A CONSUMER'S DICTIONARY OF FOOD ADDITIVES

Descriptions in Plain English
of More Than 12,000 Ingredients
Both Harmful and Desirable
Found in Foods

Ruth Winter, M.S.

ALSO BY RUTH WINTER

A Consumer's Dictionary of Cosmetic Ingredients

Vitamin E

The Anti-Aging Hormones

Super Soy

A Consumer's Guide to Medicines in Food

A Consumer's Dictionary of Medicines: Prescription, Over-the-Counter, Homeopathic, and Herbal

A Consumer's Dictionary of Household, Yard, and Office Chemicals

Poisons in Your Food

Ageless Aging

Cancer-Causing Agents

Beware of the Food You Eat

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SEVENTH EDITION

Descriptions in Plain English of More Than 12,000 Ingredients

Both Harmful and Desirable Found in Foods

RUTH WINTER, M.S.

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The best editions I ever created

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GUESS WHAT YOU ATE?

In this completely revised and updated seventh edition of A Consumer's Dictionary of Food Additives, you will learn how safeguards have weakened since the last edition and that hundreds of new and untested chemicals have entered the market.

Are you aware, for example, that direct and indirect additives in your food and drink at this writing may be

- allergens?
- antibiotics?
- cancer-causing agents?
- digestion disturbers?
- hormones?
- pesticides?
- sex life disrupters?
- toxins?
- untested new chemical compounds?

Additives are substances, or a mixture of substances, other than basic foodstuffs, that are present in food as a result of any aspect of production, processing, storage, or packaging. BHT and BHA are examples of preservatives and Red No. 3 and annatto are examples of colorings. Some substances, vitamins E and C, for example, are both nutrients and additives. The two vitamins are sometimes added for their ability to retard rancidity. The majority of food additives, however, have nothing to do with nutritional value, as you will see from the contents of this dictionary. Most are added to feed our illusions. We want enhanced food because all our lives we have been subjected to beautiful pictures of foods in our magazines, on television, and on the Internet. We have come to expect an advertiser's concept of perfection in color and texture, even though Mother Nature may not turn out all her products that way. As a result, the skins of the oranges we eat are dyed bright orange to match our mental image of an ideal orange. Our poultry is fed a chemical to turn the meat yellower and more appetizing, and our fruits and vegetables are kept unblemished by fungicides, pesticides, herbicides, and other antispoilants. Our meat and fish have color added to give the appearance of greater freshness. Food additives are estimated to be $23 billion market worldwide.[1]

Lest you think that all additives are harmful, I want to reassure you that many are beneficial. They delay spoilage, keep us well-fed, and protect against illness. But scores of added substances are unnecessary, and some may be harmful, even lethal.

I know how all this can be confusing with all the overlapping underfunded regulatory agencies, the conflicting media reports about the newest studies, and the advice from the latest diet guru. This seventh edition of A Consumer's Dictionary of Food Additives has been written to help you choose more wisely in today's marketplace.

Positive Changes

Since the first edition of A Consumer's Dictionary of Food Additives was published in 1978 there have been major positive changes.

- First, the U.S. Food and Drug Administration (FDA) and the World Health Organization (WHO); the European Union; and the Japanese, Australian, and New Zealand food protection agencies have, among others, increased computerization of information about food additives and made the data available to us and to each other on the Internet.
- Second, the evaluation of food additives has become international, so many more eyes are watching the potions cooked up in the lab.
- Third, readers like you are making an effort to become educated about what is good for you and what is not and how to pierce the hype that surrounds food and drink today. If this weren't true, you wouldn't be reading this book.

Persistent Problems

However, some problems mentioned in all six previous editions haven't gone away.

ANTIBIOTICS

The body of evidence linking extensive antimicrobial use in food-producing animals and resistant antibiotic strains in human beings continues to grow. Other nonhuman uses of antimicrobials (in pet animals, aquaculture, and horticulture) may also play a role in this transfer of resistant bacteria. When resistant pathogenic bacteria are the cause of infections in humans (as well as in animals), it will often result in inappropriate and/or more protracted therapy to cure infections and, increasingly, the infections become incurable. Since the first edition of A Consumer's Dictionary of Food Additives, regulators, including the FDA, the Food and Agriculture Organization (FAO) of the United Nations, the World Organization for Animal Health (OIE), and WHO, have been trying in vain to deal with the situation in which the same classes of antimicrobials may be used in both humans and animals. Few new antibiotics have been developed to replace those that have become ineffective through resistance.

The Union of Concerned Scientists, a science-based nonprofit organization, estimates that each year 25 million pounds of valuable antibiotics—roughly 70 percent of total U.S. antibiotic production—are fed to chickens, pigs, and cows for non-therapeutic purposes like growth promotion.[2] In fact, although the U.S. Food and Drug Administration is theoretically empowered to withdraw agricultural antibiotics from the market under existing law, in practice its procedures are so cumbersome that such withdrawals would take years for each type of antibiotic. Indeed, withdrawal proceedings for other kinds of agricultural drugs have taken up to twenty years to complete. To avoid these unacceptable delays, the Preservation of Antibiotics for Medical Treatment Act of 2007 (PAMTA) amends the Federal Food, Drug and Cosmetic Act to withdraw approvals for feed-

additive use of seven specific classes of antibiotics: penicillins, tetracyclines, macrolides, lincosamides, streptogramins, aminoglycosides, and sulfonamides. Each of these classes contains antibiotics used in human medicine. The cancellations automatically take effect two years after the date of enactment unless, prior to that date, the antibiotic's producer demonstrates to a reasonable degree of certainty that use of the drug as a feed additive does not contribute to development of resistance affecting humans.[3]

The bill bans only the feed-additive uses of the named drugs for "nontherapeutic" purposes, defined as use "in the absence of any clinical sign of disease in the animal for growth promotion, feed efficiency, weight gain, routine disease prevention, or other routine purpose." By specifically targeting the nontherapeutic use of antibiotics, the bill allows for sick animals to receive treatment and for legitimate prophylaxis. The bill leaves farmers with many options, including other nontherapeutic antibiotics that are not used in human medicine, as well as improved animal husbandry practices such as those utilized in Europe and on some U.S. farms. In addition, the legislation provides that if a nontherapeutic antibiotic that is now used only in animals (i.e., one that is not one of the seven named antibiotics) also becomes potentially important in human medicine, the drug would be automatically restricted from nontherapeutic use in agricultural animals unless the FDA determines that such use will not contribute to development of resistance affecting humans.

The consumer is becoming more aware of the danger of nontherapeutic use of antibiotics in animal feed; thus you now see RAISED WITHOUT ANTIBIOTICS signs on many products in the supermarkets. PAMTA will help cut down on the salting of animal feed with antibiotics just for weight gain.[4] The European Union has banned most antibiotics in feed. This is progress!

CANCER-CAUSING AGENTS

Progress has not been made as far as stopping the addition of potentially cancer-causing additives on our plates and in our glasses. In fact, some regression has occurred. A major report on the relationship between nutrition and the development of cancer concludes that 3 to 4 million cases of cancer per year could be prevented by appropriate diet.[5] As you will read in this dictionary, scores of food additives are known or suspected cancer-causing agents, such as the furan flavorings, some colorings, and benzene.

The Delaney Amendment was written by Congressman James Delaney as part of a 1958 law requested by the FDA. The law stated that food and chemical manufacturers had to test additives before they were put on the market and the results had to be submitted to the FDA. Delaney's Amendment specifically states that "no additive may be permitted in any amount if the tests show that it produces cancer when fed to man or animals or by other appropriate tests." Ever since it was enacted it has been severely attacked by food and chemical manufacturers and the Nutrition Council of the American Medical Association. Even several FDA commissioners and scientists were critics because they claimed the law was unenforceable. They all agreed that an additive used at very low levels need not necessarily be banned because it may cause cancer at high levels. Proponents justified the clause on the basis that cancer experts have not been able to determine a safe level for any carcinogen. This was the underlying basis in 1959 for a nationwide FDA recall of cranberries contaminated by the weed killer aminotriazole. Notwithstanding publicity critical of the FDA, this action had beneficial results, particularly in convincing farmers that pesticides must be used with care.

The problems with identifying exposure to a cancer-causing additive include the following:

- In most instances, exposure to cancer-causing agents (carcinogens) takes place twenty to thirty years before a statistically significant increase is observed.
- Animal studies may give clues, but laboratory conditions and the bodies of other creatures may not result in valid conclusions for us.
- Each of us is unique in the way our bodies process chemicals based on our age, sex, heredity, medical history, diet, and behavior. Epidemiologists estimate that approximately one-third of all cancer deaths can be attributed to diet.[6]
- No one knows how much of a cancer-causing agent it takes to cause cancer.

The Delaney Amendment, as pointed out, is being ignored by many producers and regulators. The listings in this dictionary describe scores of additives known to or suspected of causing cancer. There are well-publicized ones, such as nitrates and nitrites (see) and lesser-known ones, such as the flavorings furfural and ally1 isovalerate (see both).

There have been continued attacks against the Delaney Amendment since it was enacted. When Congress passed the Food Quality Protection Act (FQPA) of 1996, many in the press announced that this law effectively repealed the Delaney Amendment, which they claimed had banned all traces of cancer-causing pesticides in processed foods. The act concerned the so-called Delaney paradox, which, according to Delaney critics, resulted from one bill that seemed to prohibit residues of cancer-causing pesticides in processed foods, and two others that permitted the setting of tolerances for carcinogenic pesticide residues in raw agricultural products. What the FQPA of 1996 did was repeal the prohibition on cancer-causing pesticides in processed foods that exceed the raw agricultural commodity tolerances plus added a new, more restrictive safety standard that allows no more than a one-in-one-million risk of cancer from pesticide residues in both raw and processed foods.[7]

Doesn't that mean equal amounts of cancer-causing pesticides must be in both raw agricultural products and processed foods?

Beside the pesticide interests, two other great lobbying efforts to abolish or weaken the Delaney Amendment are fighting in the ring. They are the producers of artificial sweeteners and the makers of food colorings, who both have additives that are potentially carcinogenic.

The late FDA toxicologist Dr. Adrian Gross told Congress that the artificial sweetener aspartame violated the Delaney Amendment because it caused cancer in lab animals, especially brain tumors.[8] Congress sided with Monsanto. Dr. Gross's last words on the subject were: "Given the cancer-causing potential of aspartame, aka 'NutraSweet' and 'Equal,' how would the FDA justify its position that it views a certain amount of aspartame as constituting an allowable daily intake or 'safe' level of it? Is that position in effect not equivalent to setting a 'tolerance' for this food additive and thus a violation of that law? And if the FDA itself elects to violate the law, who is left to protect the health of the public?"

TOXINS

Although the testing for cancer-causing additives in our food may be imperfect, testing for nerve- and brain-damaging additives in our food is really lacking. This is true even though many scientists believe neurotoxins are more of a problem in food than carcinogens.[9,10] No one knows how much of a problem because the testing for toxicity is relatively new as far as food safety is concerned. The suspected toxins—aside from those in poisonous botanicals, and certain bacteria production—are usually linked to synthetic food colorings and flavorings.

In humans, neurotoxicity can adversely affect a broad spectrum of behavioral functions, including the ability to learn, to interact appropriately

In humans, neurotoxicity can adversely affect a broad spectrum of behavioral functions, including the ability to learn, to interact appropriately with others, and to perceive and respond to environmental stimuli; basically these represent everyday functions that enable people to live productive lives. The FDA is now focusing on neurotoxicity and is trying to develop more relevant information about the potential adverse effects of chemicals in food on the nervous system.[11]

In the meantime, this dictionary cites those chemicals, such as monosodium glutamate and Red No. 3 (see both) that have been found to be suspected neurotoxins. Most of the other chemicals identified as neurotoxins are pesticides, since they have long been linked to nerve damage. They are difficult to avoid unless you grow your own food without chemicals and don't buy processed edibles. You can reduce your intake by avoiding other additives listed in The Consumer's Dictionary of Food Additives that have been cited as potential neurotoxins, such as glutamates used in flavorings, butyl phosphorotrithioate used in animal feed, and the food coloring Red No. 3 (see all).

The estimation of the dietary intake of a chemical residue can rarely completely reflect the long-term exposure of a population (or individual) to that residue because of the difficulties inherent in determining long-term food consumption patterns. Nonetheless, an initial approximate assessment of dietary intake is essential to indicate whether current regulatory practices for a contaminant are adequate; to provide triggering mechanisms for deciding whether further, more detailed assessments of intake are required; and, ultimately, to determine whether further controls over the use of a toxic substance should be considered.[12]

Toxins in food may or may not survive the cooking process. The botulism toxin caused by Clostridium botulinum can be inactivated by boiling food for ten minutes. However, many other toxins are heat stable. For example, Staphylococcus can produce toxins that are not destroyed by high cooking temperatures. To prevent toxins from developing in food, don't leave food sitting out at room temperature for more than two hours. On a hot day (90° F or higher), food should not sit out for more than one hour. Because honey can contain spores of Clostridium botulinum and has been a source of infection for infants, children less than twelve months old should not be fed honey. Honey is safe for children one year of age and older. Food-borne botulism has often been caused by home-canned foods with low acid content, such as asparagus, green beans, beets, and corn. However, outbreaks of botulism have occurred from more unusual sources, such as chopped garlic in oil, chili peppers, tomatoes, carrot juice, and home-canned or fermented fish. Persons who do home canning should follow strict hygienic procedures to reduce contamination of foods. Oils infused with garlic or herbs should be refrigerated. Potatoes that have been baked while wrapped in aluminum foil should be kept hot until served or refrigerated.

PESTICIDES PERSIST IN FOOD

When pesticide chemical residues occur in processed foods due to their use in raw agricultural commodities, this is an enigma. If the pesticide use was in conformity with an exemption granted or a tolerance prescribed by American or European agencies, the processed food will not be regarded as adulterated if the producers followed “good manufacturing practice.” That means if an effort was made to remove any residue from the raw agricultural commodity in the processing, such as by peeling or washing, and as long as the concentration of the residue in the processed food when you are ready to eat it is not more than the amount originally on the raw food, it is considered safe.

How can we know how much pesticide remains in what we are eating? We really can't, especially if it comes from a country with unskilled and sometimes illegal application of chemicals. In fact, the attorneys general of Connecticut, Massachusetts, New Jersey, and New York sued the federal Environmental Protection Agency September 15, 2003, contending that it is allowing unacceptably high levels of pesticide residues in some foods favored by children.

POTENTIAL FOOD BIOTERRORISM

We want fresh strawberries in winter and tomatoes all year-round, yet we have replaced many of our farms with housing and roadways and our edibles are increasingly being grown in other countries. Only a tiny fraction of the foods that enter our ports is checked by our guardian agencies. Not only do we have to worry about foreign foods with undesirable additives and residues, we now have to be protected against terroristic tampering. The FDA in 2003 announced the publication of proposed regulations required by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. Two regulations deal with establishing and maintaining records among food firms and the administrative detention of foods that may pose a risk to public health. Two regulations concern the registration of food facilities and prior notice of imported foods. These regulations further bolster the FDA's ability to protect the more than four hundred thousand domestic and foreign facilities that deal with food within our country, according to former FDA commissioner Mark B. McClellan, M.D., Ph.D. Under the rule, manufacturers, processors, packers, distributors, receivers, holders, and importers of food must keep records identifying the immediate source from which they received the food, as well as the immediate subsequent recipient. This requirement applies to almost all foreign and domestic food sources and almost all recipients of food destined for consumption in the United States. It would assist the FDA in addressing credible threats of serious adverse health consequences or death to humans or animals.

As a side benefit for all, an additional $20,500,000 was given for Counter Terrorism-Food Safety. The increase is supposed to provide grants to states, increase laboratory preparedness, and develop the foods registration system. The grants to the states are meant to be used to build states' infrastructure to enable them to become part of the Laboratory Response Network and conduct direct federal food inspections. Increased laboratory preparedness should theoretically allow the agency's laboratory accreditation program to continue and to develop uniform scientific practices. But according to some sources within the government, the money was designated but not really provided.

There are loopholes. “To minimize the economic burden on food companies affected” by the rule, the FDA allows companies to keep the required information in any form they prefer. The proposed rule also states that existing records can be used to satisfy the requirements of the regulations if these records contain all the required information. With respect to the immediate previous source, the specific source of each ingredient that was used to make every lot of finished food product would have to be identified if this information is reasonably available. What is reasonably available may vary from case to case, according to the FDA. If an article of food is reasonably believed to be adulterated and presenting a threat of serious adverse health consequence or death to humans or animals, firms are required to provide these and other records to the FDA within four hours during certain business hours, or eight hours at other times. Transporters are also required to keep similar documentation, including information about all the means of transportation used.

Farms, restaurants, fishing vessels not engaged in processing, and firms regulated exclusively by the U.S. Department of Agriculture, are exempted from the record-keeping requirements. With some exceptions, foreign facilities are excluded if their food products undergo further manufacturing/processing, including packaging, by another facility outside the United States. Retail food operations are exempted from maintaining records on immediate subsequent recipients of foods sold directly to consumers.

The FDA's Center for Food Safety and Applied Nutrition not only has set priorities emphasizing the prevention of terrorism on the food supply

and handling transmissible diseases from food to humans, but also has added emphasis on food additives, dietary supplements, and food biotechnology and increased its attention on food allergens. It also has responsibility for the multibillion-dollar drug and cosmetic industries. The FDA's Center for Food Safety has 904 full-time employees at this writing, including office personnel, down from 924 in 2001. They are dedicated public servants but they must deal with the fact that contaminated, diseased food such as Listeria-loaded cheeses can kill quickly and the FDA can react rapidly, but cancer-causing or neurotoxic additives may damage and kill slowly over twenty years or more.

WHO'S WATCHING THE PORTS?

Most of our food is now imported. The FDA has been able, so it is said, to inspect 100 of 190,000 foreign food plants. The agency is so understaffed that, at its current pace, it would need at least twenty-seven years to inspect every foreign medical device plant that exports to the United States, thirteen years to check every foreign drug plant, and nineteen hundred years to examine every foreign food plant, according to government investigators.

Investigators for the Government Accountability Office (GAO) found that, in many of its functions, the FDA was unable to provide even basic information about its inspection responsibilities. For instance, one of the agency's computer programs estimates that three thousand plants export drugs to the United States. Another entirely incompatible computer program pegs the number at 6,800.[13]

The FDA is responsible for ensuring the safety of roughly 80 percent of the U.S. food supply, including $417 billion worth of domestic food and $49 billion in imported food annually. The outbreaks of E. coli in spinach, Salmonella in peanut butter, and contamination in pet food highlight the risks posed by the contamination of FDA-regulated food products. Changing demographics and consumption patterns underscore the urgency for effective food safety oversight. In response to these challenges, in November 2007, the FDA and others released plans that discuss the oversight of food safety. The FDA's Food Protection Plan sets a framework for food safety oversight. In addition, the FDA's Science Board released FDA Science and Mission at Risk, which concluded that the FDA does not have the capacity to ensure the safety of the nation's food supply. This testimony focuses on (1) federal oversight of food safety as a high-risk area that needs a governmentwide reexamination, (2) the FDA's opportunities to better leverage its resources, (3) the FDA's Food Protection Plan, and (4) tools that can help agencies to address management challenges. To address these issues, the GAO interviewed FDA officials; evaluated the Food Protection Plan using a GAO guide for assessing agencies' performance plans; and reviewed pertinent statutes and reports. The GAO also analyzed data on FDA inspections and resources.[14]

Who Else Is in the Food Protection Mix?

Stay with me, because I must fill you in on the often confusing alphabet soup of agencies mixed up with food additives. Don't despair when you come to a listing in the dictionary such as AMS, which is the abbreviation for the U.S. Department of Agriculture's Agricultural Marketing Service. After an AMS inspection, products that don't conform to assigned specifications are reported back to the company. The produce industry relies on AMS's inspectors to provide impartial review and certification of shipments in various stages of marketing.

I have tried to list the abbreviations in several places for you so that you can look them up easily when you come upon ones you don't recognize.

A FLOUNDERING FDA

The reports and a recent assessment by the FDA's Science Board conclude that the FDA is so overwhelmed by a flood of imports that it is incapable of protecting the public from unsafe drugs, medical devices, and food. Another factor that is having a particularly heavy impact on the international additives industry is the emergence of Chinese firms in the market. In many sectors, prices have come under heavy pressure as cheaper products have flooded the market from China. In order to compete with Chinese firms at the lower pricing levels, many Western suppliers have invested in the Chinese market, having formed joint ventures with local Chinese firms, acquired local businesses, or built their own production operations within China. But how do we know food additives from China are safe? There was the scare in 2007 about Chinese melamine, a cheap substitute for protein, poisoning American pets; then the FDA had to warn consumers to avoid using any toothpaste labeled “Made in China” because the agency found levels as high as 3–4 percent of a poisonous chemical, diethylene glycol (DEG), in Chinese toothpaste. Because of increasing takeover of food additive production, the FDA has been permitted to open three offices in China to help provide oversight. Although there has been a lot of publicity about China's missteps, there are also problems all the time with South America and disadvantaged countries selling food contaminated by pesticides and bacteria.

WHAT ABOUT ADDITIVES DELIBERATELY ADDED TO OUR FOOD?

The FDA has a list called EFAUS (Every Food Additive Added in the United States). It is a great start but far from complete. In fact, the list does not even have the many new synthetic flavorings in use self-determined generally recognized as safe (GRAS) by the Expert Panel of the Flavor and Extract Manufacturers Association (FEMA), a trade organization. The seventh edition of A Consumer's Dictionary of Food Additives has scores of substances—some of them quite unappetizing—that may be on your plate but not listed by EFAUS. This book also describes the benefits and potential harm of food additives, which the EFAUS list does not.

