial infections, acute sinusitis can appear several days after the first sign of a cold. Exposure to tobacco smoke and chemical odors can make symptoms worse. People with allergies seem to be predisposed to developing acute sinusitis, perhaps because allergies tend to lead to inflammation of the sinuses and nasal linings. The inflammation can prevent bacteria from getting

cleared from nasal cavities. Long-term treatment for allergies can sometimes help prevent acute sinusitis from developing.

The symptoms of allergies

The symptoms that an allergic person experiences are determined by the type of allergen that triggers the reaction, the site where the reaction occurs, and the immune system's response. Some



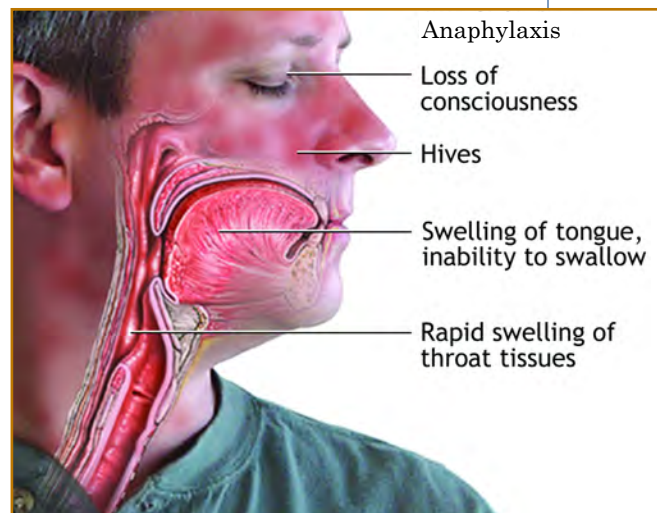
Part 2: What Are Allergies?

people suffer from symptoms that are mainly consistent with hay fever: runny nose, congestion, and sneezing. Others experience a reaction that is more typical of a response to a food allergy: swelling of the throat, difficulty breathing, and dizziness. Still others break out in hives, an itchy skin rash that forms in clusters, when exposed to a medication such as penicillin.

Allergic reactions can be quite different and can range from merely annoying to fatal. The milder, more annoying symptoms can begin with watery, swollen eyes; an itchy, irritated nose and throat; and hoarseness in the voice. The nasal passages can drain profusely, through the front of the nose or down the back of the throat. The symptoms can grow more irritating as they start to reduce the person's ability to be active. Thick **phlegm** (mucous secretions in the respiratory passages) can occur as the chest becomes more congested. Coughing and sneezing can be so severe that the person becomes exhausted from the effort both require. The skin can become one red, itchy, swollen rash. Abdominal cramps, vomiting, and diarrhea can make it impossible for a person to leave home. Still, however awful these symptoms sound, none is as bad as those suffered during anaphylaxis.

Anaphylaxis is a sudden, severe allergic reaction that can have a variety of symptoms. It is important to learn about these symptoms, because anaphylaxis can be fatal if it is not properly treated. This allergic reaction can involve major areas of the body at the same time, such as the skin, the respiratory system, the gastrointestinal tract, and the cardiovascular system. Symptoms can occur within minutes of an exposure to a trigger (for example, after receiving an insect sting). It is important to remember, though, that sometimes symptoms do not appear for several hours (for example, after taking a medication).

Symptoms associated with various forms of anaphylaxis include fever, swelling throughout the body or in one area, difficulty swallowing or breathing, nausea,



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vomiting, diarrhea, abdominal or uterine cramping, congestion, a feeling of having to urinate, hives, swelling of the lips and joints, severe anxiety, headache, itching, sneezing, coughing, and wheezing. The most dangerous symptoms of anaphylaxis are low blood pressure, breathing difficulties, shock, and loss of consciousness.

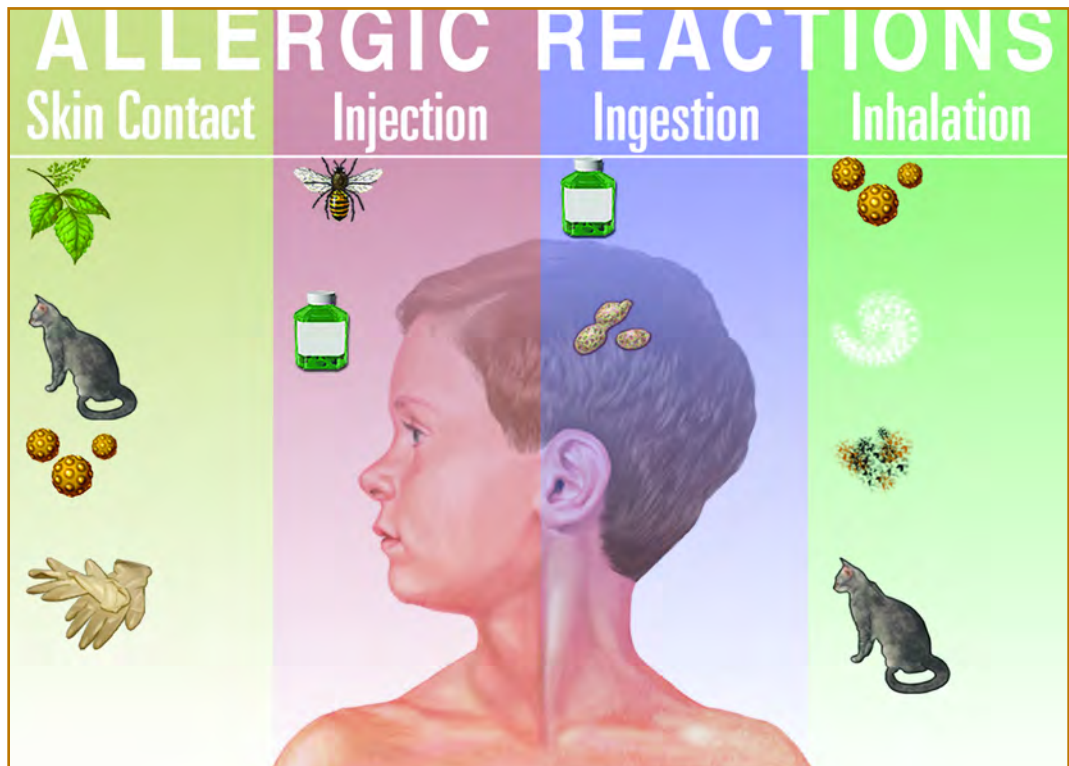
Sometimes anaphylactic symptoms are misdiagnosed as hyperventilation, anxiety attacks, low blood sugar, or drug and alcohol intoxication. A misdiagnosis can be deadly.

There are no cures for this variety of allergic reaction, but many

promising treatments can prevent or control the symptoms. (See pages 56–57 for information about treatments.)

The causes of allergies

The exact cause of allergic reactions is not known. However, there appears to be a hereditary component to the more common forms of the condition. If one parent has allergies, a child's risk of developing the condition is 48%. If both parents suffer from allergic reactions, the child is 70% likely to develop allergies. When it comes to allergies, the important question to ask is not *why*, but *what*. If a person can determine—



through experience that is confirmed by testing—*what* it is that triggers symptoms, treatment can begin.

There is an extensive list of known or suspected allergens. Each person with allergies reacts to specific substances. Someone for whom pollen is a problem might have no allergic reaction to mold. People who are allergic to cats are not necessarily sensitive to dogs. Some foods and medications trigger reactions in people; others do not. Some people can work in an environment in which they are exposed to a chemical that triggers an allergic reaction within days of their first exposure. For other people, this reaction might take years to appear.

Anaphylaxis can be caused by exposure to some common substances, such as foods, medications, insect bites, and certain material, such as latex. Exercise can also produce anaphylactic symptoms, but not consistently. Allergens that induce anaphylaxis include the following:

- **Foods and additives:** A trace amount of peanuts, tree nuts (for example, walnuts or almonds), shellfish, fish, milk, or eggs can trigger an allergic reaction in some people. This

reaction can occur quickly. Additives such as sulfides—found in beer, dried fruit, pickles, and potato products—can also cause anaphylaxis, especially in asthmatics.

- **Medication:** There is an increased chance of developing an allergy to medication if the medicine is given frequently, in large doses, or by injection. This reaction usually occurs within hours of exposure.
- **Insect stings:** Honeybees, bumblebees, yellow jackets, hornets, wasps, fire ants, and harvester ants are the insects that cause most anaphylactic symptoms, which occur within minutes of the sting or bite.
- **Latex:** Those who work in the health care or rubber industries are exposed to latex so often that some develop allergic reactions to the material. Children who have congenital diseases like spina bifida often have many early exposures during their numerous surgeries. They, too, can develop an allergy to latex. Certain foods that cross-react with latex can trigger allergic reactions in these same people. These foods include bananas, kiwi, avocados, European chestnuts, potatoes, tomatoes, peaches, plums,

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cherries, and other fruits with pits.

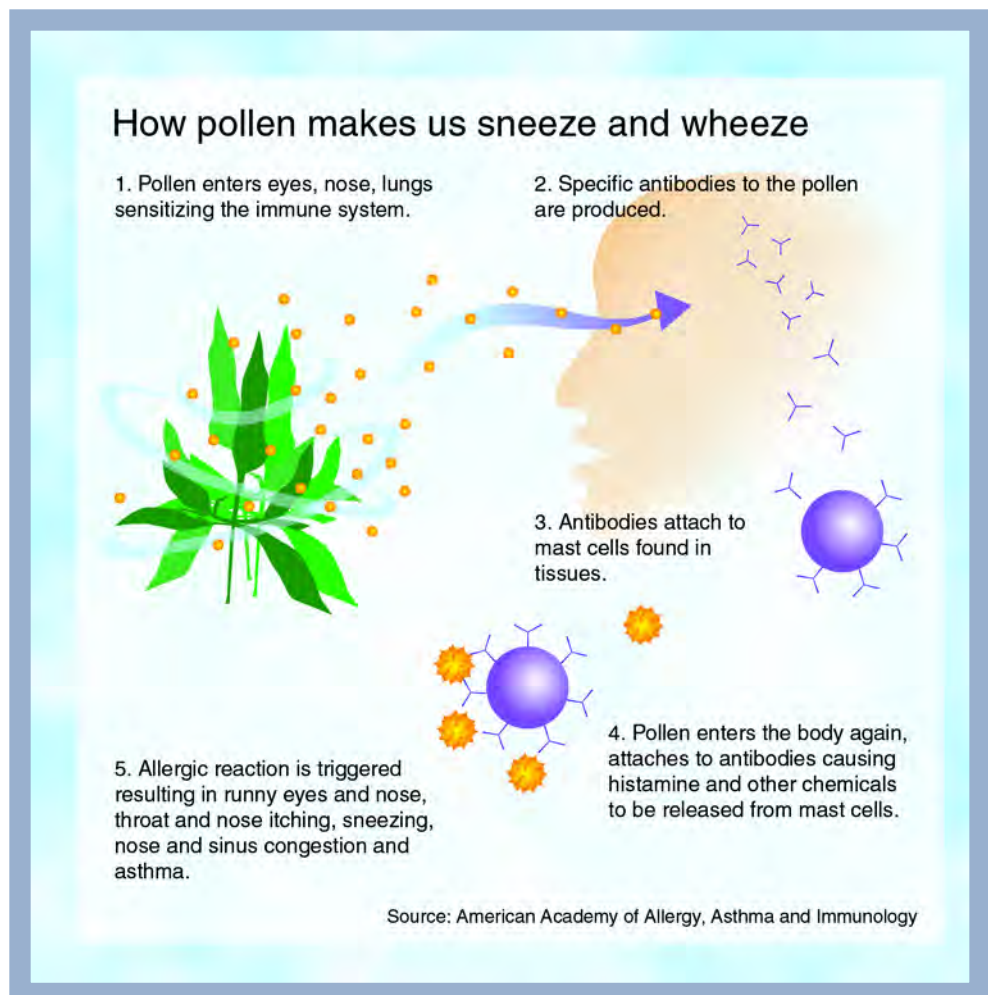
A less common type of allergic reaction is called **food-dependent exercise-induced anaphylaxis**.

Symptoms occur after a person exercises within 3 or 4 hours of eating a certain food. The foods that have been known to cause this reaction are wheat, shellfish, fruit, milk, cereal, and fish.

Usually, those who experience the reaction already have asthma as well

as other allergies.

In some cases, a person can experience what is called a **biphasic reaction**. This happens when an anaphylactic reaction occurs. After the reaction, the symptoms go away, only to return hours later. For this and other reasons, it is important for a person having these symptoms to stay at a hospital for several hours following the first signs of trouble. Even if medical staff indicate that a person is



free to go home, it is best to sit in the hospital lobby for a few hours just to make sure that the symptoms do not return. Doing so could save the person's life.

How allergies affect the body

A person can be allergic only to something to which he or she has already been exposed. In other words, an allergic response occurs after an initial exposure to a substance to which the person's immune system is sensitive. It is reexposure to the substance that produces the allergic reaction.

The first time an allergen enters the body of a person who is likely to develop allergies, a certain type of allergen-specific antibody is produced. This antibody, called **immunoglobulin E (IgE)**, travels to mast cells in many areas of the body. **Mast cells** are commonly found in the nose, eyes, lungs, and gastrointestinal tract. IgE antibodies attach themselves to the surfaces of these mast cells. Each IgE antibody is waiting for an invasion by a particular allergen.