The Joint Expert Committee on Food Additives (JECFA) is an international expert scientific committee that is administered jointly by the Food and Agriculture Organization (FAO) of the United Nations and the World Health Organization (WHO). It has been meeting since 1956, initially to evaluate the safety of food additives. Its work now also includes the evaluation of contaminants, naturally occurring toxicants, and residues of veterinary drugs in food. To date, the JECFA has evaluated more than fifteen hundred food additives, approximately forty contaminants and naturally occurring toxicants, and residues of approximately ninety veterinary drugs. The committee has also developed principles for the safety assessment of chemicals in food that are consistent with current thinking on risk assessment and take account of recent developments in toxicology and other relevant sciences.

The JECFA normally meets twice a year with individual agendas covering either food additives, contaminants and naturally occurring toxicants in food, or residues of veterinary drugs in food. The membership of the meetings varies accordingly, with different sets of experts being called on depending on the subject matter of the meeting.

The Codex Alimentarius Commission (CAC) is an international government body formed to protect the health of the consumer and facilitate international trade in food. In the 1960s, the JECFA began to provide expert advice to CAC.

The European Union (EU) has created a list of approved food additives. EU legislation requires most additives used in foods to be labeled clearly in the list of ingredients, either by name or by an E number. This seventh edition presents many evaluations by foreign agencies because food additives have become global. Although many are now made in China and India, you cannot be sure where an additive is made.

These organizations are doing a painstaking job of evaluating research on substances in our foods and estimating the average daily intake (ADI) of such chemicals. It is not realistic to use animals or humans to test every combination of additives and every chemical that is produced during processing and cooking.

Scientists in the JECFA, the Food and Drug Administration (FDA), and the U.S. Department of Agriculture and Canadian and Asian regulatory staffs have the desire to protect us from the harmful effects of a number of food additives. The scientists and regulators must deal with the following:

- The problems of underfunding, understaffing, and shortage of qualified experts
- The problem that most of the evaluations are done just by culling through the huge scientific literature and deciding which study conclusions are correct
- The problem that almost no regulatory testing is actually done in science laboratories
- The problem trying to decide how much of an additive we might eat despite our great differences in size, age, weight, culture preferences, and access to and ingestion of food and drink
- The problem of the mixture of additives—most foods contain more than one and usually many
- The problem of how the additives in our food may interact with the drugs, cosmetics, and environmental chemicals in our lives.

The fact is that one agency might not agree with the assessment of another, even in the same country. Consider, for example, benzoin, which includes any of several resins containing benzoic acid (see), obtained as a gum from various trees. The resin is used as a flavoring additive in chocolate, cherry, rum, spice, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. Benzoin also is a natural flavoring additive for butterscotch, butter, fruit liquor, and rum. It was tested by the National Cancer Institute and found not to be a cancer-causing additive in rats and mice, but it may be mutagenic. The National Toxicology Program, however, found it caused kidney damage in rats.

I know all the initialized programs can be confusing. I define them in the dictionary section for you and here in the foreword, and if you can overcome the frustration they cause, you will become more knowledgeable about who is protecting or not protecting your food and what measures you need to take to protect yourself and your loved ones. For example, who determines which food additives are in our food and drink? Who decides whether they are harmful or safe?

The Joint Expert Committee on Food Additives (JECFA) employs the maximized survey-derived intake (MSDI) method as the measure of dietary exposure for use in the Procedure for the Safety Evaluation of Flavoring Agents (PSEFI). The MSDI provides an estimate of the average exposure of consumers to a flavoring agent, which can then be compared with its threshold of toxicological concern (TTC). The MSDI is based on the reported amount of the flavoring agent disappearing into the food supply per year in specific regions—currently Europe, the United States, and Japan, and on the assumption that 10 percent of the relevant population would eat the foods containing that flavoring additive.

In other words, the “whole house of cards” is built upon what the flavor manufacturers (see FEMA) themselves decide is generally recognized as safe and the estimate of how much of the flavoring they produced disappears into the bellies of 10 percent of Europeans, Americans, and Japanese.

The JECFA has agreed to explore a new additional method of dietary exposure assessment called SPET—single portion exposure technique. SPET is supposed to provide a dietary exposure estimate based on use levels recommended by the industry. It aims to represent the ongoing dietary exposure for a regular consumer who consumes daily a specific food containing the flavor agent of interest based on a standard portion.

Even for known cancer-causing or toxic flavorings, the European Union's Procedures for Safety Evaluations of Flavoring Agents usually concludes: “There is no safety concern at estimated current levels of intake”—which of course is just a best guess. For those additives known to be of more concern, the JECFA often says “the data were insufficient to allow conclusions” and a “monograph (description including toxicology) has not been prepared.” In a few situations, the JECFA and the FDA have asked that food additives be removed from the market—but they have not always agreed upon which ones. The JECFA sees no harm in bisphenol A (see) but the FDA does, and the EU will not allow growth hormones to be given to cattle and poultry but the United States does.

Decisions, therefore, are usually made upon information gleaned from published studies and from the advice of experts. At this writing, the JECFA has revealed a shortage of experts. Progress is slow because the agencies meet infrequently. In some instances, an additive is approved and even listed as GRAS, such as in the classic case of cyclamates and, more recently, glycine. The artificial sweeteners, cyclamates, listed as GRAS were removed from the food market in 1969 because they were found to cause bladder cancer in rats. At that time, 175 million Americans—including young children—were swallowing cyclamates in significant doses in many products ranging from chewing gum to soft drinks. In April 2003, the FDA rescinded its GRAS status for the amino acid additive glycine, because it said: “Reports in scientific literature indicated that adverse effects were found in cases where high levels of glycine were administered in diets of experimental animals and current usage information indicated that the daily dietary intake of glycine by humans may be substantially increasing due to changing use patterns in food technology.” Glycine, according to the agency, is a masking agent for saccharin in beverages and bases. It is also used by food producers to improve protein. Still, there are many food additives—direct and indirect—widely used that are literally toxic.

The JECFA and the FDA do have lists of current additives slated for top priority evaluation, and you will read about these substances in the dictionary portion of this book. The submissions for evaluation are so overwhelming that the JEFCA says it has limited storage space and submitted data can either be returned to submitters at their expense or destroyed five years after evaluation. The FDA with an even greater shortage of scientists has been allowing the additive manufacturers, themselves, to evaluate the safety of their products. With a severe shortage of scientists to evaluate additives, how many chemicals will linger in limbo?

Hexadienal is another example of one U.S. agency not knowing what another is doing. This food additive is a synthetic chemical with a “green” or “citrus” odor used in flavorings. A relative, trans-2, 4-hexidienal occurs naturally in a wide variety of foods, including kiwifruit and peanuts. The National Cancer Institute asked the National Toxicology Program (NTP)—which actually does laboratory tests for government agencies—to test hexadienal because of the chemical's cancer-causing potential based on its structure and its potential link to oxidized dietary fats and human malignancies. The NTP informed the National Cancer Institute of its findings on October 18, 2001. Its studies showed hexadienal was indeed carcinogenic in rats and mice, causing oral and forestomach malignancies. The FDA, however, still lists hexadienal as ASP, meaning the agency has sought “fully updated toxicology information,” and hexadienal remains as an approved food additive in several different compounds. The FAO/WHO also says of hexadienal that there is “No safety concern at current levels of intake when used as a flavoring agent.” Should we be

concerned about the use of this unnecessary chemical that has been found in actual testing to have potential cancer-causing properties? The Food Additive Organization of the WHO says, “The use of flavorings is justified only when they impart or modify flavor to food provided the use does not mislead the consumer about the nature or quality of food.”

Does the FDA list of ingredients designated as GRAS mean they are really safe? The sellers of food products that claim their products are “registered with the FDA” may have done little more than send a letter to the agency. The Bioterrorism Act of 2002 requires food manufacturers to register with the FDA, but the agency rarely inspects these facilities or products.

FLAVORINGS

While researching this edition, I found the estimated $6-billion-a-year flavoring category is the most problematic and the category in need of the greatest scrutiny today. Unlike many substances added to our food to achieve a technical purpose, approximately 1,323 flavorings are used just to make foods more appealing. Flavor is taste plus aroma, mouth feel, and sometimes appearance and sound. Food experts say we will usually not buy food products on the basis of nutritional or clinical benefits if they don't taste good to us.

We are very busy. We want our meals easy to prepare yet still tasty. Flavoring additives replace the tastiness lost during processing. They also make products more delectable. Natural products contain many aroma chemicals. Tarragon essential oil, for example, contains up to seventy-seven components of scent and coffee, more than eight hundred components. Some products, on the other hand, have few major components, such as vanilla, which has just its vanillin as the prime ingredient. Most synthetic flavorings are prepared by using complex mixtures of aroma chemicals —some of them from nature.[15] Of the flavorings on the market, about five hundred are natural and the balance, synthetic.

In reality, there are only five tastes—sweet, sour, bitter, salt, and the newly recognized savory or umami flavor (the name savory is favored by Westerners and umami by the Japanese)—given to food by the natural amino acid glutamic acid and certain nucleotides (see). Monosodium glutamate (MSG) (see) is an example.

How do flavor chemists make the products to be sold to us tastier? Many flavors are due to specific chemical processes: Fermentation produces cheeses, yogurts, and alcoholic drinks. Roasting and frying, on the other hand, yield meat, chocolate, toast, and deep-fat-fried food flavors. These cooking techniques create specific chemical reactions in the food that have been identified. The flavorists—the Merlins of the additive world—have taken these isolated chemicals and created commercial additives that mimic the cooking results. These synthetic additives—called process flavors —aim to provide the taste of home-cooked food. The problem is that when you grill or heat foods at home yourself or a restaurant does, the natural flavoring produced contains heterocyclic amines (HCAs) (see), which have been shown to strongly damage genes and to be cancer-causing agents.[16] So the Merlins of flavoring created additives out of the “grilled” and “browned” chemicals produced on the barbecue and made them available so they could be added to foods—including meats and breads. Are the synthetic browning and grilling additives any less harmful than what you can produce on your own grill?

When the Merlins reproduce these delicious “browning effects,” do the chemical compounds created also contain HCAs? The flavorists claim that the laboratory-made flavorings in this class are heated more quickly and are mixed with other flavorings so they are less harmful. On current evidence, the Merlins say, a barbecue is a far greater health hazard than any additive.[17] True? No one knows for sure. When the FDA contacted the Flavor Experts Manufacturing Association (FEMA) and asked if there were HCAs in process flavors, the “detailed analytical information was not available,” despite the fact that there were six hundred types of formulations being made commercially by twenty-three companies in the United States who were putting 17 million pounds of the stuff on the market.

The flavorists and the companies that employ them, as well as the regulating agencies, say that a little toxicity or cancer-causing or allergy-producing flavoring won't hurt you.

How much of one flavoring and how many different flavorings do you eat at one meal or in one year? Does anyone really know?

Estimates of flavoring substance intake in the populations are very difficult to determine. What happens, for example, if you add a synthetic or even a natural flavoring to a food already containing its own potential cancer-causing flavor such as the “browning factor”? Will the ingestor then get an unmeasured, potentially harmful dose of HCAs?

Toxicity is dependent on the chemical structure of a substance, its bodily absorption, distribution, metabolism, and excretion. It also depends greatly on the dose. Therefore, the JECFA (see) of the WHO—which is trying to evaluate the safety of food additives for many countries—believes it is unnecessary to establish an acceptable daily intake (ADIs, see) for the majority of flavoring substances, since they are added in such small amounts to our food and drink.

WHAT ABOUT OTHER ADDITIVES?

Food additives are rarely used singly in foods, so one meal may contain many different additives that can interact with one another, as pointed out with flavorings. In addition, additives can change during cooking or processing. When this book was first published in 1978, there were thirty-five widely used additives that had been approved as safe for food use then but have since been removed as unsafe, most of them because they were found to be capable of causing cancer. At the time of the first edition of this book, food additives were a $1.3-billion-a-year business in the United States; today they are a $4 billion business. It is estimated that today 75 percent of the Western diet consists of processed food and that each person consumes an average of 8 to 10 pounds of food additives per year.[18] The European Parliament, in fact, issued a statement in 2003: “The ever increasing number of food additives leads to an accumulation of a large number of small risks for food safety, which are not easily evaluable, and which might create synergy effects between different substances. The total number of authorized food additives should therefore be limited, so that the industry, when applying for a new authorization, has to make a proposal for withdrawing an additive of little use.”[19]

Organic, Natural, or What?

The purchase of “organic foods”—animals and crops grown without pesticides, antibiotics, and hormones—has reportedly been increasing up to 13 percent a year and is expected to continue at double-digit growth through 2018.[20] How do you know a product is really organic? Government food organic food labeling regulations went into effect in 2002. The USDA put in place a set of national standards that foods labeled “organic” must meet, whether grown in the United States or imported. If growers do not follow the regulations, they can be fined up to $10,000 for each violation. A government-approved certifier is supposed to inspect the farm where organic food is grown to make sure the farmer is following all the rules. As

A government-approved certifier is supposed to inspect the farm where organic food is grown to make sure the farmer is following all the rules. As a result, if you see the USDA Organic seal on the item, it is at least 95 percent organic. If the label says “Made with Organic Ingredients,” the product must contain at least 70 percent and up to 95 percent organic ingredients, excluding water and salt. The USDA seal cannot be used on these. For products less than 70 percent organic ingredients, labels are allowed to list the organic items in the ingredient panel only, but not display the word organic on the front. In 2003, however, four months after the standards took effect, Congress passed legislation permitting “organic” livestock to be fed nonorganic feed (which may include antibiotics and pesticides) when organic feed is twice the price of conventional feed. It took ten years of hard-fought negotiations to get the USDA standards passed, but it took just a little backroom time to weaken the regulations.

A number of synthetic substances are allowed for use in organic crop production, such as newspapers or other recycled paper without glossy or color inks, streptomycin, soluble boron products, and hydrogen peroxide (see all). The one nonsynthetic substance prohibited for use in organic livestock production is strychnine (see), but there are more than forty-one “nonorganic” additives allowed in processed products labeled as “organic,” including potassium hydroxide and silicon dioxide (see both). There is ongoing dispute between the FDA, and those who wish to put “organic” on the label. Tyson, the large American producer of chickens, was sued by rivals because the company put “raised without antibiotics” on its labels. Competitors sued, saying the USDA was wrong in granting permission for Tyson's “raised without antibiotics” label. Tyson was using ionophores (see), an antibiotic widely used in the industry but considered less harmful by some because it is administered to animals and not humans. The USDA revoked permission for the Tyson's label and advertising “antibiotic free,” but the company was allowed to leave the existing labels on the chickens until the products were sold and the new labels became available.

Natural and organic are not interchangeable. Other truthful claims, such as “free-range,” “hormone-free,” and “natural,” can still appear on food labels. Don't confuse these terms with “organic.” Only food labeled “organic” has been certified as meeting the USDA's organic standards. The Food Standards Agency of Britain is also struggling with the definition of “natural.” In 2002, the Food Standards Agency issued guidelines for the food industry and food law enforcement authorities on how these terms should be used. In 2004, the agency carried out a survey of products to see how the food industry was using the terms, and whether the agency's guidance was being followed. The survey discovered some producers were continuing to use some of the terms in ways that are potentially misleading to consumers. The agency at this writing is carrying out research into consumer views on a wider range of terms, including “farmhouse pate,” “traditional style,” “style,” “handmade,” “premium,” “finest,” “best,” “quality,” and “selected.” As for “organic,” all food sold under that label must be produced according to European laws on organic production.

In 2008, a U.S. federal judge rejected a claim that the use of the term “all natural” on Snapple drinks was deceptive because the products contained high fructose corn syrup (HFCS). Stacy Holk, who had filed the suit on behalf of herself and other consumers, maintained that the use of the term “natural” was deceitful because the drinks contained HFCS, a “highly processed sugar substitute,” which is created through “enzymatically catalyzed chemical reactions in factories.” Holk argued that she had paid a premium for Snapple's iced tea and juice drinks and had received something “less than and different from what was promised and bargained for.” The discrepancy arises from the lack of a clear definition of the term “natural” from the nation's Food and Drug Administration (FDA).

The ruling was that it is up to the FDA, not the court, to define “natural.” Although the FDA provides no formal definition for “natural,” it does have a longstanding policy regarding the use of the term. This states that a “natural” product is one that has not had any artificial or synthetic substances added to the product that would not normally be expected to be in the food—including artificial flavors or color additives, regardless of source.

FDA also does not currently restrict the use of the term “natural” except on products that contain added color, synthetic substances, and flavors.

PASTURE FED

The U.S. Department of Agriculture (USDA) recently developed rules for labeling meat from grass-fed livestock with urging from the Union of Concerned Scientists (UCS). The rules stipulate that meat labeled “grass fed” must come from animals fed solely on grasses, hay, and other nongrain vegetation. “This rule will help consumers choose meat from ‘smart pasture operations’ that are better for the environment,” said Dr. Margaret Mellon, director of the Food and Environment Program at UCS. “Unlike massive confined animal feeding operations, these farms use sophisticated land management practices to maximize productivity without despoiling our air, water and soil.”

Raising livestock on pastures avoids the crowding and illnesses that plague livestock in confined animal feeding operations (CAFOs). Modern grass-fed methods are also more cost-effective and environmentally friendly because they take advantage of low-cost grasses that typically require little added water, and few or no synthetic fertilizers and pesticides. A growing number of farmers across the country are now turning to this modern approach to livestock production.

Additionally, grass-fed beef is better for public health, Mellon, a biologist, added. A 2006 UCS report found that meat from grass-fed cattle contains higher levels of beneficial fats that may prevent heart disease and strengthen the immune system than meat from cattle raised in CAFOs. The study also found that grass-fed meat is often leaner than CAFO meat.[21]

U.S. Food Standards

Standards of identity (SOIs) for foods were promulgated by the FDA to provide a measure for adulteration and misbranding. There are about three hundred standards that resemble recipes, describing the composition of food. The FDA's aim was to preclude modifications of basic, staple food formulas that would deceive consumers and to address the concern that synthetic food additives of questionable safety would insidiously find their way into foods. Regulatory SOIs for food define what a food must or may contain and, in many cases, how much of an ingredient the food must contain. They also specify which optional ingredients, if any, a manufacturer can put into a standardized product. Food standards serve to protect the consumer against unscrupulous food manufacturers who would adulterate their products by substituting inexpensive, low-quality ingredients for more expensive ones, according to Jim Griffiths, Ph.D., USP-VicePresident, Food & Dietary Supplement Standards.[22]

“Foods are thus regulated through standards of identity, but what about the vast portfolio of added food ingredients? Peanut butter, for example, has a regulatory SOI of at least 90 percent of peanuts. But how about its optional ingredients such as salt and nutritive sweeteners like sucrose? Shouldn't these ingredients also be standardized?” Dr. Griffiths asks.

The Codex Alimentarius Commission (CAC), a joint intergovernmental body of FAO and WHO, has worked since 1963 to create harmonized international food standards to make food safer and trading practices fairer. The Codex Alimentarius (Latin for “food code”) is a collection of these international food standards, guidelines, and codes of practice whose main purpose is to protect the health of consumers and ensure fair practices in food trade. It serves as the basis for many national food standards and related regulations. Representatives from governments, consumer groups,

industry, and academia meet to exchange views about food safety and trade and to adopt standards.

Today we have access to a variety of food from all over the world. However, there is a risk that this food may be unsafe due to contaminants, additives, or nutrient content.

Moving On

The Codex Alimentarius Commission (see CAC) held a meeting in 2008 in Geneva, Switzerland and adopted thirty-five new or revised Codex standards concerning biotechnology in animals and plants. In addition, they approved new work for its committee on developing methods for the detection and identification of food derived from biotechnology.

BIOTECH BUILDUP

Biotechnology encompasses using living organisms or any part of these organisms to create new or improved products. It includes the newer forms of genetic engineering, which offer a faster and more precise and controllable means to manipulate genes than traditional breeding and selection techniques. The science has been applied to plants, animals, and foods. Genetic engineering alarms some countries to which we export our products. For others, it may be an excuse to ban imports competitive with their own producers. Although the idea of genetic manipulation is unpalatable to many consumers, it is not new, and without it we wouldn't have bread and cheeses produced by bacteria and yeast. In the 1860s, the scientist Gregor Mendel discovered the genetic principles of selective breeding and crossbreeding. Using Mendelian genetics, the agricultural community bred hybrid forms of many crops, selecting traits that made them more resilient and otherwise desirable. Such breeding methods largely accounted for the phenomenal gains in productivity during the twentieth century. The most common goals of biotechnology today are to

- create a longer shelf life.
- expand the ability to grow.
- ship perishable products more efficiently.
- make produce and animals more productive and disease resistant.

Biotech tomatoes, for example, travel better, look very appealing, and reportedly have more resistance to fungus and insects. Biotech canola oil has more unsaturated fats while biotech soybeans reportedly have more nutritive value.

Although the biotech vegetables and animals may be more disease resistant, there are still questions about whether gene manipulation introduces toxins and allergens into food, particularly because many people are sensitive to allergens. The toxins are still an open question, although studies so far are reassuring. As for the allergens, that could be a problem since fish genes, for example, may be introduced into vegetables to reduce spoilage. Naturally occurring toxins are present at low levels in many foods. Although they have seldom posed a safety problem, they could cause illness if concentrated at high levels and consumed in large quantities. The introduction of allergens creates hazards for sensitive individuals, which has prompted the FDA to require special labeling for such products.

The FDA says that it will review genetically altered foods if

- the concentration of any naturally occurring toxins in the plant has been increased.
- an allergen not commonly found in the plant has been introduced.
- the levels of important nutrients have changed.
- new substances have been introduced into food that raise safety questions.
- there is a problem with an environmental effect.
- accepted, established scientific practices have not been followed.

The USDA regulates the products of biotechnology but not the process itself. It requires notification for genetically engineered crops that are field tested in accordance with specific safety criteria. In addition, it has special requirements that companies have to satisfy before slaughtering transgenic animals. They must describe any drugs or chemicals given to the animals, along with the biological techniques and products used. Before granting approval for slaughter, the USDA tries to scrutinize safety on three levels:

1. Any hazards introduced by the transgene; that is, the genetic material introduced into the animal
2. The safety of the final food product
3. Any secondary changes in the animal caused by the insertion of new DNA

Some consumer and environmental groups believe that the FDA's approach fails to protect public health because, in their view, genetic engineering poses unique food and environmental safety risks that warrant premarket testing and review. These groups contend that the FDA's policy allows manufacturers too much discretion in determining the safety of new food products before marketing them. Some believe that genetic engineering is a radical new technology—not an extension of traditional breeding—and will introduce products that have not been a part of the food supply.