Let's say that a person is predisposed to developing an allergy to cat dander. The IgE antibody for that allergen can be found on the surface of that person's mast

cells. He or she might develop an allergy to cat dander only. This means that the person's allergies will not be triggered by dog or horse allergens, unless, of course, those allergen-specific IgE antibodies are present as well.

Therefore, the IgE antibodies to cat dander have "set up camp" on the mast cells. The very next time that the person comes into contact with cat dander, this allergen will enter the body. The waiting IgE antibodies will capture these cat dander allergens. Once this happens, chemicals such as **histamine** are released from the mast cells. These chemicals, often called mediators, are responsible for producing the symptoms of an allergic reaction, such as sneezing and coughing. As the person continues to be exposed to the cat dander allergen, the reaction continues. Already inflamed tissues might grow more inflamed as these chemicals draw other swollen cells to the area.

The reaction that the person has depends upon the location of the mast cells to which the IgE antibodies have attached. For example, if an allergen such as pollen touches the lining of the nose, as is common in allergic rhinitis (hay fever), the mucous membranes that line the nose will

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Children have allergic reactions to food more often than adults have. As they grow older, they may outgrow some of these allergies.

become inflamed and congested. The person will experience a dripping nose and watery, itchy eyes. If the person continues to be exposed to the allergen that triggered the reaction, the symptoms will continue the same way.

A person with a very different trigger—for example, a food that produces **eczema**—will experience symptoms that affect the skin. For 80% of those with eczema, this condition—itchy, reddening, flaking, and peeling skin—begins in childhood. Another skin-specific allergic reaction can occur from an infection, eating a certain food, or taking a certain medication.

Hives can cover the skin with small or large clusters of itchy, red bumps. Children experience allergic reactions to food more frequently than adults do. Over time, a child can become less sensitive to foods that were once allergy triggers.

Food can also be a trigger for anaphylaxis. A person who is in immediate danger from this severe allergic reaction should be given an injection of epinephrine (adrenaline) as soon as possible.

Otherwise, the episode could be fatal. **Epine-**

phrine is a body chemical that is produced naturally by the adrenal glands. Used in injections, a synthetic form of the chemical fights allergic reactions in several ways. Epinephrine opens constricted air passages, constricts dilated blood vessels, elevates low blood pressure, and halts the swelling that is common with hives.

How allergies affect lifestyle

People with allergies suffer from symptoms whenever they are exposed to the provoking allergens. In some cases, a person can avoid the trigger. If shellfish provokes an

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allergic reaction, a person could simply avoid exposure to any form of this food.

With other allergy sufferers, avoiding the allergen is not as easy. If the trigger is airborne, how can a person avoid exposure if the trees, grasses, weeds, and molds that thrive from January to December each year are the culprits? Even if allergies are seasonal, this still means that for months each year, the person must avoid the outdoors. If a person working as a nurse develops an allergic reaction to latex, what can be done? There are latex-free gloves available, but latex in various forms can be found everywhere within the environment in which the person must work. A food allergy can be so severe that simply avoiding direct contact with the food is not sufficient.

Peanut allergies are among the most common allergies in the United States. Children rarely outgrow peanut allergies. People who are allergic to peanuts find it difficult to avoid the many forms of the nut that are triggers. A child with a peanut allergy must avoid exposure to ground nuts, mixed nuts, peanut butter, peanut oil, and peanut flour. All utensils and surfaces that are

used to prepare foods containing nuts must be avoided as well. The protein that causes an allergic reaction to peanuts can become airborne. Therefore, a child with a peanut allergy can have a reaction from sitting in an environment in which peanuts or peanut products are cooked or consumed—for example, in a cafeteria in which other children are eating peanut butter or in a Chinese restaurant where egg rolls are being prepared.

Allergies of all types have driven people to significantly restrict their activities. Many people with severe allergies feel as if every environment holds potential dangers. Especially if a child is suffering from allergies, it is important to create an environment in which there is little fear of symptoms and an expectation exists that the child can meet the challenges of daily living. Usually, a



Peanut allergies are among the most common allergies in the U.S.

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combination of avoidance, allergen immunotherapy, and medication is needed to give an allergy sufferer more freedom to live a normal life. Many with allergies have had to endure the difficult side effects of medications that were used to treat their symptoms. At one time, **antihistamines** caused so much drowsiness that an allergy patient had to decide whether to suffer the effects of the allergy and remain alert or suffer the drowsiness brought on by the medication. Today, many formulas that do not produce drowsiness are available.

Newer medications allow people who have suffered life-threatening

allergic reactions to live more normal lives. There was a time when a person who had suffered from anaphylaxis could not travel to any area of the world where a certain level of medical care might not be available. Some people were so concerned about the availability of treatment that they lived closer to hospitals and ate dinner at restaurants that were minutes away from an emergency room. Now that epinephrine injections are portable and easy to administer, a dangerous insect sting or food allergy can be treated immediately. Still, medical help should be sought immediately after epinephrine is used.



Epinephrine injections are more portable now. This makes it easier for people with life-threatening allergies to lead normal lives.



Out from the Shadow of Asthma

At first, Gavin Huntley-Fenner's asthma came on slowly. While training with his high school wrestling team, he grew short of breath whenever he ran laps outside in the cold. Huntley-Fenner didn't worry too much, though, because his symptoms were never severe, and they disappeared in warm weather. A few years later, things grew much worse.

By then, his asthma attacks were so severe and frequent that he ended up in a hospital emergency room twice in one month. When he was near cats, his symptoms worsened. At times, it was impossible for him to climb a short flight of steps without stopping to rest. Huntley-Fenner decided he needed to find a way to manage his disease for a lifetime.

When Huntley-Fenner puts his mind to something, the results are often impressive. He earned his doctoral degree from the prestigious Massachusetts Institute of Technology and began a research career studying how children learn to speak and to grasp the concepts of numbers and counting. His broad range of skills has made him a sought-after business consultant in Southern California, where he now lives with his wife and two children.

He approached his struggle with asthma with the same deliberate and careful study.

"My key challenge right now as an asthmatic is that I'm on a lot of medication at high doses," he says. "As I grow older and my disease worsens, I'm concerned that there will be less and less flexibility to treat flare-ups."

So, with his doctor's blessing, Huntley-Fenner tries to cut down on medications whenever possible, all the while being careful not to jeopardize his health. "Finding a doctor open to thinking through the problem with you is important," he recommends.

Huntley-Fenner, continued on next page

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His approach seems to be working. For now, Huntley-Fenner's asthma doesn't seem to be worsening. To keep his body strong, he seeks out ways to exercise that won't cause an attack. "I have to be more creative in finding ways to keep fit," he says matter-of-factly. "I can't run around as much as I would like with my kids, but we ride bikes. There are neighborhood soccer games that would be fun for me to join in, but I can't. We're managing well, though. I can run on a treadmill. I can cycle. I can swim."

For Huntley-Fenner, trying to minimize the impact his asthma has on his family is a main concern. He has worked to reduce the amount of dust and allergens in his home, which can aggravate his asthma. "We no longer have a dog, we've covered our mattresses and pillows [with special coverings to reduce allergens], and we've put in wood flooring instead of carpets," he explains.

At the same time, he is concerned that creating such a sterile environment could prevent his three-year-old son and eight-year-old daughter from building their own resistance to things that cause allergies. It's a careful balancing act.

"If you're allergic or asthmatic and you're a parent, you might worry, 'What is the impact of this disease on my children?'" he says. Though he is concerned that his children may develop asthma or allergies, he doesn't let those thoughts get the best of him.

With the care of a good doctor, proper medicine, and a healthy outlook, Huntley-Fenner has dealt with asthma head-on—and instead of anxiously awaiting another attack, he has pushed it into the background of his busy, fulfilling life.

"I know that asthma poses certain risks for me and my family," he says, "but I won't let it overshadow my life."



Part 3: Who Has Asthma and Allergies

Childhood allergies and asthma

It is estimated that, out of the 17 million Americans who suffer from asthma, 5 million of them are children. Childhood asthma is so common that it results in nearly 3 million visits to a physician and 200,000 hospitalizations each year. Asthma often begins in early childhood. Up to 80% of children with asthma show symptoms of the condition before the age of five. The first signs of asthma in infants and children are often a cough, a fast or noisy breathing pattern, and chest congestion. These asthma symptoms can be so subtle that the children might not even be aware of them. For example, a child might grow so accustomed to chest tightness that it seems normal. This is why it is crucial for parents to take note of these subtle changes. A parent's observations could be the basis for a physician to diagnose the condition sooner.

Some children will outgrow the disease, but others will not. It is just as unclear why asthma starts



as why it goes away. Severe childhood asthma often goes away, but mild asthma often does not. If asthma occasionally occurs in childhood, especially as a result of viral respiratory infections, there is a greater chance that the symptoms will ease with age. In fact, about half of all children who have chronic asthma will have fewer symptoms or none at all by adolescence. Since older children tend to get fewer viral respiratory infections, this alone might account for fewer asthma attacks.

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Asthma and the Olympics

Many asthmatics compete in the Olympic Games. In fact, 1 in 6 of all American athletes competing in 1996 had a history of asthma, as did 1 in 5 competing in 1998. Some of these athletes needed to use asthma medication during competition. In 1994, asthma was most common among the athletes who were cyclists and mountain bikers. It was least common among those who competed in beach volleyball, table tennis, and volleyball. Almost 30 percent of asthmatic athletes won individual and team medals, compared with those without asthma, who won 28.7 percent.

It is also possible that the asthma symptoms will remain, but that the triggers will change. An older child who once suffered from asthma due to viral infections could begin to experience attacks triggered by allergens or environmental factors.

Childhood asthma can lead to many absences from school. The symptoms of asthma can make participation in a variety of activities difficult for children. As a result, a child can feel left out. In addition, the symptoms of asthma—especially difficulty breathing—can leave a child feeling scared. Although having asthma at a young age can lead to restricting activities initially, every effort should be made to help asthmatics live normal lives. With proper treatment and management, many young asthmatics can excel in sports. In fact, a great number of accomplished athletes around the world have been asthmatic. Some have even competed in the Olympics and for professional sports teams.

As for allergies, some of the most serious allergy symptoms that a child can experience are triggered by foods. Food allergies were reported in Europe as early as the beginning of the 1900s. Physicians around the world have been treating food allergies since the 1940s. Children account for the majority of those affected by food allergies. In the United States, 6–8% of children and 2% of adults have food allergies, and about 100 people die each year from food-related anaphylaxis. According to a recent study, teens who have a food allergy as well as asthma are more likely to experience anaphylaxis for several reasons: They often

Part 3: Who Has Asthma and Allergies

dine away from home; they do not always carry medications with them; they might not recognize symptoms; and even if they do, they might ignore the symptoms.

For both asthma and allergies, mild and severe forms of the conditions occur in children and should be treated at the first signs of symptoms. Early, consistent treatment is important for several reasons. First, it could prevent the condition from getting worse. In fact, there is some evidence that allergen immunotherapy can actually help a child outgrow allergies. Second, if symptoms are left untreated,

learning and development can be affected. Third, it is always important to give a child whatever he or she needs to experience life in the fullest, healthiest way possible. If a child is always coughing or struggling to get a full breath, he or she is less likely to attend school, socialize, or play. Even a child with severe symptoms should feel as normal as possible.

To help a child manage asthma and allergies, it is important for parents, physicians, and school administrators to work together and keep certain goals in mind:



Children with asthma or allergies should live as normal a life as possible so that they don't feel left out.

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- **Help the child achieve emotional health.** Inspire confidence in the child. Give the child opportunities to achieve and succeed. Encourage the child to see herself or himself as a healthy person, not a sickly person.
- **Prevent symptoms from threatening normal living.** If the child is constantly struggling to breathe, it will make concentration on schoolwork, friends, and exercise more difficult. With proper management of symptoms, exercise should be encouraged not just for the child's overall well-being, but also to strengthen his or her upper respiratory system.
- **Foster communication to create a supportive environment.** Make sure that the principal, teachers, coaches, and school nurse are all aware of the child's condition and the specifics of treatment. Make sure that the child is allowed to take medications on schedule and follow other directions of his or her asthma care plan. Every effort should be made to treat the child normally. However, all school personnel should be prepared to assist the child in case of an allergic reaction or an asthma attack.
- **Reduce or avoid triggers.** This means establish a smoke-free, clean environment in which animal dander and dust mite and cockroach droppings are minimized. Also, reduce the overall amounts of dust, mold, and mildew in the home.
- **Foster an overall healthy lifestyle.** Make sure that the child has a good diet, proper rest, and exercise. Also, make sure that all medications are available and are used correctly. An asthma care plan should be clearly communicated by the child's health provider and given to the parent for posting at home.

Uneven impact of allergies and asthma

Besides AIDS and tuberculosis, asthma is the only chronic disease that has an increasing death rate. Between 1978 and 1992, the death rate from asthma increased 58%. Between 1980 and 1993, the death rate for children under 19 increased 78%. More females die of asthma than males, as do more African Americans and Hispanics than whites. Higher rates of asthma-related symptoms, hospitalizations, and death among African Americans and Hispanics seem in part to be due to poverty, poor urban air quality, indoor allergens, inadequate information, and a lack of medical care. While African Americans make up 12.8% of the population of the United States, they account for 23.7% of the total number of deaths due to asthma.

Among Hispanics, Puerto Ricans seem to have higher death rates from asthma than any other group. Unfortunately, scientists do not yet know why this is so. Recently, in the *American Journal of Respiratory and Critical Care Medicine*, a study revealed that Puerto Ricans had an annual death rate of 40.9 per million due to asthma. Cuban Americans had a rate of 15.8, and Mexican Americans a rate of 9.2, per million. If asthma is

properly managed, however, the death rates due to the condition could decline.

When adequate medical treatment is not available to help prevent the symptoms of asthma from becoming severe, hospitalizations and emergency room visits become necessary. In general, more than four times the number of African Americans are taken to emergency rooms because of asthma attacks than those of other races. African-American children are three times more likely to be hospitalized for asthma than white children.

A study published in the *Journal of Asthma* (July 1999) revealed that hospitalization rates for asthma in New York City were 21 times higher among those who lived in low-income neighborhoods and minority neighborhoods. Physicians at the New York Academy of Medicine studied 107 children with severe or chronic asthma, most of whom were Puerto Rican or African American. Only 39% of these children were using anti-inflammatory medications daily.

There appears to be some evidence that certain aspects of community life among Hispanics and African Americans account for their higher rates of asthma.

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Every form of air pollution—ozone, sulfur dioxide, acidic air particles—is more common in urban, minority neighborhoods. High crime rates create stress for those who live in these areas. In 2000, Harvard researchers said that in a study of children under the age of 26 months, children were twice as likely to have physician-diagnosed asthma if they lived in areas with higher rates of violent crime and vacant housing. Researchers found that in these same areas, children over the age of two had a 40% increased risk of being diagnosed with asthma.

Residents of high-crime areas cannot control the gun violence and the stress caused by it.

However, there is another asthma trigger that *can* be reduced, which is found inside many households in these areas. The National Inner-City Asthma Study found a relationship between inner-city residents and asthma resulting from exposure to cockroach droppings. If measures are taken to reduce the number of cockroaches in a home, this will decrease the number of droppings that an asthmatic is exposed to in bed-sheets, food, bathroom towels, and carpeting.

A similar program in Seattle for low-income children with asthma used community-based lay health workers who focused on multiple triggers, including dust mites,



Air pollution is more common in urban, minority neighborhoods.

house dust, mold, moisture, environmental tobacco smoke, roaches, and rodents. This one-year Seattle Healthy Homes intervention showed a reduction in both the number of days with symptoms and emergency clinic visits, as well as a significantly improved quality of life for caregivers.

Societal impact of allergies and asthma

In the United States, allergies are the sixth-leading cause of all chronic diseases. Allergies can develop at any age, even in the elderly. There are 50 million children and adults affected by allergies in this country alone, approximately 35 million of whom suffer from hay fever. The financial impact of hay fever in the United States in 1996 totaled \$6 billion by itself. And, in 1998, increased absenteeism and reduced productivity due to allergies cost U.S. companies more than \$250 million.

With tens of millions of sufferers in this country alone, allergies are now considered a serious disorder. Up to 10% of the population may be at risk of allergic reaction to medications. Food-induced anaphylaxis results in 30,000 visits to the emergency room each year. Approximately

10–17% of people working in health care have an allergy to latex. Up to 4% of the population has experienced anaphylaxis that was caused by an insect sting.

Asthma also has serious consequences. If asthma is not managed properly, the cost of treating the condition increases. According to the Asthma and Allergy Foundation of America, over the last 10 years the costs that resulted from adults missing work because of their own asthma quadrupled. The number of adults who stayed home to care for children with asthma increased lost work time costs in 1998 by \$3.8 billion. That same year, overall costs for visits to physicians, hospitalizations, and medications that resulted from asthma symptoms totaled \$7.5 billion. Of this total, the greatest portion was spent on hospitalizations. Asthma symptoms result in 1.8 million emergency room visits, 10 million visits to a physician's office, and half a million hospitalizations each year. Among children aged 5 to 17, asthma symptoms are the leading cause of absence from school—a loss of more than 10–14 million school days each year.

Asthma can also have a serious financial impact on a family. When a child has to stay home

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from school because of asthma symptoms, a parent often has to miss a day of work. Repeated trips to a physician's office or emergency room or multiple stays in a hospital can be costly even when a family is insured. When a family is uninsured, these expenses can be devastating.

The best way to avoid the high costs of asthma and allergies is to have the conditions diagnosed and treated as early and as consistently as possible.



Asthma symptoms result in 10 million doctor visits and 10–14 million school absences each year.

Printer:

Strip in photo from negative provided.

Food Allergies: Avoiding a Recipe for Disaster

While spending the day with her grandmother, one-year-old Natalie Kalitsi suddenly began acting strangely. First the little girl grew very sleepy; then red blotches broke out all over her body. She seemed to struggle to breathe. An ambulance rushed her to the hospital, where doctors questioned her grandmother: What had Natalie eaten that day?

Nothing unusual—but Natalie did have her first bite of fish. That small bite of fish was enough to almost kill her.

Today Natalie is an active, happy three-year-old with big brown eyes. Like other toddlers, she loves going to preschool, playgrounds, and birthday parties. But wherever Natalie goes, a special shot that contains powerful medicine always follows. If Natalie accidentally eats seafood, peanuts, or dairy products—all of which give her allergic reactions—the shot will help her breathe until she can be taken to a hospital.

“At first it was hard getting used to, but it’s routine now,” says Gale Kalitsi, Natalie’s mother. “Everywhere Natalie goes, I pack a special lunch box for her—it’s like a game. We even do it at birthday parties—or when she goes to her cousin’s house.”

All parents try to look out for their child’s safety, but being the mother of a severely allergic child means that Gale must be extra careful. Before Natalie began to attend a preschool near her home in Bethesda, Maryland, Gale called meetings with her teachers and the school’s director to make sure that they understood how serious allergies can be.

“Until you have an experience with food allergies, you don’t know how deadly allergies can be,” says Gale. “In Natalie’s case, it can close down her air passages and kill her. Everyone who comes in contact with her needs to be able to read food labels. And because children like to share food, or they may kiss her and have peanuts on their lips, we need to be especially careful.”

Kalitsi, continued on next page

Asthma and Allergies: The Science Inside

So a special rule was set for Natalie's classroom: No students could bring in peanut-butter sandwiches for lunch.

By now, Gale is an expert at reading the labels of everything Natalie eats, but in the beginning food labels were filled with confusing words. For example, Natalie is allergic to milk, but how could Gale know that many unfamiliar-sounding ingredients such as "casein" or "whey" contained milk? Gale says that an organization called the Food Allergy and Anaphylaxis Network (1-800-929-4040) has been an enormous help and has even provided her with special note cards listing ingredients that aren't safe for Natalie.

Gale and her husband have learned so much about food allergies that when their second daughter was diagnosed with an allergy to wheat, they felt confident of their ability to handle her special needs. "You really need to become an educator and a campaigner for your child," says Gale.

But Gale and her husband recently learned they're not the only ones watching Natalie's diet. Now that Natalie is growing up, she can speak up for herself.

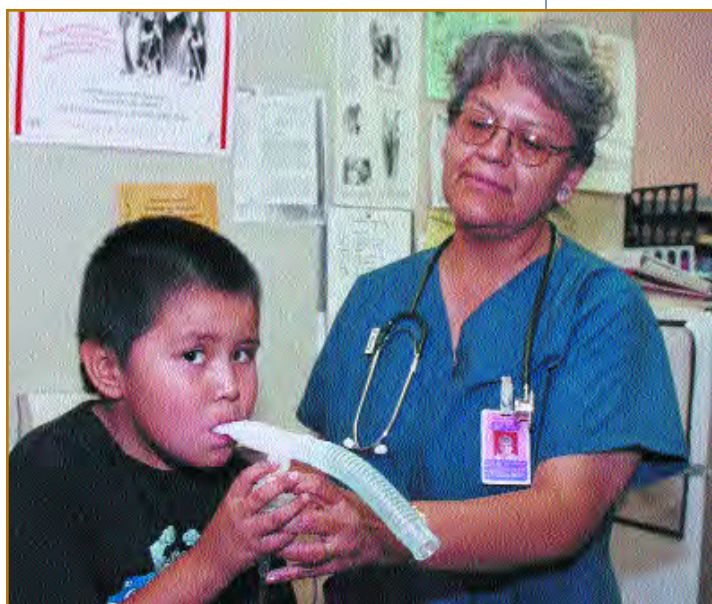
"At the age of three, Natalie can tell you what foods make her sick, and she can tell you what she can have," says Gale proudly.

Part 4: How Can Asthma Be Treated and Prevented?

Diagnosing and treating asthma

When a physician completes an evaluation to determine whether a person has asthma, several tests are done. In addition to a physical exam, the physician will ask questions about the person's general health and symptoms.

If the person is experiencing symptoms at the time of the examination, the physician will try to rule out certain conditions. It is important to distinguish asthma from bronchitis and pneumonia, for example. Both bronchitis and pneumonia are caused by bacteria and can be treated with antibiotics. But antibiotics do not work for asthma. It is equally important that the physician zero in on the specific physiological causes of the symptoms. That is, which processes in the person's body are producing a cough or a wheeze? Different physiological causes often respond to different treatments. For example, bronchoconstriction will require a different form of treatment than airway inflammation.



Even if it appears that no symptoms are present at the time of the exam, **pulmonary function tests** can detect even minor blockage or airway obstructions. These tests can help the physician determine the cause of the obstruction, if there is one. The physician might also have the patient perform breathing tests before and after exercise to record any differences in breathing capacity. These tests can be conducted either in a physician's office or outdoors and are important for a person who seems to be suffering from exercise-induced asthma.

During office visits, a doctor or nurse may test a patient's ability to breathe to help figure out if he or she has asthma.

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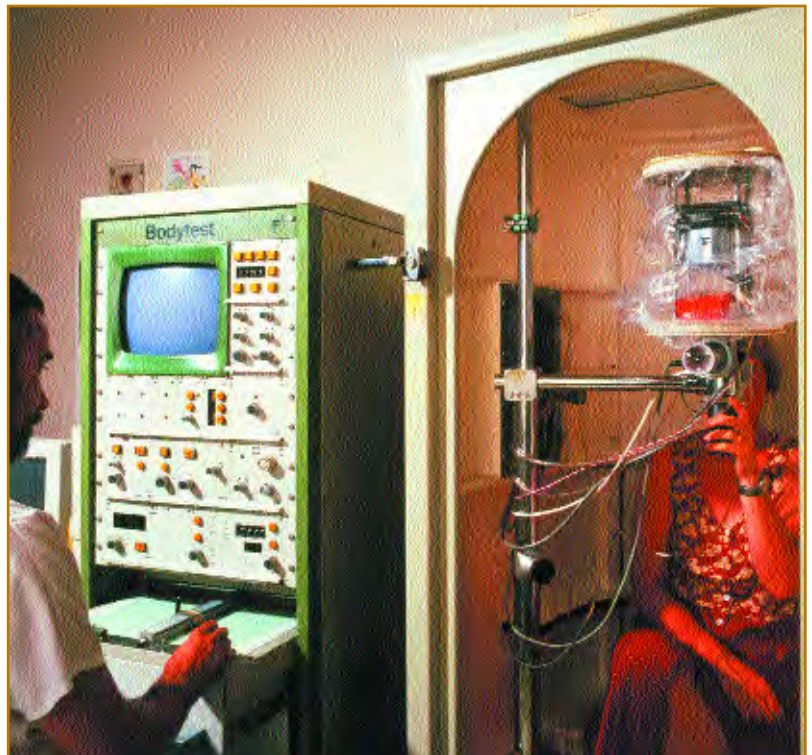
A **spirometer** measures the ability of a person to breathe out air from the lungs. If, after exertion, the person shows at least a 12–15% decrease in the volume of air blown out in one second—called the **forced expiratory value (FEV 1)**—exercise-induced asthma could be the cause. Outdoors, a portable spirometer can be used.

A device called a **peak flow meter** can also measure breathing capacity. If a peak flow meter is used, a 15–20% decrease in the volume of air blown out indicates that a patient is likely to have

exercise-induced asthma. Peak flow meters may also be used to determine when more or a different medication is needed.

Parents can help a physician evaluate whether their child suffers from asthma. Perhaps they have noticed that their child tends to withdraw from activities that require physical exertion. Maybe their child tends to cough or wheeze late at night or during a certain time of the year. There might be specific times when their child's breathing sounds heavy or noisy. These can all be indications of asthma.

A doctor may want to use a spirometer to test how much air an asthmatic can exhale. The computer that the spirometer is hooked up to draws a graph to show whether the patient exhales the same amount each time (normal lung function) or less each time (asthma or another lung condition).



Part 4: How Can Asthma Be Treated and Prevented?

Just as each person's triggers are different, the types and severity of symptoms vary.

This is why it is vital that each person understands the goals of treatment, the approach to relieving symptoms, and his or her responsibilities for maintaining good health. For younger patients, parental involvement in treatment is crucial. As children mature, they should be given more responsibility for their own asthma care.