Other countries have been developing biotechnology products: Japan and China have created many products similar to those under development in the United States and are actively working on more. Japan, for example, has produced a low-allergen variety of rice. China currently has many test plots of transgenic plants under cultivation. Europe is actively exploring biotechnology. The nations of Europe, however, have been unable to reach a uniform agreement, at this writing, on the regulations governing biotechnology. As a result, the research remains mostly in the laboratory with few field studies under way.

There is also an entity known as the Precautionary Principle (PP) that was introduced into the United Nations in 1972. Basically, it was intended to provide environmental risk managers with a tool for decision making about extraordinary environmental threats, such as ship bilge dumping and chemical spills. Since its introduction it has expanded to a wide base of environmental concerns, including genetically modified foods and food additives including the bovine growth hormone (BST) (see). PP is not recognized in the United States, but the EU, Canada, and the WHO have adopted it. Many in the United States and elsewhere feel that PP is sometimes just used as an excuse to prevent competitive imports of food

products. Still, those who favor PP say that people have a duty to take anticipatory action to prevent harm: the burden of proof of harmlessness of a new technology, process, activity, or chemical lies with the proponents, not with the general public.

The European Parliament approved legislation on July 3, 2003, to require labels for food and feed made with genetically altered ingredients, a move that was hailed by environmentalists but pilloried by U.S. farmers. Intended to inform European consumers, the legislation requires supermarkets to label all foods containing more than 0.9 percent of genetically modified organisms. The legislation also requires genetically modified foods like grains to be traced from their creation to the EU through the processing stage and into the supermarket.

The FDA at this writing does not require special labeling for foods to indicate whether or not a food or food ingredient is a bioengineered product.

NANOTECHNOLOGY—SIZE DOES MATTER

Nanotechnology involves nanometers (nm) that measure one thousand millionth of a meter. The diameter of a single human hair, for comparison, is about 80,000 nm; a red blood cell approximately 7,000 nm; a DNA molecule 2 to 2.5 nm, and that of a water molecule almost 0.3 nm. The excitement about nanotechnology lies in the fact that the minute size of nanometers results in physical and chemical properties that differ significantly from those at a larger scale. Food industry experts predict that nanotechnology will have a significant impact on food products in a variety of ways both directly and indirectly. Most foodstuffs contain natural nanoscale particles. Nanotechnology-based products are increasingly being used to produce antimicrobial food contact materials commercially available as packaging or as coatings. Current research on such “smart” surfaces is aimed at the development of surfaces that can detect bacterial contamination and react against bacterial growth.

Silicon chips have been made using nanotechnology for more than twenty years and nano-enabled sensors, which can detect chemical and biological contaminants, are expected to have a substantial impact on food safety and quality. In addition, the use of nanoscale filters in water and in environmental remediation could have implications for food safety, particularly in developing countries. Eventually, these advances are expected to make it possible for consumers to learn the source, history, and storage of a food product and its nutritional characteristics and suitability for individuals' genetic makeup and lifestyle.

New developments, however, are never without potential problems. Many scientists and consumers are wary of nanotech food. For example, certain nanoparti-cles possess the ability to cross the blood-brain barrier and can serve as carriers for other molecules. Information on the bioaccumulation and potential toxic effects of inhalation and/or ingestion of free-engineered nanoparticles and their long-term implications for public health is needed. Nanoscale materials may also present new challenges in relation to exposure assessment, including measurement of nanoparticles in the body and in complex food composition.

Approval systems for food additives have not, in the past, taken much heed of the particle size of the additive. For nanoparticles, this is obviously an important aspect since nanoparticles may be handled differently in the body than their previously approved, macro counterparts. It is likely that the approach will vary from country to country. Most scientific committees that have reviewed the initial applications of nanotechnology conclude that although consumers are likely to benefit from this technology, new data and new measurement approaches may be needed to ensure that the safety of products using nanotechnology are properly assessed.

FUNCTIONAL FOODS AND NUTRACEUTICALS

No matter what you call them, foods that provide health benefits beyond basic nutrition compose one of the fastest-growing segments of the food additive industry. Could it be that the burgeoning number of baby boomers—the large number of individuals approaching sixty years—are eager to hold back diminishing prowess and other signs of aging? The producers of additives believe that is the target market, but functional foods at any age are in demand. In addition to good old-fashioned vitaminsand minerals, there are omega-3 fatty acids, isoflavones, and pro- and prebiotics (see all).

In 2008, chocolate and other candy began being increasingly promoted as “functional foods.” According to data gathered by a cocoa company, a quarter of Western consumers are interested in chocolate with physical or emotional benefits. The survey found that functional chocolate is most popular in the United States, where 14 percent of consumers say they eat it at least once a month.

The company's claims about the popularity of such products appear to be backed up by market research. Euromonitor reports that the functional market has grown by 15 percent on average per year over the last four years; however, there has recently been some backlash from regulators and health advisers. As 31 million Americans turn age sixty-five over the next ten years and as young people become more health conscious, the demand for condition-specific foods is expected to greatly increase. Foods that combat high cholesterol, elevated blood pressure, thinning bones, and diabetes will offer a market for “functional foods” or so-called nutraceuticals. The savvy maturing population will want omega-3s, polyphenols, vitamins, fibers, flavones, plant sterols, and more vitamins and minerals in or added to their edibles. Consumers today are already succumbing to the promotion for “inner” and “outer beauty” foods and drinks. Then there is the wish to be buff and strong at any age.

And what about functional confections for the brain? The British have launched functional cocoa for a charity—The Food for the Brain Foundation. The labeling cites the link between diet and cognition at both the supplement and retail level and offers the following criteria:

- Low in sugar and doesn't raise blood sugar much
- High in essential fats (omega-3, −6, and phospholipids)
- High in vitamins and minerals
- Free from harmful or unnecessary chemical additives or colorings

PROBIOTICS—PREVENTION FOODS

We have all heard about the evil bacteria that contaminate our meat and spinach and other edibles we may ingest, but can there be good bacteria deliberately added to our food? The answer is yes, and I've been giving some to myself and my family for years. The beneficial bacteria are called probiotics, a word compounded from Latin and Greek, meaning “favorable to life.” The WHO defines probiotics as “live microorganisms that when administered in adequate amounts confer a health benefit on the host.” The idea that friendly bacteria in yogurt, for example, can crowd out pathogenic organisms was originally propounded by Russian-French bacteriologist Ilya Metchnikoff in The Prolongation of Life, published in 1907.

Today, most products contain bacteria isolated from milk products, typically species of Lactobacillus or Bifidobacterium, both of which I have

used in powdered or pill form. Now, more and more live microorganisms are being added to food or used in animal feed. They are considered "friendly germs," due to their benefits to the colon and the immune system by restoring microbial balance in the intestine. In addition to lactobacilli, bifidobacteria, and streptococci, some yeasts and molds, alone or as mixtures, are now food additives. In marketing probiotics, companies either make health claims based on research on their own products or make references to the wide range of studies conducted with various probiotic strains. Many studies have shown that probiotics may, indeed, boost the immune system. A recent investigation reported by Dr. Mark Besselink of Utrecht University Medical Center in the Netherlands in the journal Surgery described fourteen randomized controlled trials on the use of probiotics. The friendly bacteria were given to patients undergoing abdominal surgery, liver transplantation, or severe trauma. Nine showed a significant decrease in infectious complications, causing Dr. Besselink to say he was "enthusiastic about preoperative probiotics."

In another study published in 2007 in the British Medical Journal, it was reported that probiotics boost immune response to vaccines in adults and reduce respiratory infections in athletes. Other investigators have reported that lactobacillus adheres to the mucous membrane of the intestines and is believed to help restore the balance of our gastrointestinal (GI) microflora, promote gut-barrier functions, diminish the production of carcinogenic compounds by other intestinal bacteria, and activate the innate immune response and enhance adaptive immunity, especially during infections.

Scientific understanding of probiotics and their potential for preventing and treating health conditions is still in an early stage, despite the fact that they have been used in folk medicine for many years. Traditional medicine practitioners are now paying attention to the "friendly bacteria." A conference cofunded by the U.S. National Center for Complementary and Alternative Medicine (NCCAM) and convened by the American Society for Microbiology explored this topic. According to the conference report, there is encouraging evidence shown by scientific studies for some uses of probiotics. They include treating diarrheas, preventing urinary tract or female genital tract infections, reducting recurrent bladder cancer, shortening intestinal infections, and preventing and managing eczema in children.

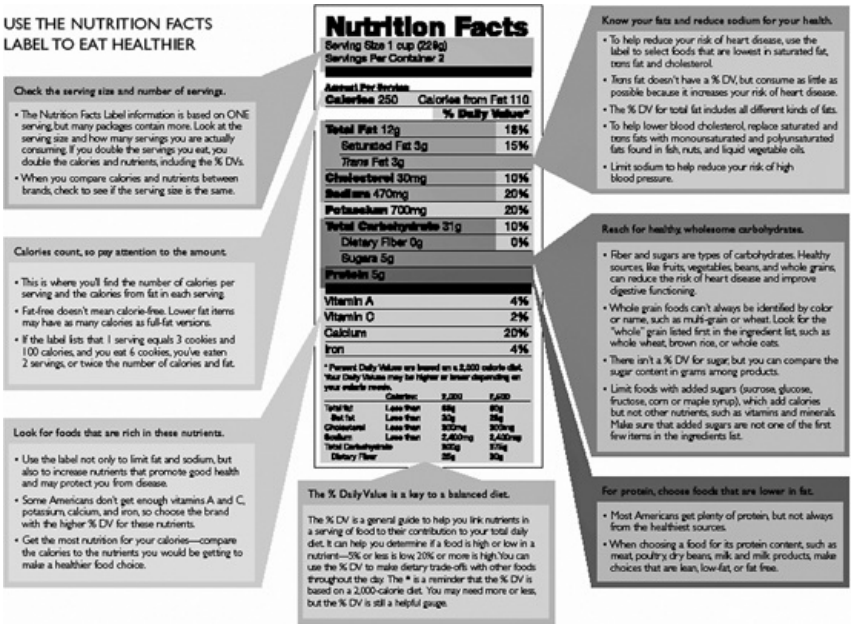
Do probiotics have side effects? The experts says if adverse reactions occur, they tend to be mild and digestive, such as gas or bloating. For more information check the U.S. government's website http://nccam.nih.gov/health/probiotic.

What You Can Do

You must be the primary gatekeeper to protect your family's health by being a conscientious and informed consumer. The first place to begin is with the food label.

TAKE TIME TO READ THE LABEL

A food label is a contract between you and the manufacturer. Like most contracts, it may be difficult to understand and what is not included may be as important as what is. The government estimates that over the next twenty years, labels will reduce national health-care costs substantially by making it easier for the public to choose more healthful diets.



Identifying Nutritious Foods

The goal of A Consumer's Dictionary of Food Additives is to help you find foods that not only use safe ingredients but also are nutritious. Again, the label is a key tool for locating and evaluating the nutritional content of foods. The nutritional chart has been required on almost every foodstuff since the middle of the 1990s. It provides very valuable information but can be somewhat confusing. The following are explanations that will make it clearer and more useful for you.

Daily values (DV) comprise two sets of references for nutrients: (1) daily reference values (DRVs) and (2) reference daily intakes (RDIs).

DAILY REFERENCE VALUES (DRVs)

These designations are for nutrients for which no set of standards previously existed, such as fat, cholesterol, carbohydrates, proteins, and fibers. DRVs for these energy-producing nutrients are based on the number of calories consumed per day. For labeling purposes, 2,000 calories have been

established for calculations. This level was chosen, in part, because many health experts say it approximates the maintenance calorie requirements of the group most often targeted for weight reduction: postmenopausal women.

- DRVs for the energy-producing nutrients are calculated as follows:
- Fat based on 30 percent of calories
- Saturated fat based on 10 percent of calories
- Carbohydrates based on 60 percent of calories
- Protein based on 10 percent of calories
- Fiber based on 11.5 grams of fiber per 1,000 calories

The DRVs for cholesterol, sodium, and potassium, which do not contribute calories, remain the same no matter what the calorie level.

Because of the links between certain nutrients and specific diseases, DRVs for some nutrients represent the uppermost limit considered desirable. Eating too much fat or cholesterol, for example, has been linked to heart disease and too much sodium to the risk of high blood pressure. Therefore, the label shows you when a product has less than the uppermost limits of DRVs for fats, cholesterol, and sodium, which are as follows:

- Total fat: less than 65 g
- Saturated fat: less than 20 g (total saturated fat now includes trans fats [see])
- Cholesterol: less than 300 mg
- Sodium: less than 2,400 mg

REFERENCE DAILY INTAKES (RDIs)

A set of dietary references based on and replacing the recommended dietary allowances (RDAs) for essential vitamins and minerals and, in selected groups, protein. You will continue to see vitamins and minerals expressed as percentages on the label but these figures now refer to the daily values. Here are The RDIs—once familiar to us as RDAs:

Nutrient	*Amount*
vitamin A	5,000 International Units (IU)
vitamin C	60 milligrams (mg)
thiamin	1.5 mg
riboflavin	1.7 mg
niacin	20 mg
calcium	1.0 gram (g)
iron	18 mg
vitamin D	400 IU
vitamin E	30 IU
vitamin B_6	2.0 mg
folic acid	0.4 mg
vitamin B_{12}	6 micrograms (mcg)
phosphorus	1.0 g
iodine	150 mcg
magnesium	5 mg
copper	2 mg
biotin	0.3 mg
pantothenic acid	10 mg

The mandatory and voluntary dietary components on the label and order in which they must appear are:

- Total calories
- calories from fat
- calories from saturated fat (including trans fats)
- stearic acid (on meat and poultry products only)
- polyunsaturated fat
- monounsaturated fats
- cholesterol
- sodium
- potassium
- dietary fiber
- soluble fiber
- insoluble fiber
- sugars
- sugar alcohol (for example, the sugar substitutes xylitol, mannitol, and sorbitol)
- other carbohydrate (the difference between total carbohydrate and the sum of dietary fiber, sugars, and sugar alcohol, if declared)
- protein
- vitamin A
- percent of vitamin A present as beta-carotene

- vitamin C
- calcium
- iron
- other essential vitamins and minerals.

If a food is fortified or enriched with any of the optional components, or a claim is made about any of them, pertinent additional nutrition information becomes mandatory. These mandatory and voluntary components are the only ones allowed on the nutrition panel.

When a caloric value for a serving of food is less than 5 calories, the FDA allows the label to read “zero” calories. If a fat calorie is less than 0.5 grams, it can be listed as “calories from fat zero.”[23]

Government agencies are not satisfied with the information on food labels. One of the major problems is that they do not know how much you actually read the labels. Another is that as new scientific information about the effects of what we eat on our health becomes available, recommendations should change. The current percent daily values (%DV) that appear on your food labels are partly based on 1968 RDA (see), and in Canada, the nutrient information is from that nation's 1983 Recommended Nutrient Intakes (RNIs). The average daily dietary nutrient intake level sufficient to meet the nutrient requirement of 97–98 percent of healthy individuals in a particular life stage and gender group is signified as the tolerable upper intake levels (UL)—the highest average daily nutrient intake level that is likely to pose no risk of adverse health effects to almost all in the general population. As an additive intake increases above the UL, the potential risk of adverse effects may increase. These reference values are replacements for the former RDAs in the United States and the RNIs in Canada, harmonizing the recommendations of the two.

Besides giving specific information about the nutritional value (or lack thereof) of foods, there are other terms that indicate nutritional value, as discussed in the following.

Food Grade

The USDA has established grades for more than three hundred food products. Grading for most products is done voluntarily at the manufacturer's request (and expense) by an USDA inspector, and an USDA grade symbol may then appear on the package; lack of a symbol does not mean substandard product. Unfortunately, these grades lack continuity among product categories (Grade AA is the highest grade for eggs; Grade A is the highest for milk). Meat and poultry, however, whether fresh or processed and packaged, must be inspected and carry an inspection stamp.

Special Dietary Information or Disinformation

To minimize consumer confusion, descriptive terms have been defined.

Nutrient Content Descriptors that May Be Used on Food Labels:

Descriptor	Definition
Free	A serving contains no or a physiologically inconsequential amount: <5 calories; <5 mg of sodium; <0.5 g of fat; <0.5 g of saturated fat; <2 mg of cholesterol; or <0.5 g of sugar
Low	A serving (and 50 g of food if the serving size is small) contains no more than 40 calories; 140 mg of sodium; 3 g of fat; 1 g of saturated fat and 15% of calories from saturated fat; or 20 mg of cholesterol; not defined for sugar; for “very low sodium,” no more than 35 mg of sodium
Lean	A serving (and 100 g) of meat, poultry, seafood, and game meats contains <10 g of fat, <4 g of saturated fat, and <95 mg of cholesterol
Extra lean	A serving (and 100 g) of meat, poultry, seafood, and game meats contains <5 g of fat, <2 g of saturated fat, and <95 mg of cholesterol
High	A serving contains 20% or more of the daily value (DV) for a particular nutrient
Good source	A serving contains 10–19% of the DV for the nutrient
Reduced	A nutritionally altered product contains 25% less of a nutrient or 25% fewer calories than a reference food; cannot be used if the reference food already meets the requirement for a “low” claim
Less	A food contains 25% less of a nutrient or 25% fewer calories than a reference food
Light	(1) An altered product contains one-third fewer calories or 50% of the fat in a reference food; if 50% or more of the calories come from fat, the reduction must be 50% of the fat); or (2) The sodium content of a low-calorie, low-fat food has been reduced by 50% (the claim “light in sodium” may be used); or (3) The term describes such properties as texture and color, as long as the label explains the intent (e.g., “light brown sugar,” “light and fluffy”)
More	A serving contains at least 10% of the DV of a nutrient more than a reference food. Also applies to fortified, enriched, and added claims for altered foods
% Fat Free	A product must be low-fat or fat-free, and the percentage must accurately reflect the amount of fat in 100 g of food. Thus, 2.5 g of fat in 50 g of food results in a “95% fat-free” claim

Healthy	A food is low in fat and saturated fat, and a serving contains no more than 480 mg of sodium and no more than 60 mg of cholesterol
Fresh	(1) A food is raw, has never been frozen or heated, and contains no preservatives (irradiation at low levels is allowed); or (2) The term accurately describes the product (e.g., “fresh milk” or “freshly baked bread”)
Fresh frozen	The food has been quickly frozen while still fresh; blanching is allowed before freezing to prevent nutrient breakdown
Percent fat free	Used only to describe foods that qualify as low fat
High potency	Describes a nutrient in a food that is 100 percent or more of the RDI (see) established for that product. The term may also be used with multiingredient products if two-thirds of the nutrients are present at 100 percent of the RDI.
Antioxidant	May be used in conjunction with currently defined claims for “good source” and “high” to describe a nutrient scientifically shown to be absorbed in a sufficient quantity such as vitamin E to inactivate free radicals (see) or prevent free radical-initiated chemical reactions in the food.

University of Nebraska Cooperative Extension prepared by Julie A. Albrecht, Extension Food Specialist

Sometimes, you have to learn to read between the lines. There are terms on packages that may be misleading. For example “unsalted,” “processed without salt,” or “no salt added” may signify that the producer didn't put any additional salt in during processing but the food may still be naturally high in sodium. For example, a low-sodium soy sauce has 390 mg of sodium per teaspoon (and who can use only a teaspoon of soy sauce on a dish) and a popular tomato-vegetable drink with “no salt added” has 90 milligrams per 4.5 fluid ounces. Salt can also be listed under dozens of “sodium” designations, such as monosodium glutamate and sodium caseinate, adding additional salt to your diet. Sugar labeling, like salt, can be deceptive. A food can be labeled “sugar free” or “sugarless” and still contain calories from sugar alcohols such as xylitol, sorbitol, and mannitol. A yogurt drink, for example, does indeed have live and active cultures but among the more than forty additives are sucrose, fructose, dextrose, and maltodextrin—all sugars. It also contains artificial colors, artificial flavors, and starch.

No Nutrition Information

You may be confused about the government's efforts at nutrition labeling, but how about making sense of some foods that are exempt from nutrition labeling? Due to space limitations, small packages such as a candy bar do not have to provide nutrition information on the label. However, the address or telephone number must be provided for shoppers who wish to obtain this material. It's important for consumers to realize that products produced and sold in the same state and not shipped interstate, or that do not have ingredients that move interstate, are not subject to FDA regulations. Other foods that do not have to provide nutrition labeling include:

- Food produced by small businesses. FDA defines a small business as one with food sales of less than $50,000 a year or total sales of less than $500,000. The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture defines a small business as one employing five hundred or fewer employees and producing no more than a certain amount of product per year.
- Food served for immediate consumption, such as that served in restaurants and hospital cafeterias, on airplanes, and by food service vendors (such as mall cookie counters, sidewalk vendors, and vending machines).
- Ready-to-eat foods that are not for immediate consumption, as long as the food is primarily prepared on-site—for example, many bakery, deli, and candy store items.
- Food shipped in bulk, as long as it is not for sale in that form to consumers.
- Medical foods.
- Plain coffee and tea, flavor extracts, food colors, some spices, and other foods that contain no significant amounts of any nutrients.
- Donated foods.
- Products intended for export.
- Individually wrapped USDAFSIS-regulated products weighing less than half an ounce and making no nutrient content claims.

Although these foods are exempt, they are free to carry nutrition information, when appropriate, as long as it complies with the new regulations.

As pointed out on page 20, bioengineered foods, such as “Flavr Savr” tomato and milk produced with bovine somatotropin (BST) (see), do not list ingredients on their labels. Government agencies, in fact, forbid dairy food producers to say that no BST was used in their products.[24]

Who Checks the Nutritional Analysis of a Product?