Each person's asthma care plan is unique. The person being treated should actively participate in making decisions about his or her asthma care. The best way to do this is to learn as much as possible about the disease. Whatever the approach to treatment is, remember the following guidelines:

- If any part of the therapy is not effective, discontinue it under your doctor's guidance.
- Do what works, unless the risks of the treatment exceed the benefits of it.
- The side effects of the treatment should not be worse than the symptoms of asthma.
- The asthma care plan should be simple and easy to follow. (An example is shown in Appendix 1 on page 72.)



The inhaler dispenses a bronchodilator drug that widens the airways in the lungs.

Components for Managing Asthma

In its National Asthma Education and Prevention Program, the National Institutes of Health outlined four main components for managing asthma:

- Medical personnel should use objective tools such as the peak flow meter and the spirometer to assess how severe a patient's asthma is and then monitor treatment accordingly.
- Patients should avoid or eliminate environmental factors (for example, secondhand smoke, certain foods, strenuous physical activity) that trigger asthma attacks.
- Patients should consult a physician to obtain proper medications. The goals are to manage flare-ups in the short term and to prevent airway inflammation in the long term.
- The patient, the patient's family, and health care providers should form a partnership to define and implement the best treatment plan.

Preventing and controlling asthma

In trying to prevent or control asthma attacks, it is important to keep in mind certain overall goals:

1. Chronic symptoms such as wheezing and coughing must be minimized.
2. There should be access to daily treatments that allow for normal breathing most of the time. These are often called “controller medications,” such as steroid inhalers.
3. Every asthmatic should try to maintain normal activity levels, which include exercise.
4. Symptoms should be treated as soon as they appear, in order to minimize emergency room visits and hospitalizations. These treatments are in addition to controller medications and are often called “reliever medications,” such as albuterol inhalers.

It is never safe to withhold treatment. Asthma is not a condition that a person should hope to outgrow. Having trouble breathing is not something that will get better on its own. It is a symptom that needs to be treated. It is always safer to assume that narrowing airways will not open on their own. Mucus that blocks the pas-

sage of air to and from the lungs will not loosen on its own. If an asthmatic is under the care of a physician, any changes—improvements or setbacks—will be noted and treatments adjusted.

Even someone with an active form of the disease could experience brief periods without symptoms, especially as a result of treatment. This does not mean that it is safe to stop using the medications. The opposite is true. The medications have helped the person remain symptom free. The best way to increase the number of symptom-free days is to remain under the care of a physician and follow treatment instructions.

Intervention (or “rescue”) measures can be used to control and relieve asthma symptoms once they start. Controller medications, also known as maintenance medications, can be used to prevent asthma symptoms from occurring. Ideally, controller medications can lessen the need for rescue medications. If some attacks can be prevented, then there will be fewer symptoms to control. Once an asthma attack starts, its severity usually can be controlled. Whether a person has mild or severe asthma, there are ways to manage the condition. If asthma symptoms are not managed properly, a mild case can become severe and a severe

Part 4: How Can Asthma Be Treated and Prevented?

case can become fatal. Learn to recognize the warning signs that an attack might be getting worse. These warning signs can be different for each person.

Some asthma sufferers receive treatment only in an emergency room. Unfortunately, due to the high costs of health care, this may be a way for some people to afford treatment. But emergency care is not the best way to treat asthma. An asthmatic needs ongoing care from a physician, not just rescue measures. In addition, if only the flare-ups are treated, then controller medication cannot work to prevent future attacks. The symptoms will continue and will reach a crisis state before treatment is sought, which is bad for the person's overall health.

It is vital that an asthmatic use the correct medication for his or her condition. It is also important to use the medication as directed. Take the dosage that is prescribed—no more and no less. In some cases, medications need to be used daily, even on days when there are no symptoms. Steroid inhalers, for example, prevent symptoms only if used daily, as directed.

Many medications are effective in preventing and controlling asthma. Some of them are called anti-inflammatories. They do what their name suggests: They reduce the swelling of the airways, so that more air can travel to and from the lungs. Inhaled medications have the advantage of being administered directly to the area that is inflamed or



An asthmatic needs ongoing care from a doctor, not just emergency treatment at a hospital.

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obstructed. There are several devices used to administer inhaled medications. Many **metered dose inhalers (MDIs)** use a chemical propellant—usually a chlorofluorocarbon (CFC)—to force medication out of the inhaler. Pharmaceutical companies are in the process of developing other MDIs with propellants that, unlike CFCs, do not damage the ozone layer. Two types of inhaler that deliver medication without using CFCs are **rotary inhalers** and **dry-powder inhalers**.

A device called a **nebulizer** delivers a fine liquid mist through a mask that is placed over the nose and mouth or through a mouthpiece. These devices make inhaling medication easier, especially for infants, children, and those unable to use a standard inhaler. Some nebulizers are small and portable, have battery packs, and can be used for travel.

Using an inhaler can be difficult at first. An asthmatic should ask a health care provider to demonstrate how to use it properly. Often, it is a challenge to direct inhaled medication to the lower airways accurately; it tends to get sprayed onto the back of the throat. A **spacer**—a device that fits on the end of an inhaler and provides a holding chamber and one-way valves—can help adminis-

ter inhaled medication with greater accuracy. Never overuse an inhaler.

Inhaled medications often cause fewer side effects than oral medications do. The side effects associated with inhalers vary from headaches to hand tremors. Sometimes these side effects can impair learning in children. When a child has a headache, it can be difficult to concentrate. Hand tremors can influence a child's handwriting. It is important that both teachers and parents be aware of these side effects and make an effort to note any that occur. In many cases, the type or dosage of medication can be adjusted to prevent side effects.

People who suffer from exercise-induced asthma can benefit from using a reliever-type medication, such as a short-acting bronchodilator, 15 minutes before starting an activity. In one study, this form of inhaler was effective for up to 4–6 hours after inhalation in 80–90% of patients. Albuterol, pirbuterol, and terbutaline are among the medications in this category. In addition to preventing attacks, these inhalers can relieve symptoms after they start. A longer-acting inhaler can provide up to 12 hours of relief. If a child with exercise-induced asthma uses a longer-acting inhaler before leaving for



A young girl breathes into the face mask of a nebulizer to relieve her symptoms of asthma. The nebulizer delivers a fine spray of an asthma drug into the face mask and then into the throat and bronchial tubes. The drug is usually a bronchodilator, which reduces the constriction of the airways to the lungs that accompanies an asthmatic attack. Nebulizers are often used to treat emergency asthma attacks. Most patients find them easier to use than conventional inhalers.

school in the morning, it is possible that there will be no need for additional medication during the day.

Warming up before exercise and warming down after does more than just stretch muscles. For those with exercise-induced asthma, it is another way to help prevent the chest tightness that is caused by cold air suddenly becoming warm in the lungs.

Each person should play an active role in his or her asthma treatment plan. This is easy to do:

- Know your asthma care plan and when to use your controller and reliever medications.
- Learn both the brand names and generic names of the medications that are prescribed.
- Write down any side effects that result from taking these medications.

Asthma Medications

Medications that are often prescribed to treat asthma include the following:

Anti-inflammatories (cromolyn and nedocromil are nonsteroidal examples)—These medications reduce swelling in the airways and lungs. Anti-inflammatories are not as strong as inhaled corticosteroids, but they cause fewer side effects.

Corticosteroids—Available since 1948, these steroidal, anti-inflammatory medications are prescribed in different forms. Creams can be applied to the skin to treat rashes. Inhalers are often recommended for asthmatics with daily moderate or severe symptoms. Pills are prescribed for those with severe asthma. Corticosteroids decrease swelling of the bronchial tubes, reduce the amount of mucus the body produces, and calm the airways. It is important to use these medications even on days when there are no symptoms, because they can help maintain healthy airways.

Bronchodilators (theophylline and anticholinergics)—Often called “rescue” medications, they open the bronchial tubes so that more air can travel to and from the lungs. These medications relieve coughing, wheezing, shortness of breath, and difficulty breathing. They are available as inhalers, tablets, capsules, liquids, or injections. They should not be overused. If a patient uses more than one canister (of an inhaler) a month, a new treatment plan should be considered. One exception is a long-acting medication—called salmeterol—which is designed for daily, preventative use.

Anti-leukotrienes—These are medications taken in pill form which fight the chemicals that cause airway inflammation and which make airways less sensitive.

- Report any changes in symptoms or triggers.
- Ask a health care provider any question that arises, and share any concerns.

Apart from medication, some adjustments can be made to both indoor and outdoor environments to help prevent asthma attacks. According to the American Lung Association, the best environment to live in is smokefree. This is especially important in homes with children. In fact, research shows that the children of smokers are twice as likely to have asthma as the children of nonsmokers. As a rule, it is best to avoid an envi-

ronment where secondhand smoke is common. Pregnant women should not smoke. Women who do smoke during pregnancy can give birth to babies who have narrowed airways.

There are many forms of indoor and outdoor pollution. Whenever possible, it is best to avoid all of them. Indoors, many children and adults are sensitive to allergens that are known to cause asthma. These allergens include everything from cockroach and dust mite droppings to pet dander and mold. Cockroaches can be controlled or eliminated by using safe pesticides. Dust mites can be kept under control by doing several things regularly: Wash bedding in hot water (130°F or higher). Keep floors free of dust by vacuuming with a machine that has a special filter. Avoid placing carpets, rugs, drapes, and stuffed



animals in bedrooms. Irritants such as perfumes and strong cleaning agents or fragrances, which are found in many households, should also be avoided.

Outdoors, high levels of pollen and mold can trigger asthma symptoms in many people. Smoke from factories and exhaust from trucks can also be harmful. On days when the air quality is considered poor—often, days when ozone levels are high—doctors may tell patients to restrict physical activity or even to stay indoors.

Even for a person who suffers from occupational asthma, there are treatments that can provide some relief. Special masks (respirators) can also be used to filter out allergens in the workplace. Many workers—from bakers to hairdressers—are exposed to substances that trigger asthma symptoms. After the trigger substance is identified, it is important that the worker's exposure to it be eliminated. If medications or respirators don't solve the problem, the worker may have to move to a location where the trigger substance is not present. If a worker is removed from exposure within 1–2 years of developing symptoms, his or her asthma is more likely to be reversible. Employers should monitor the



levels of these substances and try to keep the levels low. Employers can check for early signs of occupational asthma by testing employees who are regularly exposed to harmful substances and ultimately can seek out non-harmful alternatives.

The relationship between allergies and asthma

Scientists have long known that there is a connection between allergies and asthma. Many people who have one condition will develop the other. In fact, asthma is sometimes called an allergic disease. Both allergies and asthma cause airway inflammation and narrowing of air passages. In an asthmatic, this reaction might be caused by a respiratory tract infection. In a person with allergies, exposure to an inhaled allergen might cause the same symptoms.

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Allergic rhinitis (hay fever) is considered a risk factor for developing asthma. According to the American Academy of Allergy, Asthma and Immunology, up to 78% of asthmatics also have allergic rhinitis. The symptoms of both conditions can be triggered by allergens that are either seasonal or year-round. Pollens, molds, animal dander, and dust mite and cockroach droppings are among the most common trigger allergens. Some people have **seasonal allergic asthma**, a condition that occurs over an extended period when high levels of allergens are common in a particular region of the country.



Many people who suffer from allergies will develop asthma. More than 50% of people who have eczema will become asthmatic. People who have symptoms of food-dependent exercise-induced anaphylaxis are often asthmatics as well. Those with asthma, eczema, or allergic rhinitis are at greater risk of having anaphylaxis at some point in their lives. This severe allergic reaction can occur as a result of exposure to foods, medications, latex, or insect stings.

The connection between allergies and asthma can help physicians in treating both conditions. For example, the majority of asthma attacks are triggered by allergic reactions. This means that if the allergic reactions can be controlled, the number of asthma attacks can be reduced. Many people with allergies are likely to develop asthma. This means that a physician should look for the early signs of asthma in such people and test their breathing capacity regularly.

The Case of the Unusually High Asthma Rates

Alexander Ortega has an inquisitive mind. Like a modern-day Sherlock Holmes, he likes to sift through facts and ponder difficult questions. A clue here, a trail picked up there, and suddenly, the pieces of a tough puzzle all fall neatly into place. But Ortega isn't a detective—he's an assistant professor of epidemiology and public health at one of the country's most prestigious universities, Yale University in New Haven, Connecticut.



Ortega's work, however, involves seeing patterns that aren't obvious to most people. Right now, he's trying to uncover the mystery behind the sky-high rates of asthma in Puerto Rican children.

Puerto Rican children have the highest asthma rates of children anywhere, with 30 percent of kids on the island suffering from the disease. Eleven percent of children who are of Puerto Rican descent, but live in the United States, are also afflicted.

What Ortega wants to know—and hopes to find out—is whether those kids are truly suffering from asthma or whether some of them have been misdiagnosed.

“There is a strong association between anxiety disorders in children and asthma—more specifically, to panic disorders and separation anxiety,” he says. “The typical panic attack's symptoms are identical to the symptoms of an asthma attack: shortness of breath, chest tightness, and wheezing.”

Could it be that thousands of children are really suffering panic attacks or anxiety, but are being treated for asthma? If that's the case, Ortega worries that the underlying mental health problems in a generation of chil-

Ortega, continued on next page

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dren aren't being treated—and, like a domino effect, their mental health problems could worsen with time and affect their own children and families.

But that isn't the only issue Ortega is trying to sort out. If, indeed, many Puerto Rican children are suffering from anxieties and not asthma, then why aren't doctors identifying the real problem?