Being on a low-salt diet, I have often wondered who checks the analysis of a product for the amount of sodium or any other ingredient. The FDA does not approve, and is not in a position to endorse or recommend, specific laboratories. The FDA tells food processors: “assistance may be available through the following sources: trade and professional associations, trade publications, colleges and universities, and by looking in local phone books under testing or analytical laboratories. For compliance purposes, FDA uses appropriate methods published by the Association of Analytical Chemists in Official Methods of Analysis of the AOAC International.”

When researchers at Columbia University, New York, checked the calorie content of packaged foods, they found the actual calories as much as three-and-one-half times higher than the labels indicated. The blatant underestimations occurred with regionally sold foods rather than with national brands.[25]

The FDA has been accused of scant monitoring of deceptive food labeling. In addition, the FDA has been accused of misleading Congress by ignoring the enforcement of key regulatory provisions intended to provide accurate food labeling. The claim was made after the government agency issued a report to Congress on food manufacturers' compliance with food labeling regulations.

The report was conducted in response to concerns of the House and Senate Appropriations Committees surrounding the agency's efforts to stop inaccurate nutrition information and misleading health-related claims on food labels. In the document, the FDA conducted an overview of its accomplishments under the Food Labeling Compliance Program over the past two years. But according to the consumer advocacy group Center for Science in the Public Interest (CSPI), which sent a rebuttal of the FDA's report to appropriators in Congress, the FDA primarily focused on checking for the presence, not the accuracy, of ingredients.

What Don't You Want to Eat or Drink?

Over the past thirty years, obesity rates have increased dramatically worldwide, and the well-documented health problems associated with obesity can be deadly: diabetes, heart disease, and some forms of cancer. Once considered an issue only in developed countries, excess weight is now becoming a health problem in low- and middle-income countries as well.

FIGHTING OBESITY

The federal government wants to reduce the huge number of Americans who are obese, so the FDA is looking for ways to revise labeling on food packages to help you count calories. At this writing, the rules have not been set but are likely to include the percentage of the recommended daily calorie intake a product contains. The agency, recognizing that most people consume a whole snack package and/or soda at once, proposes that the labels list the total calories instead of just a theoretical “serving.” The FDA is also proposing that restaurants provide calories and other health information on their menus. The government agency is recommending increased enforcement to ensure accurate labeling and research on healthier foods and better weight-loss drugs. The U.S. weight-loss market is projected to grow from $61 billion today to $69 billion by 2010. Product—usually high-fiber foods—that give you a feeling of fullness in your stomach are now selling very well.[26]

In the meantime, could a food additive other than sugar or fat be, in large part, responsible for the current increase in obesity? Fructose (see) has been used to sweeten food and soft drinks since the 1970s. The introduction of the high-fructose, corn-based sweetener dovetailed with the beginning of the sharp rise in obesity rates, which has set alarm bells ringing among public health officials. Consumption of high-fructose corn sweeteners increased more than 1,000 percent between 1970 and 1990, far exceeding changes in intake of any other food or food group. The corn fructose additives account for 40 percent of all sweeteners added to food and drink and are the only sweeteners used in the production of U.S. soft drinks. George Bray, a professor at the Louisiana State University System's Pennington Biomedical Research Center, pointed out in 2004 that body weights rose slowly for most of the twentieth century until the late 1980s. Since that time many countries have shown a sudden increase in the rate at which obesity has been galloping forward; Bray and other academic and government scientists believe that high-fructose sweetened foods may be a major cause. Other scientists deny that the sugary corn syrup is to blame.

Thanks to pressure by parents and consumer advocates, since the last edition of A Consumer's Dictionary of Food Additives, food additive producers are paying more attention to obesity in children, which has skyrocketed. In the effort to remove a lot of additives, preservatives, and artificial colors or flavors so kids' products can lose the label of “junk food,” food producers are trying to make more fruit snacks that actually have fruit and juice drinks with less sugar.

BRAIN FOOD

With the baby boomers growing older and afraid of losing their memories and with children in highly competitive schools, magic potions that will nourish and improve the brain are in demand. One of the biggest growth areas in food marketing involves additives that are aimed at improving mental performance. Just over one-third of consumers drink energy beverages to boost their brain function. Coffee, of course, with its caffeine, is the number one psychoactive drink in the United States. Ginseng, guarana, and taurine and chocolate are moving up fast, being added to drinks, candy, and gum.[27]

LOW-CARB

A recent craze, quickly taken up by food producers, is the low-carb diet. Books such as those by the late Robert Atkins, M.D., and more recently, The South Beach Diet by Arthur Agatston, M.D., have promoted meat, eggs, and other fatty foods over carbohydrates (see). Although the phenomenon is fading at this writing and dieters are on other kinds of regimens, the shelves of the supermarkets are increasingly filled with products containing fewer carbohydrates and calories. They achieve the “low carbs” by doing such manipulations as replacing wheat flour with soy flour; adding extra fiber and high-fat ingredients and replacing sugar with sugar alcohols (see). The FDA as of this writing has not set standards for labeling products as “low-carb.”

ENERGY AND OTHER DRINKS

Snapple's Fire claims it well help keep your energy going with gingko biloba, ginseng, and guarana gum (see all), and if you feel stressed, you have only to down a Celestial Seasonings brew that contains valerian, spearmint, lemongrass oil, hawthorn berries, and orange blossoms (see all). A company is offering a drink, Joint Juice, containing glucosamine, a nutritional supplement believed to help rejuvenate joints and treat arthritis. Mott's Clamato Energgia, according to the company, is the first vegetable juice-based energy drink geared toward the Latino market. It contains “energy-releasing herbs” like taurine, ginseng, guarana gum, and B vitamins (see all). If you need to stay awake, you may opt for Jolt Caffeine-Energy Gum. It contains guarana gum and ginseng (see both). Two pieces are claimed to contain the same amount of caffeine as one cup of coffee. It comes in spearmint and ice mint flavors. Dasani, owned by Coca-Cola, promotes a “7-Day Refresh Drink” that will make you “feel great about yourself” and “renew yourself.” Dasani is, according to its promotion, “purified water with a unique blend of minerals.” Provexis, at this writing, is hoping to put a “clot busting” health drink, CardioFlow, on the market. It contains an extract from tomatoes that is said to have a beneficial effect in reducing the tendency for excessive blood clotting, which in some circumstances can lead to heart attacks, strokes, and deep vein thrombosis.

Clinicians should consider screening energy drink use in their patients to ensure a greater understanding of the possible impacts of long-term exposure to the high-dose caffeinated products, new findings have suggested. Amid concerns over increased reports of caffeine poisoning, researchers at the University of Massachusetts Division of Medical Toxicology reviewed how the products' ingredients are absorbed, digested, and

researchers at the University of Massachusetts Division of Medical Toxicology reviewed how the products' ingredients are absorbed, digested, and then expelled from a body. It is hoped that screening could allow greater understanding and more effective regulation over the products in the future, according to the report, published in the journal Clinical Pediatric Emergency Medicine. Of particular concern in the report was the availability of research directly relating to the impact of energy drink consumption. “Clinicians should report all suspected cases of energy drink toxicity to a poison control center,” the researchers claimed. Anheuser-Busch agreed to stop making and selling caffeinated alcoholic drinks as part of a settlement with eleven state attorneys general in June 2008. The states' top lawyers alleged that the St. Louis company had failed to adequately disclose negative health effects of its Tilt and Bud Extra drinks on their labels, made false or misleading marketing claims that they help users stay up late for partying, and illegally targeted minors with its advertising.

“Quite simply, alcohol mixed with high amounts of caffeine is a recipe for disaster, particularly in the hands of young people,” said Maine's attorney general, Steven Rowe, during a conference call. Anheuser said in a statement that it will reformulate Tilt and Bud Extra, removing caffeine and other stimulants.

Caffeine itself is the most common psychoactive drug. Coffee and tea have caffeine contents of 56 to 100 mg per 100 milliliters (ml) to 20 to 73 mg per 100 mil-liliters, respectively. Caffeine is present in cola drinks and chocolate at 9 to 19 mg per 100 ml and 5 to 20 mg per 100 grams, the University of Massachusetts study stated.

According to the research, the use of caffeine within energy drinks is of particular concern as the current FDA rules allow for a maximum caffeine content in carbonated beverages of 18 mg per 100 ml, yet no restrictions are imposed on energy drinks. “Although their caffeine concentration (in milligrams per milliliter) may be similar to coffee, energy drinks are often packaged in significantly higher volumes, resulting in increased caffeine intake,” the report stated.

Taking a prominent leading brand of energy drink as an example, the report found that packaging sizes did not always reflect the true content of caffeine in a product. “SoBe No Fear contains 141 mg of caffeine per 16 oz (473 ml) bottle, the equivalent of 1½ cups of brewed coffee, or 4 cans of regular Coca-Cola,” the researchers noted.

The energy drink market is expected to reach $39.2bn in value by 2010, currently led by the United States where sales were expected to reach $17bn last year alone, according to Global Industry Analysts.

Caffeine, though easily available and commonly used, is not entirely harmless. Caffeine intoxication can lead to symptoms such as nausea or palpitations, although in most cases a single energy drink serving is not sufficient to lead to severe symptoms.

In 2005, the University of Massachusetts study found that the U.S. Association of Poison Control Centers received 46,000 queries related to concerns over caffeine.

Of this number, 2,345 people required some form of treatment at health-care facilities, the report said.

Besides caffeine, there are other additives like guarana, a naturally derived plant-based stimulant, often used in energy drink formulation. It is itself a product relatively high in caffeine, with a presence of as much as 250 mg to just 3–5 grams of the product used. Nonetheless, researchers say the presence of guarana and herbal ingredients like kola nut, tea, and cocoa do not require caffeine labeling, which possibly results in their omission from the total stimulant content in the beverage. In their conclusions, the researchers from the University of Massachusetts said that a number of key areas should be focused on to increase awareness of the long-term effects of energy drink consumption on children and adolescents.[28] These include the mixture of energy drinks with alcohol and the potential impact of energy drink consumption on obesity.[29]

Avoiding Certain Additives

Contrary to public belief, food additives are not a modern innovation. Adding chemicals to food began in the dawn of civilization when humans first discovered that by adding salt to meat, the meat would last longer.

The father of modern food additives laws was Dr. Harvey W. Wiley, who in the early 1900s led the fight against chemical preservatives such as boric acid, formaldehyde, and salicylic acid. He dramatized the problem by his famous “Poison Squad,” composed of young men willing to be guinea pigs, which meant eating measured amounts of these chemicals to determine toxicity. As a result of Dr. Wiley's pioneering work, the first Federal Food and Drug Act was passed in 1906.

The FDA operates the Adverse Reaction Monitoring System (ARMS) to help serve as an ongoing safety check of all additives. The system monitors and investigates complaints by individuals or their physicians that are believed to be related to a specific food, food and color additives, or vitamin and mineral supplements. The ARMS computerized database helps officials decide whether reported adverse reactions represent a real public health risk associated with food so that appropriate action can be taken. You and your loved one are unique, however. An additive that may not bother someone else at your table may be upsetting and in rare cases extremely serious to you and/or yours. The following sections identify some of the major potential problems, especially if you suffer from allergies, food sensitivities, a compromised immune system, diabetes, high blood pressure, heart problems, or a genetic susceptibility to cancer.

AVOIDING SALT

The basic sources of cereals are salt free—wheat, corn, rice, and oats. Yet instant oatmeal may contain about 360 mg per serving, instant corn grits 590 mg, and instant cream of wheat 180 mg. If you're willing to cook the noninstant cereals, you can avoid the high salt. It's providing the “instant” that dishes out the sodium. Some seventy sodium compounds are used in foods, as you will see in this book. The National Academy of Sciences, whose experts establish dietary guidelines, recommends that we ingest no more than 2,400 milligrams of sodium for the entire day. The average American ingests 3,500 to 7,000 milligrams. (A teaspoon of salt has about 2,000 milligrams of sodium.) If the numbers for sodium look very low on a label, look again and be aware of the difference between milligrams (mg) and grams (g). Some companies make you think there is less by saying 2 grams of sodium, for example, which is really 2,000 milligrams.

AVOIDING SUGAR

Sugar, as you may recall, also masquerades under a variety of names, such as sucrose, corn syrup, corn sweetener, dextrose, high fructose corn syrup, honey, invert sugar, brown sugar, raw sugar, maltose syrup, and fruit juice concentrate (see all in the dictionary listings). Sugar can be difficult to avoid. Common names such as sucrose, fructose, and corn syrup may be familiar to you but a food can be labeled “sugar free” or “sugarless” and still contain calories from sugar alcohols such as xylitol, sorbitol, and mannitol. They may help your weight-loss diet indirectly

because they often cause diarrhea. Saccharin is a nonnutritive sweetener—that is, it has no calories. Aspartame has the same calories as sugar, but is so much sweeter that only small amounts are needed to provide the desired sweetness in a product (see both). I hope this book helps you to be a label reader because two tablespoons of ketchup contains one teaspoon of added sugar, for example. Two tablespoons of barbecue sauce has 2.5 teaspoons of added sugar and 6 ounces of fat-free fruit yogurt has 4 teaspoons. Even one cup of tomato soup has 4 teaspoons of sugar. If you drink a 20-ounce cola, you will be imbibing 17 teaspoons of sugar.

We may even be getting more than we bargained for when we get our sweets from fruit juice. A popular brand of diet fruit juice has a beautiful picture of an open pineapple and a cut orange on its label proclaiming it to be “sugar free” and “low sodium.” It is, however, artificially colored with FD and C Yellow No. 5 and No. 6, both recognized allergens; flavored with benzoate of soda, a flavoring agent and also a common allergen; and sweetened with saccharin and aspartame (see all). Now from what tree was that concoction harvested?

AVOIDING ALLERGENS

Seven million Americans are estimated to have food allergies, and even minuscule amounts of allergens can cause severe reactions and may even be lethal. According to the American Academy of Allergy, Asthma, and Immunology, more than thirty thousand people a year are rushed to emergency rooms in the United States because of food allergies.

An allergic reaction to certain food additives may range from an itchy, runny nose or sore throat to indigestion and even death. Any food may cause an allergic reaction, but the most common offenders are milk, fish, shellfish, mollusks, soybeans, chicken, nuts, berries, eggs, peanuts, and some fresh fruits such as peaches and apples.

Food allergens—those parts of foods that cause allergic reactions—are usually proteins. Most of these allergens can still cause reactions even after they are cooked or have undergone digestion in the intestines. Numerous food proteins have been studied to establish allergen content. In some food groups, especially tree nuts and seafood, an allergy to one member of a food family may result in the person being allergic to all the members of the same group. This is known as cross-reactivity. However, some people may be allergic to both peanuts and walnuts, which are from different food families; these allergies are called coincidental allergies, because they are not related. Within animal groups of foods, cross-reactivity is not as common. For example, people allergic to cow's milk can usually eat beef, and patients allergic to eggs can usually eat chicken.

The only specific treatment for food allergy is avoidance, but escaping a food allergen in the form of a hidden additive is not so simple. For example, if you were allergic to corn, you would have to try and avoid corn sugar, dextrose, and corn syrup. You would have to know that they are used in maple, nut, and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. The syrup is also used in bacon, baking mixes, powders, beers, bourbon, breads, cheese, cereals, chop suey, chow mein, confectioners' sugar, cream puffs, fish products, ginger ale, hams, jellies, processed meats, peanut butters, canned peas, plastic food wrappers, sherbets, whiskeys, and American wines. It may also be found in bologna, baking powders, bath powders, corn chips, fritters, frostings, canned or frozen fruit, frying fats, fruit juices, graham crackers, gravies, grits, gum, monosodium glutamate, oleomargarine, pablum, tortillas, vinegar, and yeasts. Sulfites and peanut oil (see both), which may be in foods as additives, are among the most common cause of the life-threatening allergic reaction, anaphylaxis (see).

As pointed out, it is difficult to avoid certain allergenic food additives, but it can help if you read the listings for the additive to which you know you are allergic and note the foods to which it may be added. By reading the dictionary, you will learn about various names for an additive you may want to avoid. For example, milk may not be listed as an ingredient on a label; rather, the label may list casein (a milk protein), sodium caseinate, or milk solids. Not every food that contains wheat identifies it as such; sometimes wheat is listed as gluten. Similarly, egg white is frequently listed as albumin. The FDA is moving toward requiring that the most common food allergens—peanuts, soybeans, milk, eggs, fish, crustacean, tree nuts, and wheat—be listed on the label if a product contains them, a benefit if it comes to fruition.

Food intolerance is sometimes confused with food allergy. Food intolerance refers to an abnormal response to a food or food additive. It differs from an allergy in that it does not involve the immune system. For instance, you may have uncomfortable abdominal symptoms after consuming milk. This reaction is most likely caused by a milk sugar (lactose) intolerance, in which you may lack the enzymes to break down milk sugar for proper digestion. Other food intolerance reactions may be triggered by druglike chemicals in some foods. Symptoms can include nervousness after consuming caffeine in coffee or soft drinks, headaches triggered by chemicals in cheese and chocolate, or various adverse reactions to chemicals and preservatives added to food, called food additives. The most common food additives that may cause sensitivity reactions include aspartame, benzoates, BHA and BHT, FD&C dyes Yellow No. 5 and Red No. 3, monosodium glutamate (MSG), nitrates/nitrites, parabens, and sulfites (see all). Your allergist/immunologist can help you determine the difference between intolerance and allergy and help you in establishing a management plan.

The Food Allergen Labeling and Consumer Protection Act (FALCPA) of 2004 requires the label of a food that is or contains an ingredient that bears or contains a “major food allergen” declares the presence. FALCPA defines a “major food allergen” as one of eight foods or food groups (i.e., milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans) or a food ingredient that contains protein derived from one of those foods. Issues associated with labeling food are the responsibility of the Office of Nutritional Products, Labeling, and Dietary Supplements (ONPLDS) in the Center for Food Safety and Applied Nutrition, which was aimed at stopping manufacturers from adding small amounts of allergens as incidental ingredients without mentioning them on packaging, listing them instead as “natural flavors.” This is a good act on the part of regulators.

AVOIDING HYPERACTIVITY

In the 1970s, some scientists suggested that food additives or colors may be linked to childhood hyperactivity. Since that time well-controlled studies have been conducted and have produced no evidence that food additives or colors cause hyperactivity or learning disabilities in children. In 1982, the Consensus Development Panel of the National Institutes of Health (NIH) concluded that there was no scientific evidence to support the claim that additives or colorings cause hyperactivity. Subsequent scientific studies continue to support the NIH panel's conclusion. Try to convince parents of hyperactive children who eat sugar or colored foods and become wild. The Feingold Organization has a great deal of information on that (see page 49). The British Food Standards Agency evidently disagrees with the NIH panel's conclusion and states: “Certain combinations of the following artificial food colours: sunset yellow (E110), quinoline yellow (E104), carmoisine (E122), allura red (E129), tartrazine (E102) and ponceau 4R (E124) have been linked to a negative effect on children's behaviour. These colours are used in soft drinks, sweets and ice cream.” And it cautions parents: “If your child shows signs of hyperactivity or Attention Deficit Hyperactivity Disorder (ADHD), you should try to avoid these additives because this might help improve their behaviour.”[30]

When you look at the shelves in a supermarket today, it's hard to determine whether you are buying a cereal or a drink or a medicine with a breakfast food or fruit juice added. In fact, there is a whole category unofficially called nutraceuticals.

The European Commission has culled its gargantuan nutrition and health claims list from more than forty thousand to fifteen hundred as the health claims process moves closer to fruition in January 2010. The list has been reduced so dramatically because many initial submissions duplicated each other. Others were deemed inappropriate for want of supporting data or were making claims about foods or food supplements that were not legally available in the EU. The nutrition and health claims regulation was enacted in 2006 and seeks to harmonize claims across the bloc by creating central lists of approved claims that can be employed in all of the EU's twenty-seven member states. The fifteen hundred claims have been returned to member states for final comment, and they were then passed to the European Food Safety Authority (EFSA) for assessment, expected to have occurred by the end of July 2007. Once it received the claims, EFSA's team of scientists were to begin the task of validating them, although it has given no time frame for this work other than the January 31, 2010, deadline.

Industry has expressed its concern about EFSA's ability to meet this deadline, although the Parma, Italy-based agency recently launched a campaign to boost its scientific resources.

What about the health claims for everyday foods like cereals and vegetables? This is an area that has really burgeoned since the last edition of this book, and the FDA is still struggling with it.

Because people may be allergic to certain additives and to help them better avoid them, the ingredient list must include, when appropriate:

- FDA-certified color additives, such as FD&C Blue No. 1, by name
- Sources of protein hydrolysates (see), which are used in many foods as flavors and flavor enhancers
- Declaration of caseinate (see) as a milk derivative in the ingredient list of foods that claim to be non-dairy, such as coffee whiteners
- Beverages that claim to contain juice must declare the total percentage of juice on the information panel. In addition, FDA's regulation establishes criteria for naming juice beverages. For example, when the label of a multi-juice beverage states one or more—but not all—of the juices present, and the predominantly named juice is present in minor amounts, the product's name must state that the beverage is flavored with that juice or declare the amount of the juice in a 5 percent range—for example, “raspberry-flavored juice blend” or “juice blend, 2 to 7 percent raspberry juice.”

The allowed nutrient-disease relationship claims and rules for their use are:

- Calcium and osteoporosis: To carry this claim, a food must contain 20 percent or more of the daily value for calcium (200 mg) per serving, have a calcium content that equals or exceeds the food's content of phosphorus, and contain a form of calcium that can be readily absorbed and used by the body. The claim must name the target group most in need of adequate calcium intakes (that is, teens and young adult white and Asian women) and state the need for exercise and a healthy diet. A product that contains 40 percent or more of the daily value for calcium must state on the label that a total dietary intake greater than 200 percent of the daily value for calcium (that is, 2,000 mg or more) has no further known benefit.
- Fat and cancer: To carry this claim, a food must meet the nutrient content claim requirements for “low-fat” or, if fish and game meats, for “extra lean.”
- Saturated fat and cholesterol and coronary heart disease (CHD): This claim may be used if the food meets the definitions for the nutrient content claim “low saturated fat,” “low-cholesterol,” and “low-fat,” or, if fish and game meats, for “extra lean.” It may mention the link between reduced risk of CHD and lower saturated fat and cholesterol intakes to lower blood cholesterol levels.
- Fiber-containing grain products, fruits, and vegetables and cancer: To carry this claim, a food must be or must contain a grain product, fruit, or vegetable and meet the nutrient content claim requirements for “low-fat,” and without fortification, be a “good source” of dietary fiber.
- Fruits, vegetables, and grain products that contain fiber and risk of CHD: To carry this claim, a food must be or must contain fruits, vegetables, and grain products. It also must meet the nutrient content claim requirements for “low saturated fat,” “low-cholesterol,” and “low-fat” and contain, without fortification, at least 0.6 grams soluble fiber per serving.
- Sodium and hypertension (high blood pressure): To carry this claim, a food must meet the nutrient content claim requirements for “low-sodium.”
- Fruits and vegetables and cancer: This claim may be made for fruits and vegetables that meet the nutrient content claim requirements for “low-fat” and that, without fortification, for “good source” of at least one of the following: dietary fiber or vitamins A or C. This claim relates diets low in fat and rich in fruits and vegetables (and thus vitamins A and C and dietary fiber) to reduced cancer risk. The FDA authorized this claim in place of an antioxidant vitamin and cancer claim.
- Folic acid and neural tube defects: This claim is allowed on dietary supplements that contain sufficient folate and on conventional foods that are naturally good sources of folate, as long as they do not provide more than 100 percent of the daily value for vitamin A as retinol or preformed vitamin A or vitamin D. A sample claim is “healthful diets with adequate folate may reduce a woman's risk of having a child with a brain or spinal cord defect.”
- Dietary sugar alcohols and dental caries (cavities): This claim applies to food products, such as candy or gum, containing the sugar alcohols xylitol, sorbitol, mannitol, maltitol, isomalt, lactitol, hydrogenated starch hydrolysates, hydrogenated glucose syrups, or a combination of any of these. If the food also contains a fermentable carbohydrate, such as sugar, the food cannot lower the pH of plaque in the mouth below 5.7. Besides the food ingredient's relationship to dental caries, the claim also must state that frequent between-meal consumption of foods high in sugars and starches promotes tooth decay. A shortened claim is allowed on food packages with less than 15 square inches of labeling surface area.
- Soluble fiber from certain foods, such as whole oats and psyllium seed husk, and heart disease: This claim must state that the fiber also needs to be part of a diet low in saturated fat and cholesterol, and the food must provide sufficient soluble fiber. The amount of soluble fiber in a serving of the food must be listed on the nutrition facts panel.

While the FDA is struggling to identify false health claims, so are the members of the European Union. Researchers in Britain, however, have figuratively thrown in the towel. They proved that consumers are prone to be misled by some health claims and thus proposed that only foods meeting a certain nutritional profile—those low in salt, sugars, or fat—would be allowed to make a health claim.

The aim of this dictionary is to help you cut through the burgeoning health claim hype presented to you in the media and in the store. If you see

a “health” notice on a package, if it doesn't mention a specific disease such as heart or cancer but says “may help heart health” or “may help keep you regular” and “a good source” or “made with,” it may not tell you that the product may also contains ingredients you would not choose.

Preservatives

These “antispoilants” are used to help prevent microbiological spoilage and chemical deterioration. They are of many different types, of which about one hundred are in common use. Preservatives for fatty products are called antioxidants, which prevent the production of off-flavors and off-odors. Some common antioxidants include benzoic acid used in margarine and butylated hydroxyanisole (BHA) used in lard, shortenings, crackers, soup bases, and potato chips. Others include bacte-riophage control agent, chemosterilant/wine maturing additive, disinfection additive, antibrowning additive, fungistatic additive, and antimold and antirope additives.

In bread, preservatives are usually “mold” inhibitors. They include sodium and calcium propionate, sodium diacetate, and acetic substances such as acetic acid and lactic acid. Sorbic acid and sodium and potassium salts are preservatives used in cheeses, syrups, and pie fillings.

Preservatives used to prevent mold and fungus growth on citrus fruits are called “fungicides.” Sequestering agents, still another type of preservative, prevent physical or chemical changes that affect color, flavor, texture, or appearance. Ethylenediaminetetraacetic acid (EDTA) and its salts, for instance, are used to prevent the adverse effects of the presence of metals in such products as soft drinks where metal ions can cause clouding. Sequestrants used in dairy products to keep them “fresh and sweet” include sodium, calcium, and potassium salts of citric, tartaric, and pyrophosphoric acids. Other common multipurpose preservatives are the gas sulfur dioxide, propyl gallate, and, of course, sugar, salt, and vinegar.

Food processors have explored some novel food preservation systems. Consumers evidently prefer a preservative from a “natural source,” which enables the processors to use the word natural on the label. Bacteriocins are not new; however, like nisin—derived from the starter bacteria for yogurt—they are now being employed to extend shelf life in a variety of food products. The use of bacteriocins is likely to be expanded in the future, especially in dairy and refrigerated foods.

There are also nonchemical preservatives using bright light, plused electric current to heat the food and kill bacteria and inhibiting microbial growth by excluding oxygen or by inhibitory concentration of carbon dioxide. If you are heating your food in microwavable bags, you are making use of this technology. Probably the most controversial of the nonchemical preservatives is irradiation of food.

When food is irradiated, it is loaded onto a conveyor belt and passed through a radiation cell where it is showered with beams of ionizing radiation produced by high radioactive isotopes. The radiation can inhibit ripening and kill certain bacteria and molds that induce spoilage, so that food looks and tastes fresh for up to several weeks. The process does not make food radioactive and does not change the food's color or texture in most cases. Radioactive cesium is used to sterilize foods. Does it destroy nutrients? Does it create radiolytic products in food after exposure that may cause genetic damage? Is irradiation less dangerous than some of the other chemicals added to foods as preservatives? These questions are being hotly debated. The FDA requires foods that have been irradiated to reveal that on the label and to display an international logo, a flower in a circle so you will be able to decide for yourself. (See cesium and radiation in the dictionary.)

Ready-to-go Cooked or Fresh Refrigerated Products

This is the fastest-growing product category because of busy households and the high cost of going out to dinner. These meals may have chemical preservatives but are designed to offer the convenience of frozen and canned foods while providing homemade taste and appearance. Typically, they are cooked just enough to ward off spoilage for a short period of time. As a further aid to freshness, they are often sealed in packaging that contains little or no oxygen, which can extend shelf life for several weeks. Scientists, however, are concerned that some dangerous bacteria may not be killed during the minimal precooking and those microorganisms that cause botulism can flourish in an oxygen-free environment. One publicized outbreak of botulism associated with this category could devastate it.[31]

The ready-meals market across Europe and the United States has grown steadily in recent years. In 2006, the combined European-U.S. market was worth $36.4 billion. By 2010, it is expected to reach $47.7 billion. More than half of the food industry thinks that “better-for-you” variants will be the most important feature for the success of a ready-meal product over the next five years.

Nearly 10 percent of all households are headed by single parents, and more and more people live alone. Your supermarket and other food sellers have developed many ready meals in the chilled category. Thus, in order to compete with private label, the big industry plays are gearing up to sell frozen and canned ready meals through advertising and other means. Frozen ready meals already compose a large share of the ready-meals market, accounting for about 50 percent of ready meals in both Europe and the United States in 2006.[32]

More Conventional Methods of Adding Additives Directly to Food for Various Purposes

In this seventh edition of A Consumer's Dictionary of Food Additives, I have inserted the various processing agents, moisture controls, and other processing substances added to your food within the listings. The many coloring additives, nutrition substances, and flavorings are there in alphabetical order.

More Information Is Needed on Food Additives

Although officially the FDA claims to know what additives are being used in food, FDA researchers report that it is impossible to check small manufacturers. Efforts have been made through the years to have food manufacturers register and provide the information. Ironically, thanks to the new bioterrorism threat, the FDA is asking food processors to register (see page 7).

There is still much to learn about additives. My aim is to help you uncover many of the answers to the questions you had about what you have been eating before you looked between the covers of this book.

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[3]The Preservation of Antibiotics for Medical Treatment Act of 2007 (S. 549/H.R. 962).

[4]Linda Bren, “Antibiotic Resistance from Down on the Chicken Farm,” FDA Consumer, January-February 2001, pp. 10–11.

[5]John R. Seffrin, PhD., CEO of the American Cancer Society and American Association for Health Educators School, “Personal Behaviors Are What Really Matters When It Comes to Avoiding Cancer,” presented to the American Association for Health Educators, St. Louis, March 22, 1997.

[6]Robert J. Scheuplein, “Perspectives on Toxicological Risk—An Example: Food-borne Carcinogenic Risk,” Critical Reviews in Food Science and Nutrition 32, no. 2 (1992): 105–121.

[7]James Truner, “Delaney Lives! Reports of Delaney's Death Are Greatly Exaggerated,” Posted 18 July 2006, Environmental Law Reporter, ELW 10003.

[8]Dr. Adrian Gross before Congress, The Congressional Record (SID835:August 1, 1985) http://www.dorway.comwww.dorway.com.

[9]Bernard Weiss, University of Rochester School of Medicine, Nutrition Update 1 (1983): 21–38.

[10]Charles Vorhees and R. E. Butcher, Developmental Toxicology, ed. K.Snell (London: Croom Helm, 1982), 247–98.

[11] Thomas J. Sobotka, “Revisions to the FDA's Redbook Guidelines for Toxicity Testing: Neurotoxicity,” Critical Reviews in Food Science and Nutrition 32, no. 2 (1992): 165–171.

[12] Summary and assessment of data received from the FAO/WHO Collaborating Centres for Food Contamination Monitoring, Global Environmental Monitoring System 1982 (unpublished UNEP/FAO/WHO document).

[13]GOA Report, Federal Oversight of Food Safety: FDA's Food Protection Plan Proposes Positive First Steps, But Capacity to Carry Them Out Is Critical” (29-JAN-08, GAO-08-435T). Gardiner Harris, “For F.D.A.; A Major Backlog Overseas,” New York Times, January 29, 2008, www.nytimes.com.

[14]Report Number: GAO-08-435T, Account Number: A80249. “Federal Oversight of Food Safety: FDA's Food Protection Plan Proposes Positive First Steps, But Capacity to Carry Them Out Is Critical, 01/29/2008.

[15]Rung International, manufacturer and exporter of a wide range of food colors, reactive dyes, and pthalogen dyes based in Mumbai, Maharashtra.

[16]The Toxicology Forum, Summer Meeting 1999, Charles Manley, Overview of the Commercial Production and Chemistry of Process Flavors, Takasago International. Aspen, CO, July 12–16, 1999.

[17]http://www.faia.org.uk/flavour.php, Food Additives and Ingredients Association of the UK.

[18]NOTICE OF PUBLIC HEARING: Food additives and behavioral disorders. Purpose: To examine the potential relationship between food additives and hyperactivity in children. New York City, Tuesday, October 30, 2007.

[19]Food Additives to 2008, Demand and Sales Forecasts, Market Share, Market Size, Market Leaders Study #1846 Published: 09/2004, The Freedonia Group. www.freedoniagroup.com.

[20]“The Top 10 Functional Food Trends in America,” Food Technology 62, no. 4 (April 2008): 25–44.

[21]“New USDA Grass-fed Rules Will Benefit Consumers and the Environment,” October 16, 2007, Union of Concerned Scientists website, http://www.ucsusa.org/news/press_release/rules.html.

[22]Jim Griffiths, “FCC Expert Viewpoint Why Are ‘Standards’ So Important: Do They Really Relate to Safety?” FCC eNewsletter, April 15, 2008, mailto://fccmarketing@usp.org.

[23]FDA's Guiding Principles for Nutrition Labeling and Fortification (2004). www.fda.gov.

[24]Keith Schneider, “FDA Warns the Dairy Industry Not to Label Milk Hormone-Free,” New York Times, February 8, 1994, p. 1.

[25]Roger Field, “Calorie counts on food labels can be misleading,” Medical Tribune, October 21, 1993, p. 3.

[26]“The Top 10 Functional Food Trends in America,” Food Technology 62, no. 4 (April 2008).

[27]Ibid.

[28]Kavita M. Babu, Richard James Church, and William Lewander, “Energy Drinks: The New Eye-Opener for Adolescents,” Clinical Pediatric Emergency Medicine 9, no. 1 (2008): 39–42.

[29]Ilan Brat and Suzanne Vranica, “Anheuser to stop selling alcoholic energy drinks,” The Wall Street Journal, June 27, 2008, Page B3.

[30]Food Standards Agency's advice to parents on food colours and hyperactivity. www.food.gov.uk/safereating/chemsafe/additivesbranch/colours.

[31]Business Intelligence for the Consumer Goods Industry, Clarkson Consulting, San Diego, CA 2008.

[32]Ibid.

HOW TO USE THIS BOOK

I have tried to make finding what you would like to know in this book as easy as possible. I have defined general terms, such as poly-, a prefix meaning “many,” and ose, a suffix meaning “sugar.” I have repeated where I could all the many alphabetized names of organizations such as EU for the European Union and JECFA, the Joint Expert Committee on Food Additives. Although unique in content, this dictionary follows the format of most standard dictionaries. The following are sample entries with any explanatory notes that may be necessary:

MARJORAM, POT • Sweet Marjoram. The natural extract of the flowers and leaves of two varieties of the fragrant marjoram plant. The oleoresin (see) is used in sausage and spice flavorings for condiments and meats (3,500 ppm). The seed is used in sausage and spice flavorings for meats and condiments. Sweet marjoram is used in sausage and spice flavorings for beverages, baked goods, condiments, meats, and soups. The sweet oil is used in vermouth, wine, and spice flavorings for beverages, ice creams, ices, candy, baked goods, and condiments. Can irritate the skin. The redness, itching, and warmth experienced when applied to the skin are carried by local dilation of the blood vessels or by local reflex. May produce allergic reactions. Essential oils such as marjoram are believed to penetrate the skin easily and produce systemic effects. GRAS.

This entry says that pot marjoram is a natural flavoring extract, that there are two kinds of marjoram—pot and sweet. Both are utilized as an oleoresin, a seed, and as sweet oil. By looking up “oleoresin” we learn that it means a natural plant product consisting of essential oil and resin extracted from a substance, such as ginger, by means of alcohol, ether, or acetone and that oleoresins are usually more uniform and more potent than the original product. The “ppm” figures stand for “parts per million,” that is, 3,500 parts of marjoram is added to a million parts of meat. However, because ppm amounts (they do not appear on labels) represent maximum rather than actual usage, they are not reliable estimates of consumption and are included here only to show how amounts can be relatively large or small. GRAS means, of course, that the item is on the government's generally recognized as safe list although it may not have undergone laboratory testing. “GRAS in packaging” means that even though substances from the containers may migrate into the food, they are assumed not to be harmful.

WORMWOOD • Absinthium. A European woody herb with a bitter taste, used in bitters and liquor flavoring for beverages and liquors. The extract is used in bitters, liquor, and vermouth flavorings for beverages, ice cream, candy, and liquors, and in making absinthe. The oil is a dark green to brown and a narcotic substance. Used in bitters, apple, vermouth, and wine flavorings for beverages, ice cream, ices, candy, baked goods, and liquors. In large doses or frequently repeated doses, it is a narcotic poison, causing headache, trembling, and convulsions. Ingestion of the volatile oil or of the liquor, absinthe, may cause gastrointestinal symptoms, nervousness, stupor, coma, and death.

“Absinthium” is another name for wormwood (which is cross-referenced in the dictionary). Source material for the comments on toxicity is indicated on pages 49 and 595. A similar example is the entry for lye.

SODIUM SESQUICARBONATE • Lye. White crystals, flakes, or powder produced from sodium carbonate. Soluble in water. Used as a neutralizer for butter, cream, fluid milk, ice cream, in the processing of olives before canning, cacao products, and canned peas. Used as an alkalizer in bath salts, shampoos, tooth powders, and soaps. Irritating to the skin and mucous membranes. May cause allergic reaction in the hypersensitive. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices.

Terminology generally has been kept to a middle road between technician and interested consumer, while at the same time avoiding oversimplification of data. If in doubt, look up any term. Isolate (used in its chemical context), extract, or anhydride, for example, are in the entries to describe chemicals but also have their own entries to help you clarify. Many abbreviations have been used to save space but their definitions are listed in the dictionary and the major ones are right up there at the beginning of the text. With A Consumer's Dictionary of Food Additives you will be able to work with the current labels to determine the purpose and the desirability or toxicity of the additives listed. You will be able to assert your right to wholesome food along with a wholesome environment. By having options in the marketplace, by rejecting those products that are needlessly costly or unsafe or unpalatable in favor of “clean” food, you strike back at greed and ignorance as practiced by too many in the food industry. And you reward those manufacturers who deserve your purchases.

There is little doubt that what we eat affects our health. Our bodies are wonderful machines that can detoxify and render harmless many poisons we ingest, and we don't want to overburden our bodies by taking unnecessary chances. Certainly, not all food additives are harmful. Some, in fact, are greatly beneficial. It is all a matter of judgment. I hope this book will allow you to make wiser choices.

If You Need More Information or Want to Report a Problem

A number of agencies offer information about food additives and benefits and difficulties they may cause.

If you have a problem that you think or know may be due to a food additive, the FDA, in particular, wants to know about it because that is how they discover something may be wrong. The widespread distribution of food additives and consequent public safety concerns necessitate timely and reliable evaluation of suspected adverse reactions. Currently, consumer complaints related to food additives, as well as other food products, are monitored by passive surveillance, carried out primarily by the FDA. Therefore, it is very important that if you have had an adverse reaction to a food product, you report it. To report an incident or to ask a question about a processed food ingredient, contact:

Consumer Inquiries: 888-INFO-FDA
The Office of Consumer Affairs, Food and Drug Administration, HFE-88
5600 Fishers Lane
Rockville, MD 20857

The FDA Food and Seafood Information Line is at 1-800-FDA-4010 (1-800-332-4010). Reports relating to dietary supplements appear on the Web but are updated only four times a year. This creates substantial delay between the time FDA learns of an adverse reaction and others learn about it. Ideally, they should appear on the Net as soon as the FDA learns about it. The FDA website is http://www.FDA.gov.

REPORTING ADVERSE EVENTS

You can play an important public health role by reporting to the Food and Drug Administration any adverse events or other problems with FDA-regulated products. Timely reporting allows the agency to take prompt action. Report what happened as soon as possible. Have the following information ready:

- Description of the adverse event
- Name, address, and phone number of the doctor or hospital if emergency treatment was provided
- Name of product and manufacturer
- Any codes or identifying marks on the product label or container
- Name and address of the store where you purchased the product and the date of purchase

To report an emergency that requires immediate action, such as a case of food-borne illness, call the FDA's main emergency number, staffed 24 hours a day: 301-443-1240.

To report a nonemergency adverse event, contact the FDA district office nearest you. Look up the FDA's phone number under the Department of Health and Human Services in the blue U.S. government section of the telephone directory. Or check the phone numbers listed by state at www.fda.gov/opacom/backgrounders/complain.html.

If the problem involves meat or poultry, which are regulated by the U.S. Department of Agriculture, call the USDA hotline at 1-800-535-4555. Operates toll free weekdays 10-4 EST.

The USDA Center for Nutrition Policy and Promotion (CNPP) was created on December 1, 1994, and is the focal point within USDA where scientific research is linked with the nutritional needs of the public. http://www.fns.usda.gov/fncs

USDA Organic Standards, National Organic Program
1-202-720-3252
USDA-AMS-TM-NOP, Room 4008 S. Bldg., Ag Stop 0268
1400 Independence, SW, Washington, DC 20250
http://www.ams.usda.gov/nop

Integrated Risk Information System (IRIS), prepared and maintained by the U.S. Environmental Protection Agency (U.S. EPA)

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of chronic toxicity data by U.S. EPA health scientists from several program offices and the Office of Research and Development. For technical questions about the scientific information content in IRIS contact:

U.S. EPA Risk Information Hotline 1-301-345-2870
Fax: 1-301-345-2876
E-mail: mailto://Hotline.IRIS@epamail.epa.gov
http://www.epa.gov/iris/intro.htm

By regular mail:

IRIS
c/o ASRC
6301 Ivy Lane, Suite 300
Greenbelt, MD 20770

National Toxicology Program

The National Toxicology Program (NTP) within the U.S. Department of Health and Human Services is an interagency program headquartered at the National Institutes of Health's National Institute of Environmental Health Sciences (NIEHS) located in Research Triangle Park, NC. Please send queries, comments, and suggestions to mailto://ntpwm@niehs.nih.gov.

If you want agencies such as the FDA and USDA well funded so they can more adequately protect our food supply, contact your senators and representatives. The phone number for the House and Senate office buildings is 1-202-224-3121. If you want any federal agency, including the White House, the Federal Information Center (FIC) phone number is 1-800-688-9889.

It can be frustrating trying to report something to agencies, especially if they have an automated-menu system. Eventually, with persistence, you will be able to not only make yourself feel better, but you will be protecting the rest of us from a similar adverse experience.