One reason could be that poor children don't have equal access to quality medical care and that white children in general tend to get better treatment. "We know that Hispanic and black kids, particularly those who live in the inner city and are poor and on Medicaid, are much more likely to be seen by residents or non-board-certified pediatricians," Ortega reports. One question he hopes to examine is whether doctors seem more willing to report that a child has asthma if that child is black or Hispanic.

Ortega—who himself has seasonal allergies and "wheezes in April and May"—says that many people, upon hearing of his work, assume that he is also Puerto Rican. "Actually, I'm Mexican-American," he notes. Growing up, he crisscrossed the United States as a "military brat," living in Honolulu and New Mexico before attending the University of New Mexico to study economics and then the University of Michigan to receive his Ph.D. in epidemiology.

Ortega hopes to be on the move again soon: He is hoping to receive funding for a grant that would allow him to focus on 1,000 kids on the island of Puerto Rico in an intensive, three-year study. That will give him a chance to collect more clues as he keeps digging into the complicated issue of those unusually high asthma rates.

Part 5: How Can Allergies Be Treated and Prevented?

Diagnosing and treating allergies

When a physician is evaluating a person for allergies, there are several steps involved. First, the patient's history is taken. Then, the patient is examined. Depending on the patient's symptoms, several tests might be done. Since some medications (especially antihistamines) can affect test results, a person should ask the health care provider which medications should be stopped days before the testing is to take place.

Skin (scratch or puncture) testing. In this test, a variety of substances that are common to the region in which the person lives are evaluated. Tiny amounts of fluids containing allergens such as pollen, animal dander, dust mites, and molds are placed just under the surface of the skin. Within 15–20 minutes, swelling occurs at the site of any substance to which the person has an allergy. The severity of the reaction can indicate the person's level of sensitivity.

Virtually painless, this form of testing offers immediate results and almost no risk of serious allergic reaction. This test is usually used to assess reactions to respiratory allergens.

Intradermal testing. These tests are similar to scratch or puncture tests, but are slightly more involved. Tiny amounts of allergens are injected under the skin. Intradermal tests are often done if the scratch or puncture test results are not complete or useful.



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Blood (RAST) testing. In these tests, a person's blood is combined with an allergen to determine whether any IgE antibodies react. If there is a reaction, there is likely an allergy to the tested substance. Although slightly more expensive than skin tests, this test is relatively painless, offers fast results, and provides almost no risk of serious allergic reaction. Blood testing is often used to evaluate reactions to insects and medications in people for whom skin testing is not an option.

the physician both the nature of and the severity of the symptoms. Provocative testing can be uncomfortable. Severe allergic reactions can occur.

An infant's sensitivity to a food or even a food allergy might be diagnosed at home first. If a parent knows that there is a family history of food allergies, there is a way to avoid having an infant experience full-blown symptoms. By gradually introducing small amounts of new foods—one at a time—parents can isolate a reaction. If a few foods are grouped together in a single meal, it is far more difficult to figure out which one is causing the reaction. If, however, a parent already suspects that a child has a food allergy, it is best not to test this suspicion any further at home. Safer testing can be done in an allergist's office.



Patch testing. For this type of test, allergen-specific adhesive patches are placed on a person's skin and left for 72 hours. The sites that show swelling or redness indicate an allergic response. This form of testing is commonly used to assess reactions to metals and cosmetic additives.

Provocative testing. This type of testing is also called challenge testing. Usually, the substance in question is administered in an effort to provoke symptoms gradually. A trace amount of the allergen might be administered in an aerosol spray. The person's reaction to the allergen indicates to

A person can be treated for allergies, but not cured. The range of treatment options provides some relief for most people. As mentioned earlier, one common form of treatment involves ongoing allergen immunotherapy (also called allergy desensitization injections). Those who suffer from reactions to airborne allergens and insect stings find this form of treatment quite beneficial. Over time, a series of injections containing the offending allergens is given in an effort to build

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the immune system's defenses against them.

When a person first begins allergen immunotherapy, a very diluted form of the allergen compound is given. Gradually, more of the substance is added to the injection. Eventually, the allergist determines that the optimal dose has been reached. The allergist could also determine that the person is at risk of developing an allergic reaction if the injections continue. Whatever the determination is, at this point the therapy ends.

The entire process of allergen immunotherapy can last for years. There is some evidence that this type of therapy works by tricking the immune system. As increased amounts of the allergen are injected, the immune system starts to produce a blocking antibody (IgG). The IgG antibody competes with the allergy antibodies (IgE) for the allergen, takes it over, and then does two things that halt an allergic reaction: It prevents the mast cells from activating and it stops the release of histamines.

Most of the oral medications that are used to treat allergies fall into two categories: antihistamines and decongestants. **Antihistamines** prevent a



histamine—a chemical that the body produces during an allergic reaction—from taking effect. Antihistamines are available over-the-counter in tablet and liquid form; they are also available as tablets, liquids, and injections with a prescription. **Decongestants** work by shrinking blood vessels and decreasing fluid leakage so that nasal congestion is reduced. Both liquid and tablet forms are available as over-the-counter and prescribed medications. Often, antihistamines and decongestants are combined in a single medication to address a greater number of symptoms.

For an acute allergic reaction that involves a great deal of congestion, a physician might recommend a decongestant in the form of drops or a nose spray. The over-the-counter form of medication should not be used for more than three or four consecutive days. Otherwise, it can actually increase nasal congestion. A prescription form of this medication

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can be used for a longer period without producing this side effect.

Nasal steroid inhalers or sprays can offer fast relief by reducing inflammation and swelling, as well as by slowing the rate at which histamines are released. These sprays deliver a very fine mist directly into the lining of the nose. They temporarily constrict the blood vessels in the swollen tissues within the nose. They also temporarily open a larger passage to allow for the free flow of air. When the effects of the spray wear off, the swelling returns. Sometimes, the swelling has grown worse. When this happens, most people just reuse the spray. Unfortunately, a series of brief periods of relief can lead to longer bouts of congestion. It is important to note that decongestant nasal sprays can be overused. If a person does overuse these sprays, his or her heart rate can increase and blood pressure can rise.

The good news is that most allergy symptoms can be treated easily and safely. The bad news is that, on rare occasions, an allergic reaction can be deadly. As we discussed earlier, anaphylaxis is a severe, sometimes fatal, allergic reaction. It is usually treated with an injection of epinephrine, and antihistamines and steroids are also given. The sooner the allergic person gets treatment, the less severe the

symptoms will be. Epinephrine can stop the progression of anaphylaxis; antihistamines and steroids cannot. Antihistamines and steroids should never be given *instead of* epinephrine, because, while they can help recovery, they cannot reverse the symptoms of anaphylaxis.

Often, a person who has a severe food allergy learns about it only after exposure to the trigger. Such exposure can happen as a result of breathing in or eating the substance. After the symptoms are treated, contact an allergist for follow-up care. The allergist can help determine what trigger caused the reaction. This is very important in preventing anaphylaxis from happening again.

Although triggers that are foods may be easy to avoid, it might be trickier when the allergen is a food additive. This is why it is crucial to be under a doctor's care. If anaphylaxis happens again, the person might already have an injection of epinephrine handy. Using this medicine will keep symptoms under control until the person can be taken to a hospital. An allergist can even offer treatments that can help build immunity to some triggers. For example, if anaphylaxis is triggered by insect stings, ongoing allergy shots can help build tolerance to the venom.

Here are some suggestions for what can be done to assist someone who is experiencing anaphylaxis:

1. Ahead of time, learn enough about the symptoms to recognize when the reaction is occurring.
2. Get medical help as soon as possible.
3. Do not allow a person who is undergoing this type of reaction to drive.
4. Even if the person receives treatment at the location where the reaction occurred, it is vital that he or she go to an emergency room, where the condition can be monitored.
5. Make a note of what could have caused the reaction and what amount of time elapsed between exposure and reaction. Having this information could help to prevent a future reaction.

Preventing and controlling allergies

For most allergies, preventing or controlling symptoms requires a few simple steps. Depending on the severity and frequency of the reaction, almost all symptoms can be minimized by changes in environment and the person's behavior. Once the triggers are known,

they should be avoided. Changes to the home, school, and work environments can significantly reduce the person's exposure to a variety of allergens.

The most important behavioral change that a person can make to help prevent and control allergies is to use all available methods of treatment. Allergen immunotherapy can help build tolerance against specific allergens. Other medications can help prevent or control symptoms that do recur. A person who suffers from allergies can also improve his or her general health by eating nutritious foods, exercising regularly, and getting enough rest.

At the very beginning of life and during early childhood, measures can be taken to help prevent some allergies. Researchers have known for some time that breast milk is far more nutritious for infants than formula, cow's milk, or soy milk. Studies show that infants who are breast-fed are less likely to develop allergies to a variety of substances. The lower incidence of allergy in children who were breast-fed might result from the mother's immunities being transferred to the child through the breast milk.



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Another way to help lower the risk of allergy—specifically, peanut or nut allergy—involves not exposing children under the age of three to peanut products. Allergists believe that one reason that there are so many children in the United States with peanut allergies might be the extensive early exposure they have to peanuts. Many young American children regularly eat foods that contain peanuts or peanut products.

In the case of life-threatening allergic reactions, prevention is possible only if the trigger can be completely avoided. This is difficult to do, so additional measures must be taken to control symptoms. If a person has had an anaphylactic allergic reaction in the past, a physician might suggest carrying a supply of epinephrine at all times.

Regardless of whether the trigger is or is not known, the symptoms certainly are. Having a supply of a medication that can offer immediate relief will help get the symptoms under control until the person can be taken to a hospital. Since this medication is given in the form of an injection, the person who carries it must know how to administer it. However, because there is a possibility that the person having the reaction might be incapable of completing the injection, a companion should also know how to administer it. Another measure that can help save the life of a person known to have anaphylactic reactions is even easier to do: Have the person wear a medical bracelet that indicates to medical personnel and others the nature of the person's allergic condition and any possible triggers.



A Little Bit of Discomfort Brings Relief

Every day when Erminia Cardenas goes to work, she performs a simple test that can change the lives of her patients.

Cardenas, who is a licensed vocational nurse in Houston, uses tiny prongs to prick the skin on her patients' backs. There are 80 prongs in all, and each contains something different—from grass pollen to mold to cat dander.



The procedure is often the first step in unlocking the mystery of what is causing her patients' unexplained sneezing fits, watery eyes, and even difficulty in breathing—all symptoms of allergies. For Cardenas's patients, the test is fascinating: Could the cause of all their problems be something as simple as the goose-feather-stuffed comforter on their bed, or could the culprit be a type of tree that lines the streets in their neighborhood?

If one or more of the pricks begin to itch, swell, or turn red, Cardenas has the answer. Even though the prong pricks cause a bit of discomfort, finally learning the cause of their difficulties can be a huge relief to patients.

"We have one patient, a young man who works on the golf course at a country club, who came to us because he had started sneezing every time he went out on the course," says Cardenas. "When we tested him, he was allergic to all the grasses and tree pollens that surrounded him on the golf course—he was a mess, poor thing! He said, 'I can't give up my job,' so we put him on shots and he's doing very well."

Cardenas, whose ancestors are Mexican, considers herself lucky because she doesn't have any allergies. Neither did her parents, which was fortunate, since they were migrant workers who spent a lot of time outdoors in the cotton fields. As a baby, Cardenas traveled with her parents to the fields. "If they ever had allergies, it wasn't severe—not like what the patients I see have," she says.

Cardenas, continued on next page

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But her son suffers from watery eyes and sneezing when the season changes every year from summer to fall. The good news is that, with treatment, even people who suffer from severe allergies can control their symptoms.

“Some of our patients can even give themselves shots at home, if their symptoms are milder,” says Cardenas.

Cardenas, a mother of three who returned to nursing after taking time off to raise her children, sounds positively maternal when she talks about her patients. She worries that many of the patients she sees—who range from airline pilots to lawyers to fellow nurses—have such demanding jobs that their symptoms can worsen because of the pressure. “Sometimes because they’re so stressed at work, they don’t take care of themselves,” she says. “I think stress can aggravate allergies.”

So can the change of seasons—and Cardenas, who talked about her job on a beautiful March day when the spring’s first flowers were pushing through the ground, knew she would be in for a busy time at work.

That’s just fine for Cardenas. After all, she knows that after patients come to her office and receive a proper diagnosis and treatment, they might actually be able to sit outside and take in nature’s beauty—without suffering from a sneezing fit.

Part 6: What Does Research Tell Us about Asthma and Allergies?

Current lines of research

There are many promising areas of research on allergies and asthma. Some scientists focus on what causes these problems. Others concentrate on finding ways to prevent allergic reactions and asthma symptoms. Still other researchers try to discover new or improved ways to treat allergies and asthma. Because allergies and asthma are so closely associated, research on one subject can often offer insights into the other.

Recent research into what causes allergic reactions and asthma has explored the impact of environmental factors, behaviors, genetics, and stress. If scientists can determine which environments and behaviors are more likely to contribute to symptoms, these factors can be reduced or avoided. Identifying genetic factors might also contribute to better screening.