More Consumer Information

If you have food allergies or think you might, you may contact:
American Academy of Allergy, Asthma and Immunology (AAAAI)
611 East Wells Street
Milwaukee, WI 53202
AAAAI Physician Referral and Information Line
1-800-822-2762

AAAAI Website: www.aaaai.org
Allergy and Asthma Network: Mothers of Asthmatics
2751 Prosperity Ave., Suite 150
Fairfax, VA 22031
1-800-878-4403
1-703-641-9595
http://www.aanma.org

Food Allergy and Anaphylaxis Network (FAAN)
10400 Eaton Place, Suite 107
Fairfax, VA 22030
1-703-691-3179 or 1-800-929-4040
http://www.foodallergy.org

Asthma and Allergy Foundation of America
1125 15th St. NW, Suite 502
Washington, DC 20036
1-800-7-ASTHMA
1-202-466-7643
http://www.aafa.org

American Dietetic Association
(answers questions about nutrition)
216 W. Jackson Blvd.
Chicago, IL 60606-6995
1-312-899-0040 or 1-800-877-1600
http://www.EatRight.org

CSPI Center for Science in the Public Interest
(publishes Nutrition Action Healthletter; often petitions the FDA about actual and potential problems with food additives)
1875 Connecticut Ave., NW Suite 300
Washington, DC 20009-5728
http://www.cspinet.org/

Environmental Defense Fund
A national nonprofit organization representing more than five hundred thousand members. Since 1967 it has linked science, economics, and law to create innovative, equitable, and cost-effective solutions to society's most urgent environmental problems. Guided by science, the Environmental Defense Fund evaluates environmental problems and works to create and advocate solutions that have lasting political, economic, and social support because the organization is nonpartisan, cost-efficient, and fair.

257 Park Avenue South
New York, NY 10010
General Information 1-800-684-3322
http://www.edf.org/home.cfm

The Environmental Working Group's (EWG) mission is to use the power of public information to protect public health and the environment. EWG is a nonprofit organization founded in 1993 by Ken Cook and Richard Wiles. In 2002, they founded the EWG Action Fund, which advocates on Capitol Hill for health-protective and subsidy-shifting policies. EWG specializes in providing resources such as Skin Deep and the Shoppers' Guide to Pesticides in Produce to consumers while simultaneously pushing for national policy change.

EWG Headquarters

1436 U St. N.W., Suite 100
Washington, DC 20009
1-202-667-6982

EWG California Office
1904 Franklin St., Suite 703
Oakland, CA 94612
1-510-444-0973
www.ewg.org

Pure Food Campaign
860 Highway 61
Little Marais, Minnesota 55614
Activist or Media Inquiries: 1-218-226-4164 or 1-202-775-1132
Requests for Consumer Information: 1-800-253-0681
Fax: 1-218-226-4157; E-mail: mailto://alliance@mr.net

The Feingold Program
The Dietary Connection to Better Behavior, Learning and Health
127 E. Main Street #106
Riverhead, NY 11901
Contact: 1-800-321-3287 (U.S. only)
1-631-369-9340
Fax: 1-631-369-2988
E-mail: mailto://Help@feingold.org

Toxic Effects of Chemical Substances (RTECS): http://eee.cdc.gov/niosh/rtecs Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles and ToxFAQs: http://www.atsdr.cdc.gov/toxprofiles or http://www/atsdr/cdc/gpv/tpcfaw/html
FoodNet—Foodborne Diseases Active Surveillance Network
Centers for Disease Control and Prevention
1600 Clifton Road
Atlanta, GA 30333
Tel: 1-404-639-3311 / Public Inquiries:1-404-639-3534 / 1-800-311-3435
http://www.cdc.gov/foodnet/index.htm

The Foodborne Diseases Active Surveillance Network (FoodNet) is the principal food-borne disease component of the U.S. Centers for Disease Control's Emerging Infections Program (EIP). FoodNet is a collaborative project of the CDC, ten EIP sites, the U.S. Department of Agriculture (USDA), and the Food and Drug Administration (FDA). The project consists of active surveillance for food-borne diseases and related epidemiologic studies designed to help public health officials better understand the epidemiology of food-borne diseases in the United States, but you can find the current food disease problems in your area and definitions of the various ailments.

Canadian Food Inspection Agency
Headquarters
59 Camelot Drive
Ottawa, Ontario
K1A 0Y9
Tel: 1-613-225-2342
Fax: 1-613-228-6601
1-800-442-2342
http://www.inspection.gc.ca/english/directory/maindire.shtml

EUROPEAN UNION

http://www.eurunion.org/legislat/Foodstuffs/FoodAdditivs.htm
European Union
Delegation of the European Commission to the United States
2300 M Street, NW
Washington, DC 20037

Tel: 1-202-862-9500
Fax: 1-202-429-1766

The Institute of Food Technologists (IFT) was founded in 1939. It is a nonprofit scientific society with twenty-two thousand members working in food science, technology, and related professions in industry, academia, and government.

Institute of Food Technologists
525 W. Van Buren, Ste. 1000
Chicago, IL 60607
Tel: 1-312-782-8424
Fax: 1-312-782-8348
Email: mailto://info@ift.org http://www.ift.org

The Union of Concerned Scientists is a science-based nonprofit that combines independent scientific research and citizen action to develop innovative, practical solutions and to secure responsible changes in government policy, corporate practices, and consumer choices. What began as a collaboration between students and faculty members at the Massachusetts Institute of Technology in 1969 is now an alliance of more than two hundred thousand citizens and scientists. UCS members are people from all walks of life: parents and businesspeople, biologists and physicists, teachers and students. Their achievements over the decades show that thoughtful action based on the best available science can help safeguard our future and the future of our planet.
http://www.ucsusa.org/ucs

Union of Concerned Scientists
National Headquarters
2 Brattle Square
Cambridge, MA 02238-9105
Tel: 1-617-547-5552
Fax: 1-617-864-9405

WORLD HEALTH ORGANIZATION INFORMATION SOURCES

Global Environment Monitoring System—Food Contamination Monitoring and Assessment Programme (GEMS/Food).

Food additives and contaminants resulting from food manufacturing and processing can also adversely affect health. Since 1976 WHO has implemented the GEMS/Food program, which has informed governments, the Codex Alimentarius Commission, and other relevant institutions, as well as the public, on levels and trends of contaminants in food, their contribution to total human exposure, and significance with regard to public health and trade.

Mail address:
WHO European Centre for Environment and Health, Rome Division
via Francesco Crispi, 10-00187
Rome, Italy
Tel: 0039 06 487751
Fax: 0039 06 4877599
www.who.int/fsf/gems.htm

FAO/WHO food additive evaluations can be searched at:
http://www.who.int/health_topics/food_additives/en/
http://www.who.int/foodsafety/chem/en/
E-mail: mailto://foodsafety@who.int
Joint FAO/WHO Expert Committee on Food Additives (JECFA)
http://www.who.int/pcs/jecfa/jecfa.htm

HOW TO USE THIS BOOK

Government Abbreviations Frequently Used in This Book

ASP	FDA's full up-to-date toxicology information has been sought.
EAF	There is reported use of the substance, but FDA has not yet been assigned it for a toxicology literature search.
NIL	Although listed as added to food, the FDA has no current reported use of the substance and, therefore, although toxicology information may be available in PAFA, it is not being updated.
NUL	FDA has no reported use of the substance and there is no toxicology information available in PAFA.

BAN	The substance was formerly approved as a food additive but is now banned; there may be some toxicology data available.
PAFA	Priority-Based Assessment of Food Additives.
FDA	Food and Drug Administration.
GRAS	Generally Recognized As Safe.
USDA	United States Department of Agriculture.
E	Approved or allowed by the European Union.
FAO/WHO	An international group of experts from the World Health Organization and the Food and Agriculture Organization of the United Nations.
JECFA	Joint Expert Committee on Food Additives under FAO/WHO.
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act, commonly known as Superfund, enacted by Congress in 1980.

ABEYANCE • Term for petitions that were filed but found after detailed review to be deficient. When all the information required to address the deficiency or deficiencies is provided, a petition can be refiled with the FDA and then reconsidered.

ABIES ALBA MILL • See Pine Needle Oil.

ABIETIC ACID • Sylvic Acid. Chiefly a texturizer in the making of soaps. A widely available natural acid, water insoluble, prepared from pine rosin, usually yellow and composed of either glassy or crystalline particles. Employed to carry nutrients that are added to enriched rice in amounts up to .0026 percent of the weight of the nutrient mixture. Used also in the manufacture of vinyls, lacquers, and plastics. Little is known about abietic acid toxicity; it is harmless when injected into mice but causes paralysis in frogs and is slightly irritating to human skin and mucous membranes. May cause allergic reactions.

ABSINTHIUM • Extract or oil. See Wormwood.

ABSOLUTE • Refers to a plant-extracted material that has been concentrated but remains essentially unchanged in its original taste and odor. Often called “natural perfume materials” because they are not subjected to heat and water as are distilled products. See Distilled.

AC • The abbreviation for anticaking agent.

ACACIA • Acacia vera. Acacia senegal. Gum Arabic. Egyptian Thorn. Catechu. Dried exudate from the trunk of the acacia tree grown in Africa, the Near East, India, and the southern United States. Its most distinguishing quality among the natural gums is its ability to dissolve rapidly in water. The use of acacia dates back more than four thousand years to when the Egyptians employed it in paints. Its principal use in the confectionery industry today is to retard sugar crystallization and as a thickener for candies, jellies, glazes, and chewing gum. As a stabilizer, it prevents chemical breakdown in food mixtures. In 1976, the FDA placed acacia in the GRAS category as an emulsifier, flavoring additive, processing aid, and stabilizer in beverages at 2.0 percent, chewing gum at 5.6 percent; as a formulation aid, stabilizer, and humectant in confections and frostings at 12.4 percent; as a humectant stabilizer and formulation aid in hard candy at 46.5 percent; in soft candy at 85 percent; in nut formulations at 1.0 percent; and in all other food categories at 8.3 percent of the acceptable daily intake (ADI) (see) of the product. Medically, it is used as a demulcent to soothe irritations, particularly of the mucous membranes. It slightly reduces cholesterol in the blood. It can cause allergic reactions such as skin rash and asthmatic attacks. Oral toxicity is low. See also Vegetable Gums and Catechu Extract. GRAS. ASP. E

ACARICIDE • A pesticide to get rid of mites and ticks.

ACCEPTABLE DAILY INTAKE • ADI. An estimate of the amount of a food additive, expressed on a body-weight basis, that can be ingested daily over a lifetime without appreciable health risk. The ADI is listed in units of milligrams per kilogram of body weight (mg per kg bw).

ACE K • See Acesulfame K.

ACENAPHTHENE • 1,2-Dihydroacenaphthylene. 1,8-Ethylenenaphthalene. Derived from coal tar, it is used as a dye intermediate in pharmaceuticals, insecticides, fungicides, and plastics. No absorption data are available for acenaphthene; however, since its structure is related to polycyclic aromatic hydrocarbons (PAHs) (see Polycyclic Aromatic Compounds), it would be expected to be absorbed from the gastrointestinal tract and lungs. Although a large body of literature exists on the tox-icity and carcinogenicity of PAHs, primarily benzopyrene (see), toxicity data for acenaphthene are very limited. Acenaphthene is on the EPA's Top Priority List to study. See Coal Tar.

ACEPHATE (O-S-DIMETHYL ACETYLPHOSPHERAMIDOTHIOATE and O-S-DIMETHYL PHOSPHORAMIDO THIOATE) • A contact and systemic pesticide found in cottonseed meal applied to growing crops. The FDA permits a tolerance of 8 ppm in cottonseed and 4 ppm in soybean meal resulting from application to growing crops.

ACER SPICATUM LAM • See Mountain Maple Extract.

ACEROLA • Used as an antioxidant. Derived from the ripe fruit of the West Indian or Barbados cherry grown in Central America and the West Indies. A rich source of ascorbic acid. Used in vitamin C.

ACESULFAME K • Ace K. Acesulfame potassium. “K” is the symbol for potassium. Approved by the FDA in 1988, it is crystalline sweetener that is two hundred times sweeter than table sugar, with a slight, bitter aftertaste that is countered by combining it with other sweeteners. Acesulfame K is not digested by the body, but is instead eliminated through urine; therefore, it does not provide any calories. It has a long shelf life and is suitable for cooking. It is used in candies, soft drinks, baked goods, frozen desserts, chewing gum, dry beverage mixes, confections, canned fruit, gelatins, puddings, custards, and as a tabletop sweetener. It is marketed under the name Sunette or Sweet One and Ace K. The Food and Drug Administration said that four long-term animal studies in dogs, mice, and rats had not shown any toxic effects that could be pinned on the sweetener. However, the Center for Science in the Public Interest, a Washington, D.C.-based consumer group, sent a warning to the FDA more than six months before the sweetener's approval saying that animals fed acesulfame K in two different studies suffered more tumors than others that did not receive the compound. In another study cited by CSPI, diabetic rats had a higher blood level of cholesterol when fed the sweetener. The FDA said in a press release that it had considered the Center's concerns and concluded that “any tumors found were typical of what could routinely be expected and were not due to feeding with acesulfame K.” The sweetener had previously been approved for use in twenty countries, including France and Britain. Pepsi and Coca-Cola use it in Europe and Canada in their diet drinks. When heated to decomposition, it emits toxic fumes. ASP. E.

ACESULFAME POTASSIUM • Nonnutritive sweetener. See Acesulfame K.

ACETAL • A volatile liquid derived from acetaldehyde (see) and alcohol. Used in fruit flavorings (it has a nutlike aftertaste) and as a hypnotic in medicine. It is a central nervous system depressant, similar in action to paraldehyde but more toxic. No known skin toxicity. ASP

ACETALDEHYDE • Ethanal. Occurs naturally in apples, broccoli, cheese, coffee, grapefruit, and other vegetables and fruit. Used as a solvent. It is irritating to the mucous membranes. Its ability to depress the central nervous system is greater than that of formaldehyde (see), and ingestion produces symptoms of “drunkenness.”

Acetaldehyde is thought to be a factor in the toxic effect caused by drinking alcohol after taking the antialcohol drug Antabuse. Inhalation is usually limited by intense irritation of lungs. Ingestion of large doses may cause death by respiratory paralysis. Skin toxicity not identified. GRAS. ASP

ACETALDEHYDE DIISOAMYL ACETYAL • Synthetic flavoring. Labeled GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association in 2003. See Acetaldehyde. EAF

ACETALDEHYDE ETHYL CIS-3-HEXENYL ACETAL • Synthetic flavoring. The FDA has as of this writing not yet done a thorough toxicology search. See Acetaldehyde. EAF

ACETALDEHYDE PHENETHYL PROPYL ACETAL • Petital. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Acetaldehyde for toxicity. ASP

ACETAMIDE • Flavoring Agent. The JECFA (see) noted in 2006 that the available toxicity data for this substance indicated that it was clearly carcinogenic in both mice and rats, and although the mechanism of tumor formation is unknown, the possibility of gene toxicity cannot be discounted. The JECFA considered it inappropriate for such a compound to be used as a flavoring agent or for any other food additive purpose, and agreed that acetamide would not be evaluated according to the Procedure for the Safety Evaluation of Flavoring Agents. A mild skin irritant with low toxicity, acetamide has caused liver cancer when given orally to rats in doses of 5,000 milligrams per kilogram of body weight. It has been reported it may form nitrosamines (see). FDA reports it is in use but has, as of this writing, not yet done a thorough toxicology search. EAF

p-ACETAMIDOBENZOIC ACID • See Benzoic Acid.

ACETANISOLE • A synthetic flavoring additive, with an odor of hawthorn or hay. Acetanisole is used in butter, caramel, chocolate, fruit, nut, and vanilla flavorings, which go into beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

ACETATE • Salt of acetic acid (see) used in liquor, nut, coffee, vanilla, honey, pineapple, and cheese flavorings for beverages, ice cream, sherbets, cakes, cookies, pastries, and candy. May be irritating to the stomach if consumed in large quantities.

ACETIC ACID • Occurs naturally in apples, cheese, cocoa, coffee, grapes, skim milk, oranges, peaches, pineapples, strawberries, and a variety of other fruits and plants. Vinegar is about 4 to 6 percent acetic acid and essence of vinegar is about 14 percent. It is used in cheese, baked goods, ketchup, mayonnaise, pickles, and animal feeds. Solvent for gums, resins, and volatile oils. Styptic, it stops bleeding when applied to a cut on the skin. Potential adverse skin reactions include irritation or itching, hives, and overgrowth of organisms that do not respond to germ killers. In its glacial form (without much water) it is highly corrosive and its vapors are capable of producing lung obstruction. Less than 5 percent acetic acid in solution is mildly irritating to the skin. It caused cancer in rats and mice when given orally or by injection. GRAS. ASP. E

ACETIC ACID, CITRONELLYL ESTER • A flavoring additive found in oils of cit-ronella geranium, and about twenty other oils. Colorless liquid; fruity odor. Used as a flavoring additive in mayonnaise, salad dressings, and sauces. Mildly toxic by ingestion. A human skin irritant.

ACETIC ANHYDRIDE • Acetyl Oxide. Acetic Oxide. Colorless liquid with a strong odor, it is derived from oxidation of acetaldehyde (see). Used in modifying starch. It is used as a dehydrating and acetylating additive (see acetylated) and in the production of dyes, perfumes, plastics, and aspirin. It is a strong irritant and may cause burns and eye damage.

ACETIC ETHER • A synthetic additive, with a fragrant, refreshing odor, used in butter, butterscotch, fruit, nut, and spice flavorings for beverages, ice cream, ices, candy, baked goods (1,000 ppm), and chewing gum (4,000 ppm). Also used to coat vegetables.

ACETISOEUGENOL • White crystals with a clove odor, used as a flavoring additive. It is moderately toxic by ingestion. When heated to decomposition, it emits acrid smoke and irritating fumes. The FDA permits its use at a level not to exceed an amount reasonably required to accomplish the intended effect.

ACETOACETIC ESTER • See Ethyl Acetoacetate.

ACETOIN • Acetyl Methyl Carbinol. A flavoring additive and aroma that occurs naturally in broccoli, grapes, pears, cultured dairy products, cooked beef, and cooked chicken. As a product of fermentation and of cream ripened for churning, it has a buttery odor and is used in raspberry, strawberry, butter, butterscotch, caramel, coconut, coffee, fruit, liquor, rum, nut, walnut, vanilla, cream soda, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, margarine, gelatin desserts, cottage cheese, and shortenings. Mildly toxic by injection under the skin. A moderate skin irritant. When heated to decomposition, it emits acrid smoke and fumes. GRAS. ASP

2-ACETONAPHTHONE • 2-Naphthyl Ketone. White crystalline solid with an orange blossom odor. Used as a flavoring additive. Moderately toxic by ingestion. A human skin irritant. When heated to decomposition, it emits acrid smoke and fumes. ASP

ACETONE • Acetoacetone. Diacetyl Methane. Liquid with a pleasant odor. Used as a flavoring additive in food and a solvent for spices that is residual in foods. The FDA requires that it not be used in excess of the amount reasonably required to accomplish the intended effect. It is also frequently used as a solvent for fats, oils, and waxes. Inhalation may irritate the lungs, and in large amounts it is narcotic, causing symptoms of drunkenness similar to ethanol (see). In 1992, the FDA proposed a ban on acetone in astringent products because it had not been shown to be safe and effective as claimed. It is number 184 on the CERCLA Priority List of Hazardous Substances (see). ASP

ACETONE PEROXIDE • Acetone (see) to which an oxygen-containing compound has been added. A maturing additive for bleaching flour and dough, it has a sharp, acrid odor similar to hydrogen peroxide. Approved for use in flour, and in bread and rolls where standards of identity (see) do not preclude its use. A strong oxidizing additive, it can be damaging to the skin and eyes. The Internet is full of instructions on how to make a bomb out of this additive. NIL

ACETOPHENONE • Acetyl Benzene. Benzoyl Methide. A synthetic additive derived from coal tar, with an odor of bitter almonds, used in strawberry, floral, fruit, cherry, almond, walnut, tobacco, vanilla, and tonka bean flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. It occurs naturally in strawberries and tea and may cause allergic reactions. Poisonous by injection. Moderately toxic by ingestion. A skin and severe eye irritant. Narcotic in high concentrations. When heated to decomposition, it emits acrid smoke and fumes. ASP

ACETOSTEARIN • Obtained from fats and oils, it is a glyceride (see). It is used as a protective coating for food and as a plasticizer. The Select Committee on GRAS Substances stated in 1980 should be GRAS with no limitations. NUL

ACETOXYDIHYDROTHEASPIRANE • Flavoring from tobacco used in baked goods, instant coffee/tea, snacks, soups, seasonings, meat products, and tobacco. FEMA (see) GRAS. NIL

4-ACETYOXY-2,5-DIMETHYL-3(2H)FURANONE • Synthetic balsamlike flavor. See Furans. EAF

4(p-ACETOXYPHENYL)-2-BUTANONE • Synthetic flavoring. NIL

2-ACETOXY PYRAZINE • Synthetic flavoring. See Pyridines.

ACETYL- • AC. From acetic acid and used in the manufacture of additives to break down molecules.

ACETYLALDEHYDE • Used to manufacture acetic acid, perfumes, and drugs. See aldehyde.

ACETYLAMINO-5-NITROTHIAZOLE • Acinitrazole. Trichloral. Tritheom. An animal drug used in turkeys and limited to 0.1 ppm in the bird's flesh by the FDA. When heated to decomposition, it emits toxic fumes.

ACETYL BENZENE • See Acetophenone.

ACETYL BENZOYL PEROXIDE • Used to bleach flour. Used in medicine as a germicide and disinfectant. Toxic when ingested.

ACETYL BUTYRYL • See 2, 3-Hexandione.

ACETYL CHLORINE • See Chlorine.

ACETYL-o-CREOSOL • See o-Tolyl Acetate.

3-ACETYL-2,5-DIMETHYL FURAN • Strong roasted-nut odor, it is used as a flavoring additive. When heated to decomposition, it emits acrid smoke

and irritating fumes. GRAS. ASP

2-ACETYL-3,(5 or 6)-DIMETHYLPYRAZINE, MIXTURE OF ISOMERS • Flavoring additive used in baked goods, beverages, breakfast cereal, chewing gum, confectionery frostings, egg products, fats, fish products, frozen dairy, fruit ices, gelatins, gravies, hard candies, instant coffee and tea, jams, meat products, milk products, seasonings, snack foods, soft candy, and soups. ASP

3-ACETYL-2, 5-DIMETHYLTHIOPHENE • A flavoring additive. ASP

2-ACETYL-3-ETHYLPYRAZINE • A flavoring additive. ASP

ACETYL EUGENOL • See Eugenyl Acetate.

ACETYL FORMALDEHYDE and ACETYL FORMIC • See Pyruvaldehyde.

ACETYLMERCAPTOHEXYL ACETATE • Synthetic flavoring. EAF n-ACETYL-L-METHIONINE • Nutrient in foods except infant foods and products containing added nitrites/nitrates (see both). Limited to 3.1 percent by weight of the total protein in the food. When heated to decomposition, it emits toxic fumes. ASP

ACETYL METHYL CARBINYL ACETATE • See Acetoin. ASP

2-ACETYL-5-METHYLFURAN • A synthetic flavoring. ASP

2-ACETYL-3-METHYLPYRAZINE • Synthetic flavoring used in baked goods, beverages, breakfast cereals, chewing gum, confectionery frostings, egg products, fats/oils, fish products, frozen dairy, fruit ices, gelatins, gravies, hard candy, instant coffee/tea, jams, meat products, milk products, seasonings, snack foods, soft candy, and soups. Declared GRAS by FEMA (see). EAF

4-ACETYL-2-METHYLPYRIMIDINE • A flavoring, a nitrogen substance. NIL

ACETYL-(p-NITROPHENYL)-SULFANILAMIDE • A feed additive. See Sulfanitran.

ACETYL NONYRYL and ACETYL PELARGONYL • See 2, 3-Undecadione.

ACETYL PENTANOYL • See 2, 3-Heptanedione.

ACETYL PROPIONYL • Yellow liquid used as a butterscotch or chocolate-type flavoring. See 2,3-Pentanedione.

2-ACETYL PYRAZINE • Pale yellow crystals or liquid with a sweet popcornlike odor. Used as a flavoring additive. Skin and eye irritant. When heated to decomposition, it emits toxic fumes. GRAS. ASP

2-ACETYLPYRIDINE • Synthetic flavoring that is said to require in-depth toxicology studies by FEMA (see). ASP

2-ACETYL PYRROLE • Light beige to yellow crystals with a breadlike odor used as a flavoring additive. When heated to decomposition, it emits toxic fumes. GRAS when used at a level not in excess of the amount reasonably required. EAF

4-ACETYL-6-TERT-BUTYL-1,1-DIMETHYL-INDANE • A synthetic flavoring. The International Program on Chemical Safety World Health Organization said there is more information needed for this compound. ASP

2-ACETYLTHIAZOLE • Used in the manufacture of fungicides and dyes. ASP

2-ACETYL-2-THIAZOLINE • Flavoring isolated from lychee, a Chinese tropical fruit. EAF

3-(ACETYLTHIO)-2-METHYLFURAN • Intermediate used in the manufacture of food additives. EAF

p-ACETYL TOLUENE • See 4-Methyl Acetophenone.

ACETYL-p-TOLYL ACETATE • See p-Tolyl Acetate.

ACETYL TRIBUTYL CITRATE • See Citric Acid.

ACETYL TRIETHYL CITRATE • A clear, oily, essentially odorless liquid used as a solvent and plasticizer. Moderately toxic by ingestion. When heated to decomposition it emits acrid smoke and fumes. See Citric Acid.

ACETYL TRIOCETYL CITRATE PECTIN • Citrus Pectin. A jelly-forming powder obtained from citrus peel and used as a texturizer and thickening additive to form gels with sugars and acids. Light in color. It has no known toxicity.

ACETYL VALERYL • Yellow liquid used as cheese, butter, and miscellaneous flavorings. See 2,3-Heptanedione.

ACETYL VANILLIN • See Vanillin Acetate.

ACETYLATED • Any organic compound that has been heated with acetic anhydride or acetyl chloride (see both) to remove its water. Acetylation is used to coat candy and other foods to hold in moisture. Acetic anhydride produces irritation and necrosis of tissues in vapor state and carries a warning against contact with skin and eyes.

ACETYLATED DISTARCH ADIPATE and PHOSPHATE • Starches (see) that have been modified to change their solubility and digestibility. The Select Committee on GRAS Substances stated in 1980 that there is no available evidence that demonstrates or suggests a hazard to the public when they are used at levels now current and in the manner now practiced. However, it is not possible to determine, without additional data, whether a significant increase in consumption would constitute a dietary hazard. The substances can continue GRAS with limitations on amounts that can be added to food. E

ACETYLATED DISTARCH PROPANOL • A starch (see) that has been modified to change its solubility and digestibility. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that although no evidence in the available information on it demonstrates a hazard to the public at current use levels, uncertainties exist requiring that additional studies be conducted. GRAS status is continued while tests are being completed and evaluated, the FDA said in 1980. Since then no action has been reported.

ACETYLATED HYDROGENATED COTTONSEED GLYCERIDE • See Cottonseed Oil and Acetylated.

ACETYLATED HYDROGENATED LARD GLYCERIDE • See Lard and Lard Oils.

ACETYLATED HYDROGENATED VEGETABLE GLYCERIDE • See Vegetable Oils.

ACETYLATED MONOGLYCERIDES • Acetylated mono- and diglyceride esters (see) of glycerin with acetic acid and edible fat-forming fatty acids. Bland tasting. Used as coating additives, emulsifiers, lubricants, solvents, and texture-modifying additives in baked goods, cake shortening, desserts, fruits, ice creams, margarines, nuts, oleomargarine, peanut butter, puddings, shortening, and whipped toppings. It is used as a protective coating for meat products. Use permitted by the FDA at a level not in excess of the amount reasonably required to accomplish the intended effects. When heated to decomposition, it emits acrid smoke and irritating fumes.

ACETYLATED OXIDIZED STARCH • Thickener; stabilizer; binder; emulsifier. E

ACETYLATED STARCH • Acetate (see) is used to make the starch more digestible. The statement “ADI not specified” means that, on the basis of the available data (toxicological, biochemical, and other), the total daily intake of the substance, arising from its use or uses at the levels necessary to achieve the desired effect and from its acceptable background in food, does not, in the opinion of the JECFA, represent a hazard to health. For this

reason, and for the reasons stated in individual evaluations, the establishment of an acceptable daily intake (ADI) is deemed unnecessary. E

ACETYLATED SUCROSE DISTEARATE • The acetyl ester of sucrose distearate. See Ester and Sucrose Distearate.

ACETYLISOEUGENOL • Isoeugenol Acetate. White crystals with a spicy, clovelike odor, it is used as an aroma and flavor carrier in foods. In perfumery, it is used especially for carnation-type odors.

ACETYLMETHYL CARBINOL • Slightly yellow liquid or crystals used as an aroma and flavor carrier. See Acetoin.

ACETYL PYRAZINE • With a strong popcornlike flavor, it is used in acorn, barley, baked bread, cake, chocolate, cocoa, coffee, corn chips, gingerbread, graham crackers, almonds, cashews, and other nuts, pizza, popcorn, tacos, and toasted wheat. May be an irritant.

ACETYLPYRIDINE • Additives used in making synthetic food additives.

2-ACETYLTHIAZOLE • Found in beans, potatoes, artichokes, asparagus, beef, beer, Brazil nuts, rice, boiled shrimp; synthetic flavoring used in snack foods. Also used in the manufacture of fungicides and dye. FEMA. GRAS

ACHILLEIC ACID • See Aconitic Acid.

ACID • An acid is a substance capable of turning blue litmus paper red and of forming hydrogen ions when dissolved in water. An acid aqueous solution is one that has a pH (see) of less than 7. Citric acid (see) is an example of a widely used acid in foods.

ACID CASEIN • See Casein.

ACID HYDROLYZED MILK PROTEIN • See Hydrolyzed Milk Protein.

ACID HYDROLYZED PROTEINS • See Hydrolyzed Proteins.

ACIDIFIED SODIUM CHLORITE • ASC. Approved by the FDA as a secondary direct food additive permitted in food for human consumption specifically as an antimicrobial intervention treatment for poultry carcasses, red meat parts and organs, seafood, and raw agricultural commodities. Also used for processed fruits, roots, tubers, legumes, eggplant, ground cherry, pepino, pepper, tomatillo, and tomato, cucurbit, and leafy vegetables. The JECFA said in 2007 available toxico-logical data were sufficient to assess the safety of ASC by setting ADIs (see) for chlorite and chlorate (see both). The European Union agreed. For many decades food regulators were hesitant to endorse the use of antimicrobial substances by poultry processors. They were worried that such use of antimicrobials would mask unhygienic practices and would induce resistance of the microflora present on the surface of treated products. But the existence of outbreaks of salmonella and other infectious agents make the use wise, and the antimicrobials would post no risk.

ACIDITY REGULATORY • Controls acidity by means of an acid, acidifier, alkali, base, buffer, buffering, and pH adjusting agents.

ACID-MODIFIED STARCHES • Usually made by mixing an acid—such as hydrochloric or sulfuric—water, and starch at temperatures too low for gelatinization. When the starch has been reduced in viscosity to the degree desired, the acid is neutralized and the starch is filtered, washed, and dried. It is done so that starches can be cooked and used at higher concentrations than unmodified starches. Acid-modified starches are often used for salad dressings and puddings and as inexpensive thickening additives. The final report of the FDA of the Select Committee on GRAS Substances stated in 1980 that the acid-modified starches are GRAS with no limitations.

ACIDOPHILUS • A type of bacteria that ferments milk and has been used medically to treat intestinal disorders.

ACID POTASSIUM SULFITE • See Sulfites.

ACIDS • See Acidulants.

ACIDULANTS • Acids. An acid is a substance capable of turning blue litmus paper red and of forming hydrogen ions when dissolved in water. An acid aqueous solution is one with a pH less than 7 (see pH). Acidulants are acids that make a substance more acid and function as flavoring additive to acidify taste, to blend unrelated flavoring characteristics, and to mask any undesirable aftertaste. Acidulants are also used as preservatives to prevent germ and spore growths that spoil foods. Acidulants control the acid-alkali (pH) balance and are used in meat curing to enhance color and flavor and as a preservative. Among the most common acids added to foods are acetic, propionic, and sorbic (see all).

ACIFLUOREN, SODIUM • Herbicide. FDA tolerances are 0.02 ppm residues in cattle and sheep, kidney and liver. Residues in rice, milk, and eggs is tolerated at 0.1 ppm.

ACIMETON • Lobamine. Banthionine. Cynaron. Methilanin. Neston. White crystalline platelets with a characteristic odor. Used as a dietary supplement and nutrient. Moderately toxic by ingestion and other routes. When heated to decomposition, it emits toxic fumes. See Methionine.

ACONITIC ACID • Citridic Acid. Equisetic Acid. Achilic Acid. A flavoring additive found in beetroot and cane sugar. Most of the commercial aconitic acids, however, are synthetic and manufactured by sulfuric acid dehydration of citric acid. Aconitic acid is used in fruit, brandy, and rum flavorings for beverages, ice cream, ices, candy, baked goods, liquors, and chewing gum. Also used in the manufacture of plastics. GRAS. EAF

ACROLEIN • By-product of petroleum produced by the oxidation of propylene (see) during cooking or processing fat-containing foods. Acrolein may also be generated during the ripening of fruit and some types of cheese, in caviar, and lamb, souring salted pork, raw and cooked poultry, cocoa beans and chocolate liquor, and molasses. It may also be produced as an unwanted by-product during alcoholic fermentation or during the storage and maturation of alcoholic products. Acrolein may also be detected in nonalcoholic beverages (i.e., coffee and tea). When cellophane and polystyrene thermoplastics used to package foods are heated, acrolein is released, although data on the extent of migration to packaged food items have not been identified. Therefore, with the exception of data on heated vegetable oil, the ripening of Egyptian Domiati cheese, and the reported concentration of 3.8 μg/g for red wine, there are no reports of concentrations of acrolein greater than 1 μg÷g in any food item. Humans may be exposed to acrolein in the home through cigarette smoking or through the smoke from cooking. The latest IRIS (see) evaluation says acrolein may interfere with vitamin metabolism and may be why animals in studies have shortened longevity. It is also listed as a cancer-causing agent by the Environmental Defense Fund. A report containing the collective views of an international group of experts published by the World Health Organization said: “Acrolein is an upper respiratory tract and eye irritant in humans. Respiratory rate was also reduced in male volunteers exposed to very low concentrations coughing, nasal irritation, chest pain, and difficulty breathing. Most individuals cannot tolerate exposure to small concentrations of acrolein in air for more than 2 minutes. Exposure to concentrations above 20 mg/m3 may be lethal. Direct skin or eye contact with liquid acrolein can produce severe skin or eye injury, including necrosis (see), swelling, redness, rashes, and sore throat. Suspected of being cancer-causing in workers but not proven.” The FDA says there is no reported use of the chemical and there is no toxicology information available. NUL

ACRYLAMIDE • Produced naturally in certain foods when they are cooked at high temperatures. It is also derived from acrylonitrile and sulfuric acid industrially for use in the production of polyacrylamide gels to treat drinking water and waste-water. Acrylamide is used in clarifying beet sugar or cane sugar juice and in cornstarch. It is used in the manufacturing of high fructose corn syrup. It is also used as a thickener and suspending additive in nonmedicated animal feeds. It is toxic by skin absorption. On April 24, 2002, researchers at the Swedish National Food Administration and Stockholm University reported finding acrylamide in a variety of fried and oven-baked foods. It appeared to form as a by-product of high-temperature cooking—greater than 120°C/248°F—for certain carbohydrate-rich foods. Since the Swedish report similar findings have been reported

by Norway, the United Kingdom, and Switzerland. Preliminary analysis by the FDA suggests that U.S. results will be in basic agreement with these findings. The discovery of acrylamide in foods is a concern because it is a potential human carcinogen and damaging to genes. Among the foods that have been found to have acrylamide are french fries, potato chips, and breads. It does not appear to be present in food before cooking. Research to date suggests that acrylamide formation is particularly likely in carbohydrate-rich foods. However, tests on carbohydrate-rich foods cooked at lower temperatures (e.g., by boiling) have shown much lower acrylamide levels. The FDA says at this writing not enough is known about acrylamide formation to identify safe modifications to food-processing techniques that will clearly prevent or reduce formation. Scientists have conducted epidemiological studies of people exposed to acrylamide in the workplace. The studies did not show increased cancer risk with acrylamide exposure. However, these studies do not rule out the possibility that acrylamide in food can cause cancer, both because of the limited number of people in the studies and because the route of exposure for the workers was not through food. In June 2002, the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) convened an expert committee on acrylamide. The consultation, which was attended by three FDA experts, concluded that the presence of acrylamide in food is a major concern and recommended more research on mechanisms of formation and toxicity. Both the WHO/FAO consultation and the FDA have recommended that people continue to eat a balanced diet rich in fruits and vegetables and not cook food for too long or at too high a temperature. They also advised that it is important to cook all food thoroughly—particularly meat and meat products—to destroy food-borne pathogens (bacteria, viruses, etc.) that might be present. As for acrylamides used in food processing, no emphasis was placed on them and the residues that we may be eating. Acrylamide is in a number of food additives used in processing and added to food products such as polyacrylamide (see) used as a thickener. Besides being a suspected cancer-causing and gene-damaging agent, acrylamide in high doses is also believed to be toxic to human nerves.

ACRYLAMIDE-SODIUM ACRYLATE RESIN • Used to dilute pesticides for application. NIL

ACRYLATE-ACRYLAMIDE RESIN • Acrylic Acid. Colorless, odorless crystals soluble in water and derived from acrylonitrile and sulfuric acid. It is used as a clarifying additive in beet sugar and cane sugar juice and liquor or cornstarch hydrolysate (5 ppm by weight of juice, 10 ppm by weight of liquor or hydrolysate). It is also used in the manufacture of dyes and adhesives. It is toxic by skin absorption. ASP

ACRYLIC ACID • Derived by condensing ethylene oxide with hydrocyanic acid followed by reaction with sulfuric acid (see all). It is used for making plastics and resins.

ACRYLIC ACID-2-ACRYLAMIDO-2-METHYL PROPANE SULFONIC ACID COPOLYMER • Used as a coating for film in contact with food or drinks. See Acrylic Acid. NUL

ACRYLIC RESINS • Polymers (see) of acrylics. Used in waxy oils, base coats, protective coatings, and waterproofing. Acrylates (see), if inhaled, can cause allergic reactions in humans.

ACRYLONITRILE COPOLYMER • Used in packaging materials. When heated to decomposition, it emits acrid smoke and irritating fumes. It is number 274 on the CERCLA Priority List of Hazardous Substances (see).

ACRYLONITRILE POLYMER WITH STYRENE • Used in coatings and films in packaging materials. No restrictions, but cyanide and its compounds are on the Community Right-to-Know List (see). See also Styrene.

ACTADECYLSILOXYDIMETHYLSIOLOXYPOLYSILOXANE • A component of defoaming additives (see) used in processing beets and yeast.

ACTINIDIA ARGUTA EXTRACT • More than 240 compounds have been detected when the volatile components of the flowers and the fruit are extracted from several Actinidia arguta genotypes, including lilac and kiwi. Used as an ingredient in baked goods and baking mixes, beverages and beverage bases, breakfast cereals, chewing gum, dairy product analogs, grain products and pastas, candies, jams and jellies, milk products, plant protein products, processed fruits and fruit juices, processed vegetables and vegetable juices, and snack foods at a level of 600 milligrams (mg) per reference amount of each product customarily consumed per eating occasion. Extract of Actinidia arguta and related species are being promoted for the prevention and treatment of allergic disease and nonallergic inflammatory disease, baldness, and as an anticancer ingredient. The FDA has no questions for the applicant for GRAS status. The agency has not, however, made its own determination regarding the GRAS status of the subject use of A. arguta fruit extract. As always, the FDA maintains it is the continuing responsibility of the producer to ensure that the food ingredients it markets are safe.

ACTIVATED CHARCOAL (CARBON) • Obtained by destructive distillation of organic material such as vegetables or animal bones and is activated by heating with steam or carbon dioxide, which results in a porous material. Used to remove impurities that cause undesirable color, taste, or odor in liquid. The major sources are lignite, coal, and coke. The Select Committee of the Federation of American Societies for Experimental Biology (FASEB), under contract to the FDA, concluded that it is not a hazard to human health at current or possible future use levels. However, the Committee said because the substance is extensively used in the food industry, it would be prudent to have purity specifications for food-grade activated carbon to assure the absence of any cancer-causing hydrocarbons (see) in food. It can cause a dust irritation, particularly to the eyes and mucous membranes. It is used to relieve intestinal discomfort and diarrhea and to counteract poisons. It adheres to many drugs and chemicals, inhibiting their absorption from the GI tract. Potential adverse reactions include black stools and nausea. ASP

ACTIVATED 7-DEHYDROCHOLESTEROL • See Vitamin D3.

ADENOSINE • White crystalline powder with mild saline or bitter taste. It is isolated by the hydrolysis of yeast nucleic acid.

ADENOSINE 5'-MONOPHOSPHORIC ACID AND ITS MONOSODIUM AND DISODIUM SALTS • AMP. A nucleotide (a building block of DNA) made inside the body and found in all living organisms. Used as a flavor enhancer in chewing gum, coffee and tea, snack foods, novelty snacks, soups and soup mixes (including meat and poultry), and sugar and salt substitutes. The producer, Linguagen, notified the FDA of its self-decision that AMP should be GRAS because of generally available information about the additive and its monosodium and disodium salts. The producer notified the FDA that no significant adverse effects were observed in published human clinical studies but that prolonged excessive purine consumption may lead to chronically elevated plasma uric acid levels, which are a known risk factor for the development of gout. The JECFA (see) reviewed AMP and approved it as a food additive, assigning it an ADI not specified (see); FEMA (see) found it to be GRAS as a food ingredient. Furthermore, AMP and other purines are currently approved for use as food additives by the European Community.

ADENOSINE PHOSPHATE • See Adenosine Triphosphate.

ADENOSINE TRIPHOSPHATE • Adenylic Acid. An organic compound that is derived from adenosine (see). A fundamental unit of nucleic acid, it serves as a source of energy for biochemical transformation in plants, photosynthesis, and also for many chemical reactions in the body, especially those associated with muscular activity.

ADI • The abbreviation for acceptable daily intake (see).

ADI Not Specified • This designation is applied to a food substance of very little toxicity, which on the basis of the available chemical, biological, toxicological, and other data and the total dietary intake of the substance arising from its use at the levels necessary to achieve the desired effect and from its acceptable background level in food, does not, in the opinion of the JECFA (see), represent a hazard to health.

ADIPATES • The salts of adipic acid (see) used in food packaging. Some are suspected cancer-causing additives.

ADIPIC ACID • Hexanedioic Acid. Found in beets. A buffering and neutralizing additive impervious to humidity. Used in flavorings for baked goods, baking powder, condiments, dairy products, meat products, oils, oleomargarine, relishes, snack foods, canned vegetables, beverages, and gelatin desserts (5,000 ppm) to impart a smooth, tart taste. Also used as a buffer and neutralizing additive in confections, but limited to 3 percent of contents and in the manufacture of plastics and nylons, and as a substitute for tartaric acid (see) in baking powders. Used in animal feed. Poison by injection and moderately toxic by other routes. A severe eye irritant. GRAS. ASP. E

ADIPIC ANHYDRIDE • A starch-modifying additive, not to exceed 0.12 percent of the starch compound. See Modified Starch.

ADSÓRBATE • A powdered flavor made by coating liquid flavoring on the surface of a powder such as cornstarch, salt, or malt dextrin (see all).

AEROSOL • Small particles of material suspended in gas and easily absorbed into the lungs. Spray technology is more than fifty years old.

AF • FDA abbreviation for antifoaming (or defoaming) agent (see).

AFLATOXIN • AFL. A mold that contaminates corn and peanuts. Poisonous by ingestion and moderately toxic by other routes. Carcinogenic and mutagenic. The JECFA (see) decided to base the assessment of the impact of different maximum levels for aflatoxin exposure on data provided by producing countries, noting that these better represent the materials in commerce and result in a robust estimate of AFL dietary exposure from the tree nuts. Consumption of almonds, Brazil nuts, hazelnuts, pistachios, and dried figs contributes greater than 5 percent of the total AFL dietary exposure in only five of the thirteen GEMS/Food (see) cluster diets.