In 2001, scientists from the National Institute for Occupational Safety and Health (NIOSH) studied the effects of exposure to diesel exhaust on the lungs. Researchers were especially interested in determining how breathing diesel exhaust particulate (DEP) affects asthma and lung infections in miners and other workers. Scientists hoped to determine whether alveolar macrophages (AMs), a type of



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white blood cell found in the lungs, were able to capture and destroy the DEP that was inhaled. DEP contains a mixture of chemicals that includes a solid carbon core called soot. As many as 1 million workers in the United States are regularly exposed to DEP.

Researchers examined cells of animals and humans during the study. The lung tissue of rats that were injected with DEP showed reduced AM function. The DEP had affected the AMs' ability to destroy foreign material, including bacteria, in the lungs. This meant that it was easier for lung infections to take hold. The study found that miners who were exposed to high DEP levels were more likely to suffer from lung infections. Infections were also more likely to spread elsewhere in the body.

The study continues today. It has been expanded to include mechanics who work with diesel-powered vehicles. In addition to answering a questionnaire about asthma and lung infection symptoms, the mechanics were asked to provide tissue samples. The samples were taken from their nasal linings, which were directly exposed to DEP.

Also during 2001, NIOSH sponsored a related study that examined the effect of exposure to poly-

cyclic aromatic hydrocarbons (PAHs) on lung immunity. PAHs are found in emissions from diesel engines. Researchers wanted to confirm that inhaling substances such as PAHs changes lung immunity in people who are exposed to these irritants. The changes include a predisposition to allergies, airway obstruction, and lung infections. Nasal tissue samplings from a variety of workers who were exposed to PAHs were obtained. Samplings from workers who were not exposed were also taken. This research is ongoing.

If certain behaviors seem to provoke an allergic reaction or an asthma attack, physicians can advise patients to avoid those behaviors. Research studies can help scientists test theories about behaviors that influence symptoms. A 2002 study at Brigham and Women's Hospital in Boston examined whether babies with a family history of allergies were more likely to get asthma if they were bottle-fed at bedtime. Researchers speculated that when a baby drinks a large amount of liquid just before falling asleep, some of it could reach the baby's airways. Liquid in the airways can cause irritation and narrowing, eventually leading to allergies or asthma. Researchers wondered whether a change in behavior—not feeding a baby a large amount of liquid at bedtime—might



prevent the problem. A total of 448 infants from families with at least one allergic or asthmatic parent were studied during the babies' first years of life, from age two.

In the Boston study, parents were asked to report on bedtime feeding practices and sleeping behavior. Researchers found that parents who reported (during at least three interviews) that they had given their babies a bottle in bed had babies who were 50% more likely to develop wheezing between the ages of one and five. This group was compared with babies whose parents did not report giving bottles to their children at bedtime. Researchers

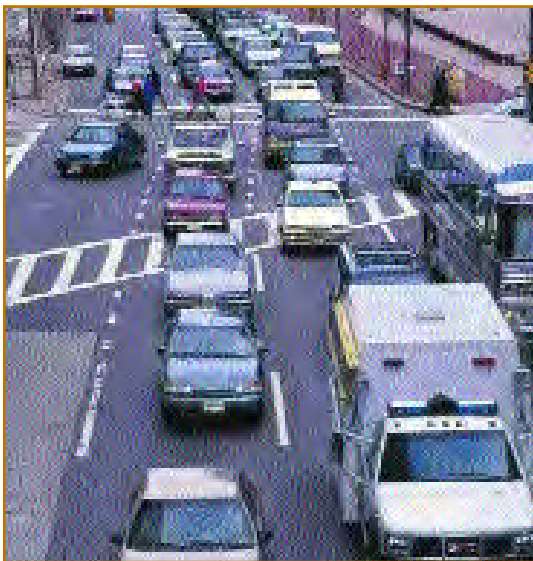
noted that they could not determine whether this behavior would produce the same results in babies with no family history of asthma. However, they did conclude that wheezing could be avoided if bottles were given at bedtime only to babies who were still fully awake, sitting up, or standing.

Unfortunately, certain dangerous circumstances are difficult, if not impossible, to avoid. Research data can help scientists identify some factors that trigger allergic reactions or asthma during these circumstances. One recent example involves the terrorist attack on the United States on September 11, 2001. In the 5–9

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weeks following the attack, a telephone survey was conducted among residents of Manhattan. Of the 13% of residents with asthma, 27% reported experiencing severe symptoms after the attack. Researchers attributed this increase in part to the psychological effects brought on by the event, as well as the unusually high levels of smoke



and debris. The results of this study indicate the impact that these factors (stress, smoke, and other inhaled irritants) have on asthma symptoms following a disaster.

Another area of allergy and asthma research focuses on prevention. Scientists know that poor air quality that results from pollution can affect the frequency and seriousness of allergy and asthma symptoms. In February 2001, the CDC examined the relationship between urban transportation trends and symptoms. During the 1996 Summer Olympics in Atlanta, the city imposed a new transportation strategy that involved closing the downtown area to car traffic, increasing access to public transportation, and promoting such activities as telecommuting and carpooling. These changes resulted in less traffic congestion and better air quality.

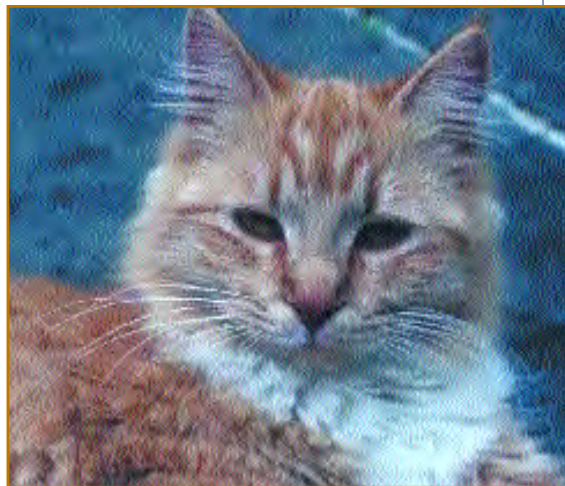
The study found that the benefits of the new strategy included a 42% decrease in asthma-related emergency room visits to Atlanta hospitals. Researchers compared the number of emergency room visits for asthma and nonasthma problems during the Olympics with visits made during the same length of time after the games, once the traffic strategy had been

lifted. The study found that prolonged improvements in air pollution levels reduced the need for asthmatics to seek emergency medical help. The study also concluded that changes in traffic patterns (rather than changes in weather patterns) were responsible for general improvements in air quality in Atlanta.

In March 2001, a study funded by the National Institute of Allergy and Infectious Disease (NIAID) examined whether high levels of cat allergen in a home could decrease an allergic reaction in children. They theorized that, over time, a higher cat allergen level could alter a person's immune response to cats. Researchers measured antibodies to cat allergen in 226 children aged 12 to 14. The children were also tested for asthma. Levels of cat allergen were measured in the homes of these children. Researchers discovered that in homes with low to moderate cat allergen levels, an allergic response to cats was triggered in children. In homes with higher cat allergen levels, antibody levels and rates of asthma were reduced.

The results of this study do not mean that physicians will advise parents to keep a cat in the house even if a child has an allergic

reaction. However, because higher levels of the allergen appear to have a protective effect against asthma in some children, more testing should be done before the cat is removed. For example, if the child is wheezing and has a positive response to cat allergen during a skin test, these may be reasons to get rid of a cat or to clean the house thoroughly.



But parents who note that a child sneezes occasionally should not necessarily fear that he or she will develop asthma because there is a cat in the household.

Another study, completed in 2002, focused on a dietary approach to reducing asthma symptoms. A study at the University of Cambridge examined whether regularly eating oily fish such as salmon and mackerel could offer people pro-

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tection against asthma symptoms. Scientists had suspected that omega-3 fatty acids, which are found in oily fish, could provide this benefit for people with asthma. These fatty acids have already been linked to increased protection against heart disease and arthritis.

More than 750 volunteers provided information on their diets, lifestyles, and asthma symptoms. In the 12 months before the study began, 333 of them reported suffering from wheezing; 437 had not experienced this symptom. More than 12% of the healthy volunteers (those who had not wheezed) reported eating oily fish at least twice a week. Only 7.5% of those who had wheezed reported eating that much oily fish. After taking into account other factors (such as smoking habits), researchers

determined that regular consumption of oily fish reduced by half the risk of asthma attacks, wheezing, and waking up with tightness in the chest. Scientists speculated that the acids might reduce the body's production of **prostaglandins**, fatty acids which are responsible for constricting the airways.

Treatment therapies for allergies and asthma are also an important area of research. Some studies focus on improving conventional ways of treating asthma, while others attempt to identify new ways to minimize symptoms.

In May 2001, researchers at the National Heart, Lung, and Blood Institute (NHLBI) reported on two studies that examined whether **long-acting beta-agonists** should replace or be used as



Allergy and Asthma Health Care Providers

Most people first see a physician when they are young. For children, this physician is called a pediatrician. A **pediatrician** specializes in caring for babies, infants, and older children. If a child seems to be experiencing allergy or asthma symptoms, usually a pediatrician will be the first health care provider to diagnose the condition. The pediatrician can provide some treatment for the symptoms, especially if he or she has completed additional training in allergy or asthma care. Adults usually consult an **internist** or a **primary care physician** for medical diagnosis and treatment. These physicians have had a broad range of training, which sometimes includes subspecialty work in allergy or asthma care.

To obtain additional care for allergies, sometimes a pediatrician will refer a child to an allergist. An internist or primary care physician might do the same for an adult patient. An **allergist** (sometimes called an **immunologist**) is a physician who specializes in the treatment of allergies and asthma. For children as well as for adults, an allergist is the physician who will probably complete any testing for allergic reactions. He or she might also evaluate breathing capacity. An allergist can treat a variety of allergic disorders, including asthma. The patient's pediatrician, internist, or primary care physician should be kept up to date about any test results, the diagnosis, and any decisions made about treatment.

A **pulmonologist** is a physician who specializes in treating respiratory disorders, especially those of the lungs. A person who is suspected of having asthma will often consult a pulmonologist, who will coordinate care with an allergist, an internist, or a primary care physician.

supplements to inhaled **corticosteroids**. These studies showed that using beta-agonists alone was not as effective as using corticosteroids alone. However, using beta-agonists regularly as supplements to corticosteroids did help control asthma symptoms.

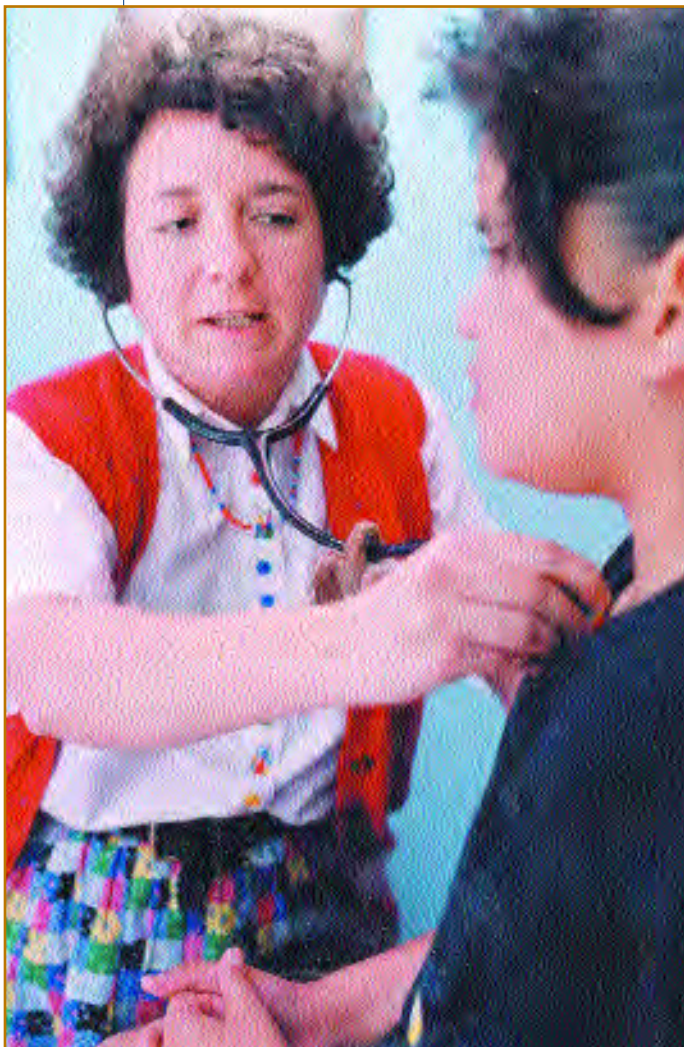
In the studies, people with mild to moderate asthma symptoms were examined. Patients treated with beta-agonists alone had nearly four times more treatment failures, nearly three times more episodes of symptoms, and significantly worse airway inflamma-

tion than those who were treated with corticosteroids alone. When patients who were using corticosteroids alone started using beta-agonists as supplements, they were able to reduce the need for corticosteroids by 50 percent.

In November 2002, the results of another study showed that taking a new approach to treating asthma could reduce symptoms. Conventional asthma treatments are often used after the first sign of symptoms. This study, conducted by scientists at Glenfield Hospital in England, examined

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the importance of determining the level of airway inflammation as a way to predict asthma attacks. White blood cells called **eosinophils** cause inflammation in the airways. The inflammation triggers asthma symptoms. Researchers determined that eosinophils are found in phlegm several weeks before a person actually experiences an asthma attack.



Scientists studied 74 patients with moderate to severe asthma who were already being treated at the hospital. Half the group was treated with reference to eosinophil levels in phlegm, and the other half was treated conventionally. Over the course of 12 months, the patients were assessed nine times. Those in the phlegm analysis group had their medication adjusted on the basis of changes in their eosinophil levels. There were only 35 asthma attacks among patients within this group, compared with 109 attacks among those in the regular treatment group.

In the phlegm analysis group, only one patient had to be hospitalized for asthma during the study, compared with six in the other group. Patients in the first group were also less likely to take unscheduled steroid pills to treat asthma symptoms—24 patients did, compared with 73 in the second group. More than anything else, this study demonstrated that even if a patient has no asthma symptoms, the inflammation in the airways is building up anyway. By the time that the patient and physician are aware of the inflammation, the asthma attack is already a certainty. This information can help health care providers make better decisions about treatment approaches. For example, in those



with severe asthma, perhaps it is better to continue a constant, stable level of treatment rather than lessen it on the basis of a lack of symptoms. Researchers found that easing up on treatment therapies when inflammation of the airways is about to produce symptoms is not the best approach to controlling symptoms.

The important role of volunteers

Volunteers are crucial to the success of research into the causes of and treatments for asthma and allergies. Physicians and researchers have made many advances that would not have been possible if not for the many

volunteers who took part in medical studies. Clinical research trials, which test new medications, have helped pharmaceutical companies develop new therapies for many people.

If people with asthma and allergies were not willing to volunteer for these trials, many new drugs could not have been tested. This would mean that some of the medications that are currently in use would not have been made available. The information that is gathered from these studies is enormous. Sometimes, it can lead to the development of vaccines or even cures.

It is important that all racial and ethnic groups be represented in medical studies and trials. That

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way, investigators are able to gather information that is useful to specific groups. African Americans and Hispanics are especially encouraged to volunteer. Asthma rates are quite high within these groups, and often the medical care available to them is not adequate. Participating in medical studies can lead to an entire community's access to new prevention strategies and medications.

People choose to volunteer for studies and trials for a variety of

reasons. Some are interested in helping to further science. Others want to have an opportunity to try a new treatment. Still others want to have access to medical care and specialists not covered by insurance. Some volunteers have no insurance at all. Many volunteers are paid to participate in studies and trials. For most people, volunteering gives them an opportunity to receive treatment and expand their knowledge about their conditions.

How New Medications Are Tested

A new drug is developed and tested in a laboratory. Here, researchers determine whether the drug does what it is supposed to do.

The drug is tested in animals to find out about any side effects it might cause. A wide range of dosages is given to animals in an effort to see what amounts can be dangerous to humans. The drug is given to pregnant animals as well, in an attempt to determine whether it will be safe for pregnant women.

Once the drug is determined to be safe for use in animals, it is sent to be evaluated for use in humans. This is when a clinical trial begins.



CONCLUSION: Let's Breathe Easy with Asthma and Allergies

Allergies and asthma have become conditions that are quite common, affecting millions of people. The good news is that both can be managed well enough to allow people with symptoms to live full and active lives. With the treatments that are now available, no one should have difficulty breathing normally. People can play active roles in managing these conditions for themselves and for others. Here's how:

Get educated about allergies and asthma. Physicians' offices, clinics, libraries, and the Internet are all good places to start learning more about allergies and asthma. People who learn about the range of symptoms and treatments can help educate family and community members. In some cases, this education can save lives.

Put that knowledge into practice. People who recognize symptoms can take charge of their own health care. Seek medical help after the first sign of symptoms. Follow the asthma care plan: avoid triggers, take medications as instructed, eat well, rest, exercise, and report any changes in the severity or frequency of symptoms.

Encourage family and community members to learn more about these conditions. Helping others get educated about allergies and asthma can lead to changes in behaviors and exposures that trigger symptoms. People who know how harmful secondhand smoke is are less likely to smoke. Those who realize the dangers of air pollution are more likely to support campaigns against it. People who work in environments where they are exposed to harmful substances should be informed about the risks of exposure. This information can be the basis for establishing new policies in the workplace. Many substances can cause occupational asthma. It is in the interest of all employees to learn more about these triggers in an effort to encourage employers to invest in measures that can reduce exposure.

Volunteer for medical studies and trials. Participating in medical studies and trials can benefit many people. New treatments, vaccines, and potential cures are all evaluated within these programs. An entire community can participate in a study, leading to positive change in the lives of many people.

Appendix 1: Sample Asthma Action Plan

Name _____

Date _____

To manage your asthma, you need to keep track of your symptoms, your use of medicine, and your peak expiratory flow (PEF). Using your PEF as a guide, here are some tips for treating your asthma symptoms:

GREEN means **Go**: You're feeling OK. Just keep using your preventive (anti-inflammatory) medicine.

YELLOW means **Be Careful**: You're having some symptoms. It's time to use your quick-relief (short-acting bronchodilator) medicine, in addition to the preventive medicine.

RED means **STOP**: Your symptoms are serious. You need to get help from a doctor!

GREEN ZONE

Your **green zone** is _____, which is 80% to 100% of your personal best peak flow. **Go!** Breathing is good, with no cough, wheezing, or chest tightness.

ACTION:

Keep taking your usual daily medicines.

YELLOW ZONE

Your **yellow zone** is _____, which is 50% to 80% of your best peak flow. **Be careful!** You may have symptoms like coughing, wheezing, or chest tightness. Your peak flow level has dropped, or you notice that you need to use quick-relief medicine more often, you have more asthma symptoms in the morning, or asthma symptoms are waking you up at night.

ACTION:

Take _____ puffs of _____ (your quick-relief medicine). Repeat this dose every 20 minutes, up to ____ more times. Use ____ puffs regularly every 4 to 6 hours for the next 2 days.

Take _____ puffs of _____ (your anti-inflammatory medicine) _____ times per day.

Start taking oral steroid medicines (or increase your dose):
_____ in a dose of ____ mg every A.M. ____ P.M. _____.

Call your doctor or a hospital emergency room for advice today.

RED ZONE

Your **red zone** is _____, which is 50% or less of your best peak flow. **Danger!** Your peak flow number is very low, or you continue to feel worse after taking more medicines according to the directions for the yellow zone.

ACTION:

Take _____ puffs of your quick-relief medicine. Repeat this dose every 20 minutes, up to ____ more times.

Start taking an oral steroid medicine (or increase the dose). Take _____ mg right now.

Call your doctor now! If you can't reach your doctor, go to a hospital emergency room.

Call your doctor at **any** time if you have any of the following problems:

Your asthma symptoms get worse even though you're taking oral steroids

or

Inhaled quick-relief medicine isn't helping you for as long as 4 hours

or

Your PEF stays at 50% of your personal best (or gets even lower), even though you're using your action plan.

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Important telephone numbers:

Doctor's office _____

Doctor after hours _____

Hospital emergency room _____

Reviewed/Updated: 9/01

Created: 9/00

This handout provides a general overview on this topic and may not apply to everyone. To find out whether the handout applies to you, and to get more information on this subject, talk to your family doctor.

Adapted from the American Academy of Family Physicians

Appendix 2: Questions to Ask Your Physician about Allergies and Asthma

1. How do I know whether I have allergies or asthma?
2. If I have no family history of allergies or asthma, is it true that I won't get them?
3. How old does a child have to be before getting tested for allergies or asthma?
4. If I don't have allergies or asthma, why is it important that I quit smoking?
5. If I don't smoke in the house, will my child still be exposed to secondhand smoke?
6. Should I not get a pet until I know whether my child will develop allergies to it?
7. Why do some people have allergies to some things and not to others?
8. If I take medication for allergies or asthma, will my lungs get stronger?
9. Is it dangerous to exercise if I have exercise-induced asthma?
10. During an allergic reaction, how will I know when I should go to the emergency room?
11. During an asthma attack, how will I know when I should go to the emergency room?
12. What can happen if I overuse my inhaler?
13. Do allergy and asthma symptoms usually get better as we get older?
14. If I am allergic to one food, will I be allergic to others?
15. Why do I seem to have asthma symptoms only during the winter months?
16. If I have asthma, will my children have it, too?

Appendix 3: Taking Part in Research Studies— Questions to Ask

A research study is a way of finding answers to difficult scientific or health questions. Here are important questions you should ask of anyone who wants you or members of your family or community to be part of a research study on high blood pressure.

1. What is the study about?
Why are you doing this study?
Why do you want to study me or people like me? Who else is being studied?
What do you want to get out of this study?
What will you do with the results?
Have you or others done this type of study ever before? Around here? What did you learn?
2. Who put this study together?
Who is running or in charge of this study?
Whose idea was this study?
How were people like me part of putting it together?
Who are the researchers? Are they doctors or scientists? For whom do they work?
Have they done studies like this before?
Is the government part of this study? Who else is a part of this study?
Who is paying for this study?
Who will make money from the results of this study?
3. How can people like me share their ideas as you do this study?
How will the study be explained in my community?
Of people like me, who will look at this study before it starts?
Of people like me, who are you talking to as you do this study?
A community advisory board?

Whom from the study can I go to with ideas, questions, or complaints?

How will people like me find out about how the study is going?

4. Who is going to be in this study?
What kinds of people are you looking for? Why?
Are you trying to get minorities in this study?
Are you including people younger than 18 years old?
How are you finding people for this study?
Are transportation or day care provided for people in this study?
Do I need to sign to participate?
Will you answer all of my questions before I sign the consent form?
Can I quit the study after signing the consent form? If I quit the study, will anything happen to me?
5. What will I get out of this study?
What are the benefits?
Is payment involved? How will I be paid?
Will I get free health care or other services if I participate?
For how long?
Will I get general health care or psychological care if I participate?
For how long?
6. How will I be protected from harm?
Do I stand a chance of being harmed in this study? In the future?
Does the study protect me from all types of harm?
If I get harmed, who will take care of me? Who is responsible?
If I get harmed in any way, will I get all needed treatment?
Who pays for treatment?
7. How will my privacy be protected?
Who is going to see the information I give?
Will my name be used with the information?
What happens to the information I gave if I quit the study?
Is there a written guarantee of privacy?
8. What do I have to do in this study?
When did you start this study? How long will it last?
How much of this study have you already done?

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Have there been any problems so far?
Will I get treated the same as everyone else?
What kinds of different treatments are offered in this study?
Are there both a real and a fake treatment?

9. What will be left behind after the study is over?
What will happen to the information people give?
How will it be kept?
What are you going to do with the results of the study?
How will the public learn about the results?
Will results be in places where the public can see them?
Are you going to send me a copy of the results? When?
What other studies are you planning to do here?

The preceding questions are from a pamphlet developed by Project LinCS (Linking Communities and Scientists), community advisory board (Durham, NC), and investigators (University of North Carolina Center for Health Promotion and Disease Prevention) in cooperation with the Centers for Disease Control and Prevention, Atlanta, GA. hivmail@cdc.gov For copies of this brochure, contact CDC National Prevention Information Network, 1-800-458-5231.

Resources

Allergy & Asthma Network Mothers of Asthmatics (AANMA)

A nonprofit membership organization dedicated to eliminating suffering and death due to asthma and allergies through education, advocacy, community outreach, and research. The website and help line are also available in Spanish.

1-800-878-4403

www.aanma.org

American Academy of Allergy, Asthma and Immunology

Call or visit their website for physician or allergist referrals.

611 East Wells Street

Milwaukee, WI 53202

414-272-6071

Patient Information and Physician Referral Line: 1-800-822-2762

www.aaaai.org

American College of Allergy, Asthma and Immunology

Call or visit their website for physician or allergist referrals.

85 West Algonquin Road, Suite 550

Arlington Heights, IL 60005

Patient Information and Physician Referral Line: 1-800-842-7777

allergy.mcg.edu

American Lung Association

61 Broadway, 6th Floor

New York, NY 10006

1-800-LUNG USA (1-800-586-4872)

www.lungusa.org

Asthma and Allergy Answers: Americans with Disabilities Act

Americans with Disabilities

1-800-949-4232

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Asthma and Allergy Foundation of America

1233 20th Street, NW, Suite 402
Washington, DC 20036
Hot Line: 1-800-7-ASTHMA (1-800-727-8462)
www.aafa.org

ClinicalTrials.gov

A web-based resource for finding clinical trials in need of volunteers.
www.clinicaltrials.gov
Select the “asthma” topic to search for asthma-related trials.

Combined Health Information Database

A web-based service that combines resources on asthma, allergies, and other diseases from several federal agencies. A service of the National Institutes of Health.
chid.nih.gov/simple/simple.html

The Food Allergy and Anaphylaxis Network (FAAN)

10400 Eaton Place, Suite 107
Fairfax, VA 22030-2208
800-929-4040
www.foodallergy.org

Healthy People 2010

A nationwide health promotion and disease prevention campaign sponsored by the Department of Health and Human Services. One of the goals of the campaign is to reduce health disparities.
Office of Disease Prevention and Health Promotion
200 Independence Avenue SW, Room 738G
Washington, DC 20201
www.healthypeople.gov
For information on the Healthy People 2010 Microgrant program that finances community-based prevention activities see:
www.healthypeople.gov/implementation/community/

MEDLINEplus

A comprehensive source of health information provided by the National Library of Medicine.
www.nlm.nih.gov/medlineplus/asthma.html

National Center on Minority Health and Health Disparities

Promotes minority health awareness and the elimination of health disparities through research and education. Affiliated with the National Institutes of Health.

6707 Democracy Blvd., Suite 800
MSC 5465
Bethesda, MD 20892-5465
800-444-6472 or 301-402-1366
ncmhd.nih.gov

National Heart, Lung, and Blood Institute (NHLBI)

To obtain a copy of Asthma Guidelines, request NIH publication #97-4051 by phone or Internet.

301-592-8573 or 301-251-1222
www.nhlbi.nih.gov/guidelines/asthma/

National Institute for Occupational Safety and Health (NIOSH)

Contact for information about occupational asthma.

800-35-NIOSH
www.cdc.gov/niosh/homepage.html

National Jewish Medical and Research Center

Top respiratory hospital in America.

1400 Jackson Street
Denver, CO 80206
www.njc.org

Native American Research Centers for Health

Research centers that link the Native American community with health research and that work to increase the number of Native American scientists and health professionals.

National Institute of General Medical Sciences
National Institutes of Health
45 Center Drive
MSC 6200
Bethesda, MD 20892-6200
301-496-7301
www.nigms.nih.gov

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New York Online Access to Health

*A searchable health information resource in English and Spanish.
www.noah-health.org/index.html*

Office for Human Research Protections

A source of information on the guidelines and ethics of research studies with humans.

Department of Health and Human Services
The Tower Building
1101 Wootton Parkway, Suite 200
Rockville, MD 20852
301-496-7005
www.ohrp.osophs.dhhs.gov

Office of Minority Health Resource Center

Serves as a national resource and referral service on minority health issues, including asthma and allergies. Affiliated with the U.S.

Department of Health and Human Services.
P.O. Box 37337
Washington, DC 20013-7337
800-444-6472
www.omhrc.gov/omhrc/

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Glossary

ac·tive (ac·quired) im·mu·ni·ty: a condition that develops when the body is exposed to various antigens and builds a defense that is specific to that antigen.

a·cute si·nus·i·tis: a condition that can be caused by bacterial infections, often appearing several days after the first sign of a cold. Acute sinusitis typically lasts 3 to 8 weeks.

air·way in·flam·ma·tion: swelling, redness, and soreness of the bronchi and bronchioles.

al·ler·gen: any substance—dust, cockroaches, weeds, certain foods—that causes an allergic reaction in susceptible people.

al·ler·gen im·mu·no·ther·apy: a treatment in which gradually increasing amounts of an allergen are injected into the body over a long period in an effort to build immunity.

al·ler·gic rhi·ni·tis (hay fever): an inflammation of the mucous membranes of the nose.

al·ler·gist: a physician who specializes in the treatment of allergies.

al·ler·gy: the body's overreaction to certain substances, such as medications, foods, animals, and plants.

al·ve·o·li: tiny air spaces within the lungs in which oxygen from the air is exchanged with carbon dioxide from the blood.

an·a·phy·lax·is: a sudden, severe allergic reaction that can have a variety of symptoms which can involve major areas of the body at the same time, such as the skin, the respiratory sys-

tem, the gastrointestinal tract, and the cardiovascular system. Anaphylaxis can be fatal if it is not properly treated.

an·ti·bod·ies: proteins that are part of the body's immune system and that travel through the bloodstream, working to fight off disease-producing organisms.

an·ti·gens: the foreign substances that are created by a disease-producing organism that invades the body.

an·ti·his·ta·mine: a medication that prevents a histamine—a chemical that the body produces during an allergic reaction—from taking effect.

an·ti·in·flam·ma·to·ries: medications that reduce swelling in the airways and lungs to prevent an asthma attack.

an·ti·leu·ko·tri·enes: medications which fight the chemicals that cause airway swelling and which make airways less sensitive to triggers, preventing an asthma attack.

asth·ma: a chronic lung disease in which the air passages get inflamed and airways narrow, making it difficult to breathe.

asth·mat·ic: a person who suffers from asthma.

B lym·pho·cytes: cells that produce antibodies to do battle with antigens, the foreign substances created by a disease-producing organism that invades the body.

be·ta·block·ers: medications taken to address heart disease, high blood pressure, glaucoma, or migraines. These medications can sometimes trigger an asthma attack.

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bi·pha·sic re·ac·tion: anaphylaxis in which symptoms often go away for a time, only to return hours later.

bron·chi: two narrow tubes that lead from the trachea to the lungs. Each tube is called a bronchus.

bron·chi·oles: within a bronchus, progressively narrower tubes that carry air to and from tiny air spaces called alveoli.

bron·cho·con·stric·tion (bron·cho·spasm): a process in which the smooth muscle that surrounds the airways contracts excessively. This action can trigger an asthma attack.

bron·cho·di·la·tors: “rescue” medications that open bronchial tubes so more air can travel to and from the lungs in order to end an asthma attack.

chron·ic asth·ma: a condition suffered by a person who experiences acute episodes as well as extended periods of symptoms, often triggered by seasonal allergens or viral infections. Rarely are these people without asthma symptoms.

chron·ic si·nus·i·tis: a condition that is often caused by bacterial infections. Its symptoms are similar to those of bronchial asthma. Sinusitis is considered chronic if it lasts longer than 8 weeks.

cil·i·a: tiny hairlike structures that move mucus along respiratory passages.

corti·co·ste·roids: also known as steroids, these strong medications are used in a cream form to treat skin allergies and in an inhaler to treat asthma. They reduce swelling in the bronchial tubes, reduce the amount of mucus the body produces, and calm the airways.

cy·ano·sis: a bluish discoloration in the skin due to a lack of oxygen.

de·con·ges·tant: a medication that works by shrinking blood vessels and decreasing fluid leakage so that nasal

congestion is reduced.

di·a·phragm: The main muscle used for breathing. It separates the chest cavity from the abdominal cavity.

dry·pow·der in·haler: an inhaler that delivers medication to the lower airways without using CFC, a chemical propellant.

ec·ze·ma: an allergic reaction with symptoms that affect the skin. This itchy, reddening, flaking, and peeling of the skin often begins in childhood.

e·o·sin·o·phil: a white blood cell that is thought to play a part in allergic reactions and the body’s response to parasitic diseases.

epi·neph·rine (a·dren·a·line): an injection used to treat life-threatening allergic reactions caused by insect bites, foods, medications, latex, and other agents.

e·soph·a·gus: the tube through which food passes from the mouth down into the stomach.

ex·er·cise·in·duced asth·ma: a type of asthma that is triggered by strenuous physical activity. Intense, prolonged breathing through the mouth or exercising in cold, dry air can bring on symptoms.

food·de·pen·dent ex·er·cise·in·duced an·a·phy·lax·is: a relatively rare allergic disorder in which symptoms occur after a person exercises within 3 to 4 hours of eating a particular food.

forced ex·pi·ra·to·ry val·ue (FEV 1): a unit of measurement that indicates a patient’s capacity to breathe, sometimes before and after exertion.

gas·tro·e·soph·a·ge·al re·flux dis·ease (GERD): a condition in which stomach acid flows up through the esophagus. This disorder affects many individuals who suffer from asthma.

his·ta·mine: a chemical present in cells throughout the body and released during an allergic reaction. It is responsible for narrowing the bronchi or airways in the lungs during an asthma attack.

hives: an allergic reaction in which the skin becomes covered with small or large clusters of itchy, red bumps. It can occur as a result of an infection, eating a certain food, or taking a certain medication.

hyper·re·spon·sive: overly sensitive; describes airways that narrow too easily or too much in response to an irritant.

id·i·o·path·ic an·a·phy·lax·is: a severe allergic reaction whose causes are unknown.

im·mu·no·glob·u·lin E (IgE): allergen-specific antibody found in people with allergies. When an allergen invades a body, that allergen's IgE captures the allergen, triggering allergy symptoms.

in·nate im·mu·ni·ty: the body's ability to resist a disease by preventing the invading microorganism from developing or by counteracting the effects of its products.

leu·ko·cytes (white blood cells): as part of the body's immune system, cells which work to destroy foreign organisms that enter the body. They also work to repair damage done by the invaders.

long·acting be·ta·ag·o·nists: these medications relax muscles within the airway that cause bronchospasm. They also cause the air passage ways to open wider, making breathing easier.

lym·pho·cytes: cells that play the most prominent role in helping the body create a natural resistance to disease. There are two types of lymphocytes: B cells and T cells.

mast cells: cells that are commonly found in the nose, eyes, lungs, and gastrointestinal tract. When an allergen stimulates the release of antibodies, they attach themselves to mast cells. Exposed again to the same allergen, mast cells release substances such as histamine into the tissue.

me·tered dose in·ha·ler (MDI): an inhaler that uses a chemical propellant (CFC) to force medication out of the inhaler and into the lower airways.

mu·co·sa: the bronchial mucous membrane. When it swells, a thick mucus is secreted in the airways and an asthma attack can occur.

na·sal ster·oid in·ha·ler (or spray): delivers a very fine steroid mist directly into the lining of the nose. It offers fast relief by reducing inflammation and swelling, as well as by decreasing the rate at which histamines are released.

neb·u·liz·er: a device used to administer inhaled medication. It delivers a fine liquid mist through a mask that is placed over the nose and mouth. It is used especially for infants, children, and those unable to use a standard inhaler.

neu·tro·phils: white blood cells that ingest bacterial invaders and produce the chemicals that destroy them.

non·ster·oid·al an·ti·in·flam·ma·to·ry drugs (NSAIDs): medications such as ibuprofen. These drugs can trigger asthma attacks.

oc·cu·pa·tion·al asth·ma: a type of asthma that develops as a result of exposure to fumes, gases, dust, or other substances at work.

peak flow me·ter: a machine that measures the ability of a patient to breathe out air from the lungs.

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phlegm: mucous secretions in the respiratory passages.

prosta·glandin: a fatty acid found in all mammals that resembles hormones in its activity—for example, controlling smooth muscle contraction, blood pressure, inflammation, and body temperature.

pulmo·nary function tests: a broad range of tests used to detect even minor blockage or airway obstruction.

ro·tary in·haler: an inhaler that delivers medication to the lower airways without using CFC, a chemical propellant.

sea·son·al al·ler·gic asth·ma: a condition that occurs over an extended period, usually prompted by a person inhaling seasonal allergens that act as triggers.

si·nus·i·tis: a condition in which the hollow cavities located behind the eyes and nose get inflamed; the condition can cause asthma symptoms.

pac·er: an attachment that fits on the end of an inhaler, provides a holding chamber and one-way valves, and helps direct inhaled medication into the lower airways with greater accuracy.

spi·rom·e·ter: a machine that measures the ability of a patient to breathe out air from the lungs. Specifically, spirometers measure forced expiratory value (FEV 1).

T lym·pho·cytes: special cells which attack cells that are foreign or infected by a virus.

tra·che·a: a single tube located in front of the esophagus. The trachea is the beginning point of the airways.

trig·ger: a factor, such as exercise, tobacco smoke, or animal dander, that can bring on or aggravate the symptoms of asthma.

whee·z·ing: a high-pitched or whistling noise that results from too little air passing through a person's airways. This sound is often more intense when air is forced in or out of the lungs in an exaggerated way (when a person takes a long breath) or when activity levels increase (during exertion).

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Project Advisors

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Yolanda Cuesta

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American Association for the Advancement of Science (AAAS)

Robert D. Goldman, PhD

Northwestern University Medical School

Max Gómez, PhD

WNBC, Health & Science Editor

Beatrix (Betty) Ann Hamburg, MD

Cornell University Medical College

Marcia Harrington

District of Columbia Public Library

Constance Hendricks, PhD

Chair, Graduate Nursing Programs
Southern University and A&M College
School of Nursing

Eric Jolly, PhD

Education Development Center, Inc. (EDC)

Betty Lawrence

Rochester Public Library, New York

Audrey Manley, PhD

President Emerita, Spelman College

Marsha Lakes Matyas, PhD

The American Physiological Society

Sandra Negro

Senior Librarian, Wheaton Library,
Maryland

Delores Parron, PhD

Scientific Advisor for Capacity Development
Office of the Director, National Institutes of
Health

Joseph Perpich, MD, PhD

J.G. Perpich, LLC

Marcy Pride, MLS, MA

Director, Oyer Memorial Library
Washington Bible College and Capital Bible
Seminary, Lanham, Maryland

Josefina Tinajero, EdD

Associate Dean, College Of Education
University of Texas at El Paso

Hypertension Content Reviewers/Advisors

Tim K. Takaro, MD, MPH, MS

Clinical Assistant Professor,
Medicine and Environmental Health
University of Washington

Rubens Pamies, MD

Vice Chancellor for Academic Affairs,
Dean for Graduate Studies
University of Nebraska Medical Center

Project Staff and Consultants

Shirley M. Malcom, Principal Investigator

Maria Sosa, Co-Principal Investigator and
Project Director

Kirstin Fearnley, Project Manager

Mary Chobot, PhD, Library Consultant and
Project Evaluator

Ann Williams, Art Director

Susan Mahoney and Associates,
Sarah Pekkanen, Writers

Tracy Gath, Writer, Editor

Betty Calinger, Editor

Maggie Sliker, Photo Researcher

Heather Malcomson, Chickona Royster,
Project Associates

Write With, Inc., Proofreader

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