AGAR-AGAR • Gelidium. Japanese Isinglass. A stabilizer and thickener, it is transparent, odorless, and tasteless and is obtained from various seaweed found in the Pacific and Indian oceans and the Sea of Japan. Agar was the first seaweed to be extracted, purified, and dried. Discovered by a Japanese innkeeper around 1658 and introduced in Europe and the United States by visitors from China in the 1800s as a substitute for gelatin, it goes into beverages, ice cream, ices, frozen custard, sherbet, meringue, baked goods, jelly, frozen candied sweet potatoes, icings, confections, and artificially sweetened jellies and preserves. It can be 1.2 percent of candy and 0.25 percent of frozen desserts, jelly, and preserves. Agar serves as a substitute for gelatin and is used for thickening milk and cream. It is also a bulk laxative and, aside from causing an occasional allergic reaction, is nontoxic. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now, and it should continue its GRAS status with limitations on amounts that can be added to food. Mildly toxic by ingestion. ASP. E

AGAVE LECHUGUILLA • American Aloe. Native to the warm part of the United States and known by its heavy, stiff leaf and tall panicle or spike of candelabralike flowers. The fermented juice is popular in Mexico for its distilled spirit (mescal). The leaves are used for a juice used in medicines as a diuretic.

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY • ATSDR. An agency of the U.S. Department of Health and Human Services, it is directed by congressional mandate to perform specific functions concerning the effect on public health of hazardous substances in the environment. These functions include public health assessments of waste sites, health consultations concerning specific hazardous substances, health surveillance and registries, response to emergency releases of hazardous substances, applied research in support of public health assessments, information development and dissemination, and education and training concerning hazardous substances.

AGRIMONY EXTRACT • An extract of Agrimonia eupatoria, an herb found in north temperate regions. It has yellow flowers and bristly fruit. Said to have medical and magical properties since the time of Pliny the Elder. Modern herbalists prescribe it for disorders of the kidneys, liver, and bladder. It reputedly has diuretic and expectorant properties.

AI • The abbreviation for adequate intake. A value based on observed or experimentally determined approximations of nutrient intake by a group of healthy people. It is used when the RDA (see) cannot be determined.

AKLOMIDE • Gray scales from alcohol, it is used as animal feed to combat fungus infections in chickens. The FDA residue tolerances are 4.5 ppm in liver and muscle of uncooked edible tissue of chickens and 3 ppm in skin and fat.

ALACHLOR • Lasso. Alanex. A preemergent herbicide. The FDA permits its use. The EPA (see) has determined it is a cancer-causing additive in rats and mice. The European Union considers it a dangerous chemical substance for priority pollution elimination in water.

ALANEX • See Alachlor.

ALANINE (B-, L-, and DL-) • Colorless crystals derived from protein. A nonessen-tial amino acid, it is used in microbiological research and as a dietary supplement in the L and DL forms. It is used as a flavor enhancer at 1 percent for pickling spice. It is now GRAS for addition to food. It caused cancer of the skin in mice and tumors when injected into their abdomens. ASP

ALAR • See Daminozide.

ALBENDAZOLE • Zental. Valbazen. A worm medicine given to cattle. The FDA tolerances for residues are 0.2 ppm in uncooked edible cattle tissue, 0.6 ppm in muscle, 1.2 ppm in liver, 1.8 ppm in kidney, and 2.4 ppm in fat.

ALBUMEN • See Albumin.

ALBUMIN • Albumen. A group of simple proteins composed of nitrogen, carbon, hydrogen, oxygen, and sulfur that are soluble in water. Albumin is usually derived from egg white and employed as an emulsifier in foods and cosmetics. May cause a reaction in those allergic to eggs. In large amounts can produce symptoms of lack of biotin, a growth factor in the lining of the cells. ASP

ALBUMIN MACRO AGGREGATES • Used as a binder and firming additive in sausage, soups, stews, and wine. Poisonous by injection.

ALCOHOL • Ethyl Alcohol. Ethanol. Alcohol is widely used as a solvent in the cosmetic and food fields. Alcohol is manufactured by the fermentation of starch, sugar, and other carbohydrates. It is clear, colorless, and flammable, with a somewhat pleasant odor and a burning taste. Medicinally used externally as an antiseptic and internally as a stimulant and hypnotic. Absolute alcohol is ethyl alcohol to which a substance has been added to make it unfit for drinking. Rubbing alcohol contains not less than 68.5 percent and not more than 71.5 percent by volume of absolute alcohol and a remainder of denaturants, such as perfume oils. Toxic in large doses. See also Anisyl Alcohol.

ALCOHOL, DENATURED • This refers to ethyl alcohol, which is deliberately made unfit for drinking.

ALCOHOL DENATURED FORMULA 23A • Used as a diluent in color additive mixtures for coloring eggshells. NUL

ALCOHOL, SDA-3A • Diluent in color additive for marking food. See Alcohol, Denatured. NUL

ALCOHOLS/PHOSPHATE ESTERS • May be used at a level not to exceed 0.2 percent to assist in the lye peeling of fruit and vegetables.

ALDEHYDE • Used to flavor certain cherry ice creams, candy, and snacks. Also used in the manufacture of resins, dyes, and organic acids. See Acetylaldehyde.

ALIPHATIC • A class of organic chemical compounds intermediate between acids and alcohols. Aldehydes contain less oxygen than acids and less hydrogen than alcohols. Most aldehydes are irritating to the skin and gastrointestinal tract.

ALDICARB • Temik. Crystals from isopropyl ether used as an insecticide, spider killer, and worm killer on citrus pulp in the growing crop. FDA

ALDICARB • Temik. Crystals from isopropyl ether used as an insecticide, spider killer, and worm killer on citrus pulp in the growing crop. FDA tolerance is 0.6 ppm, 0.3 ppm in cottonseed hulls, and 0.5 ppm in sorghum.

ALDRIN • Aldrex. Altox. Drinox. A pesticide. Poison by ingestion, skin contact, intravenous, intraperitoneal, and other routes. Causes tumors, cancer, and birth defects. Human systemic effects by ingestion: excitement, tremors, and nausea or vomiting. Continued acute exposure causes liver damage.

ALFALFA • Medicago sativa. Herb and Seed. Lucerne. A natural cola, liquor, and maple flavoring additive for beverages and cordials. Alfalfa is widely cultivated for forage and is a commercial source of chlorophyll. GRAS. ASP

ALGAE, BROWN • Kelp. Ground, dried seaweed used to carry natural spices, seasonings, and flavorings. A source of alginic acid (see). Also used in chewing-gum base. All derivatives of alginic acid are designated "algin." The food industry is one of the major users of alginates (see) along with the pharmaceutical, cosmetic, rubber, and paper industries. The United States is the largest producer of alginates. GRAS. NUL

ALGAE MEAL, DRIED • Permanently listed to be used in chicken feed to enhance color of chicken skin and egg yolks. NUL

ALGAECIDE • Pesticide to get rid of algae.

ALGANET • Derived from algae. Coloring additive used in casings and rendered fats. See Algae, Brown.

ALGIN • The sodium salt of alginic acid (see), it is used in cheeses, frozen desserts, soda water, jellies, and preserves as a stabilizer. GRAS

ALGINATES • Ammonium, Calcium, Potassium, and Sodium. All derivatives of alginic acid are designated "algin." Gelatinous substances obtained from certain seaweed and used as stabilizers and water retainers in beverages, ice cream, ices, frozen custard, emulsions, desserts, baked goods, and confectionery ingredients. A clarifying additive for wine, chocolate milk, meat, toppings, cheeses, cheese spreads, cheese snacks, salad dressings, and artificially sweetened jelly and jam ingredients. Alginates are used also as stabilizers in gassed cream (pressure-dispensed whipped cream). The alginates assure a creamy texture and prevent formation of ice crystals in ice creams. Alginates have been used in the making of ice pops to impart smoothness of texture by ensuring that the fruit flavors are uniformly distributed throughout the ice crystals during freezing, helping the pops retain flavor and color, and to stop dripping. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that calcium, sodium, or potassium alginates are a hazard to the public when used as they are now, and their GRAS status will continue with limitations on the amounts that can be added to food. ASP

ALGINIC ACID • Obtained as a highly gelatinous precipitate from seaweed. It is odorless and tasteless and is used as a stabilizer in ice cream, frozen custard, ice milk, fruit, sherbet, water ices, beverages, icings, cheeses, cheese spreads, cheese snacks, French dressing, and salad dressing. It is also used as a defoaming additive in processed foods. Capable of absorbing two hundred to three hundred times its weight of water and salts. Resembles albumin or gelatin (see both). Alginic acid is slowly soluble in water, forming a thick liquid. The JECFA (see) observed that in a ninety-day study in rats, 15 percent alginate in the diet resulted in an enlarged, distended, heavy lower intestine, bumpy urinary bladder, and calcium deposits in the renal pelvis. A slight decrease in growth was also seen. The JECFA noted that alginic acid and its salts have a laxative effect at high level of intake. The committee did not set an ADI (see) for alginic acid. See Ammonium Alginate, Calcium Alginate, Potassium Alginate, and Sodium Alginate. GRAS. ASP. E

ALITAME • A candidate for approval as an artificial sweetener, it has two thousand times the sweetness of sugar and no calories. Its potential use is in all areas requiring sweetening. It is derived from the amino acid alanine (see) and is related to aspartame (see). The benefits include a clean, sweet taste, good stability at high temperatures, broad pH (see) range, and high water solubility. The drawbacks are the off-flavor from prolonged storage in some acidic solutions.

ALKALI • The term originally covered the caustic and mild forms of potash and soda. Now a substance is regarded as an alkali if it gives hydroxyl ions in solution.

An alkaline aqueous solution is one with a pH (see) greater than 7. Sodium bicarbonate is an example of an alkali that is used to neutralize excess acidity

ALKALOID • A compound of vegetable origin. Usually derived from a nitrogen compound such as pyridine, quinoline, isoquinoline, or pyrrole, designated by the ending -ine. Examples are atropine, morphine, nicotine, quinine, codeine, caffeine, cocaine, and strychnine. The alkaloids are potent and include the hallucinogen mescaline and the deadly poison brucine. There are alkaloids that act on the liver, nerves, lungs, and digestive systems.

ALKANE • See Paraffin.

ALKANET ROOT • Alkane Ferrous Sulfate. A red coloring obtained from extraction of the herblike tree root grown in Asia Minor and the Mediterranean. It was used as a coloring for wines, inks, and sausage casings. The FDA withdrew the authorization for use in 1988. NUL

ALKANNIN • A red powder and the principal ingredient of alkanet root (see).

ALKANOMIDE OF COCONUT OIL FATTY ACIDS AND DIETHANOLAMINE • Produced by condensation of coconut oil fatty acids and diethanolamine (see). Used for delinting cottonseeds. ASP

ALKYL • Meaning "from alcohol," usually derived from alkane. Any one of a series of saturated hydrocarbons such as methane. The introduction of one or more alkyls into a compound is to make the product more soluble and stable. The mixture is usually employed with surfactants (see), which have a tendency to float when not alkylated.

ALKYL BETAINES • See Alkyl Sulfates.

ALKYL ETHER SULFATES • See Alkyl Sulfates.

ALKYL POLYGLYCOXSIDE SURFACTANT • As a sanitizing agent for foods, including meat and poultry products. See Alkyl and Surfactants. GRAS pending

ALKYL SULFATES • Surfactants (see) used in foods, drugs, and cosmetics. The Germans during World War II developed these compounds when vegetable fats and oils were scarce. A large number of alkyl sulfates have been prepared from primary alcohols by treatment with sulfuric acid; the alcohols are usually prepared from fatty acids (see). Alkyl sulfates are low in acute and chronic toxicity but may cause skin irritation.

n-ALKYL (C12-C18) BENZYLDIMETHYL-AMMONIUM CHLORIDE • A quaternary ammonium sanitizing solution compound (see).

n-ALKYL (C12-C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE • A sanitizing quaternary ammonium compound (see).

n-ALKYL-HYDROXY-POLY(OXYETHYLENE) • Quaternary ammonium sanitizing compound used to wash sugar beets prior to slicing.

ALKYLENE OXIDE ADDUCTS OF ALKYL ALCOHOLS • Used to assist in lye peeling of fruits and vegetables. The FDA permits less than 0.2 percent in lye. NIL

ALLERGEN • A substance that provokes an allergic reaction in the susceptible but does not normally affect other people. Plant pollens, fungi spores, and animal danders are some of the common allergens.

ALLERGEN LABELING • The Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA) amends the Federal Food, Drug, and Cosmetic Act (FFDCA) to require that the label of a food that is or contains an ingredient that bears or contains a "major food allergen" declare the

presence. FALCPA defines a “major food allergen” as one of eight foods or food groups (i.e., milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans) or a food ingredient that contains protein derived from one of those foods. Issues associated with labeling food are the responsibility of the Office of Nutritional Products, Labeling, and Dietary Supplements (ONPLDS) in the Center for Food Safety and Applied Nutrition.

ALLERGIC CONTACT DERMATITIS • ACD. Skin rash caused by direct contact with a substance to which the skin is sensitive. Symptoms include a red rash, swelling, and intense itching. Blisters may develop and break open, forming a crust. ACD may develop at any age and may be acute or chronic. Symptoms may appear seven to ten days after the first exposure to an allergen. More often, the allergic reaction doesn't develop for many years and may require many repeated low-level exposures. Once the sensitivity does develop, however, contact with the triggering allergen will produce symptoms within twenty-four to forty-eight hours. An attack builds in severity from one to seven days. Even without treatment, healing often occurs in one or two weeks, though it may take a month or longer.

ALLERGIC REACTION • An adverse immune response following repeated contact with otherwise harmless substances such as pollens, molds, foods, cosmetics, and drugs.

ALLERGY • An altered immune response to a specific substance, such as ragweed or pollen, on reexposure to it.

ALLOMALEIC ACID • See Fumaric Acid.

ALLSPICE • A natural flavoring from the dried berries of the allspice tree. Allspice is used in liquor, meat, and spice flavorings for beverages, ice cream, ices, candy, baked goods (1,400 ppm), chewing gum, condiments (1,000 ppm), and meats. Allspice oleoresin (a natural mixture of oil and resin) is used in sausage flavoring for baked goods, meat, and condiments. Allspice oil is used in sausage, berry, cola, peach, rum, nut, allspice, cinnamon, ginger, nutmeg, and eggnog flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (1,700 ppm), condiments, pickles, meats, liquors, and soups. A weak sensitizer that may cause skin rash on contact. GRAS. ASP

ALLURA RED • See FD and C Red No. 40. E

ALLYIC SULFIDES • Found in garlic and onions, these compounds may protect against cancer-causing additives by stimulating production of a detoxification enzyme, glutathione-S-transferase.

ALLYL- • Prefix meaning, “derived from allyl alcohol” (see).

ALLYL ALCOHOL • A colorless, pungent liquid made chiefly from allyl chloride heated to a thick substance in the presence of oxygen. It is used to make resins and plasticizers and as the basis for many synthetic flavorings.

ALLYL ALPHA-IONONE • Warm, woody, violet odor. Used as a fragrance. Eye irritant.

p-ALLYL ANISOLE • Esdragol. Isoanethole. Tarragon. Isolated from the rind of Persea gratissima, and from oil of estragon, found in oils of Russian anise, basil, fennel, turpentine, and others. A flavoring additive used in bakery products, both alcoholic and nonalcoholic beverages, chewing gum, confections, fish, ice cream, salads, sauces, and vinegar. See Estragole.

ALLYL ANTHRANILATE • A synthetic citrus fruit and grape flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

ALLYL BUTYRATE • A synthetic butter, fruit, and pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

ALLYL CAPROATE • 2-Propenyl-N-Hexanoate. Flavoring additive used in candy, gelatin desserts, puddings. Poison by ingestion and skin contact. An irritant to human skin.

ALLYL CINNAMATE • A light to yellow liquid with a cherry odor, it is used as a synthetic fruit and grape flavoring additive for beverages, ice cream, ices, candy, baked goods. Moderately toxic by ingestion. Human skin irritant. ASP

ALLYL CROTONATE • Used in the manufacture of vitamins and flavorings. ASP

ALLYL CYCLOHEXANE ACETATE and BUTYRATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

ALLYL CYCLOHEXANE HEXANOATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

ALLYL CYCLOHEXANE PROPIONATE • A synthetic, liquid and colorless with a pineapplelike odor, used in pineapple flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, chewing gum, and icings. Poisonous by ingestion. When heated to decomposition, it emits acrid smoke and irritating fumes. ASP

ALLYL DISULFIDE • Found naturally in garlic and leeks but considered a synthetic flavoring. It is used in garlic, onion, and spice flavorings for meats and condiments. ASP

ALLYL ENANTHATE • See Allyl Heptanoate.

ALLYL 2-ETHYLBUTYRATE • A synthetic berry, fruit, and brandy flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and puddings. GRAS. ASP

ALLYL 2-FUROATE • A synthetic coffee and pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. GRAS. ASP

ALLYL HEPTANOATE • A synthetic berry, fruit, and brandy flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Moderately toxic by ingestion and skin contact. A human skin irritant. Combustible liquid. When heated to decomposition, it emits acrid smoke and irritating fumes. GRAS

ALLYL HEXANOATE • A synthetic orange, strawberry, apple, apricot, peach, pineapple, and tutti-frutti flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and toppings. GRAS. ASP

ALLYL a-IONONE • Cetone V. A synthetic additive, yellow, with a strong fruity, pineapplelike odor, used in fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and toppings. A skin irritant. GRAS

ALLYL ISOTHIOCYANATE • AIT. Brassica spp. Volatile oil of mustard (VOM). Mustard Oil. A naturally occurring additive in mustard, horseradish, and onion used in meat and spice flavorings for beverages, ice cream, ices, candy, condiments, meat, and pickles. Colorless or pale yellow with a pungent, irritating odor and acrid taste. It is used also in the manufacture of war gas. Can cause blisters and other skin problems. Toxic. Mitsubishi, which applied for GRAS status for this additive, noted that VOM may be used in foods that are packaged for use in the home, in food service establishments, or in farm fields for packing of raw agricultural commodities. VOM is incorporated into a food preservation system that releases the substance into airspace within storage bags and other containers. Used as an antimicrobial agent (in packaged foods). Mitsubishi states that VOM's ability to retard the growth of a wide range of common bacteria, fungi, molds, and yeast has been well established. Based on the information provided by Mitsubishi, as well as other information available to the FDA, the agency had no questions at the time regarding Mitsubishi's

conclusion that VOM is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of VOM. See Isothiocyanates. ASP

ALLYL ISOVALERATE • Derived from valeric acid (see), it is used as a flavoring. Listed as a cancer-causing agent by the Environmental Defense Fund. ASP

ALLYL MERCAPTAN • A synthetic spice flavoring additive for beverages, ice cream, ices, candy, baked goods, and meats. Poison by inhalation and ingestion. Strong irritant to the skin and mucous membranes. Dangerous fire hazard. ASP

4-ALLYL-2-METHOXY PHENOL • See Eugenol.

ALLYL METHYL DISULFIDE • A synthetic flavoring. See Allyl Alcohol and Sulfides. ASP

ALLYL NONANOATE • A synthetic fruit and wine flavoring additive for beverages, ice cream, ices, candy, baked goods, and meats. ASP

ALLYL OCTANOATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Moderately toxic by ingestion. A skin irritant. ASP

ALLYL PELARGONATE • Liquid, fruity odor used in flavors and perfumes.

ALLYL PHENOXYACETATE • Acetate PA. A synthetic fruit and grape flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Moderately toxic by ingestion and skin contact. ASP

ALLYL PHENYLACETATE • A synthetic pineapple and honey flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

ALLYL PROPIONATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

ALLYL SÓRBATE • A synthetic fruit and grape flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

ALLYL SULFHYDRATE • See Allyl Mercaptan.

ALLYL SULFIDE • A synthetic fruit and grape flavoring additive for beverages, ice cream, ices, candy, baked goods, condiments, and meats. Occurs naturally in garlic and horseradish. Irritates the eyes and respiratory tract. Readily absorbed through the skin. Acute exposure can cause unconsciousness. Long-term exposure can cause liver and kidney damage. The IPCS INCHEM (see) says more information is needed. ASP

ALLYL THIOL • See Allyl Mercaptan.

ALLYL THIOPROPIONATE • A flavoring derived from the onion. ASP

ALLYL TIGLATE • A synthetic fruit and grape flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

ALLYL 10-UNDECENOATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

ALLYL UNDECYLENATE • See Allyl 10-Undecenoate.

ALLYL VALERATE • Artificial Flavoring. See Valeric Acid. EAF p-ALLYLANISOLE • See Estragole.

4-ALLYLVERATROLE • See Eugenyl Methyl Ether.

ALMOND, BITTER • Essential oil for flavoring. Free from prussic acid (see). GRAS

ALMOND OIL • Bitter Almond Oil. A flavoring additive from the ripe seed of a small tree grown in Italy, Spain, and France. Colorless or slightly yellow, strong almond odor, and mild taste. Used in cherry and almond flavorings for beverages, ice cream, ices, candy, baked goods, chewing gums, maraschino cherries, and gelatin desserts. Used also as an emulsifier in the manufacture of liqueurs and perfumes. It is distilled to remove hydrocyanic acid (prussic acid), which is toxic. Nontoxic without the hydrocyanic acid. GRAS. ASP

ALOE VERA • A compound expressed from the aloe plant leaf from a South African lilylike plant. Used in bitters, vermouth, and spice flavorings for beverages (2,000 ppm) and alcoholic drinks. It contains 99.5 percent water, with the remaining 0.5 percent composed of some twenty amino acids (see) and carbohydrates. It has been used as a cathartic but was found to cause severe intestinal cramps and sometimes kidney damage. Cross-reacts with benzoin and balsam Peru in those who are allergic to these ingredients. EAF

ALPHA-ACETOLACTATE DECARBOXYLASE • An enzyme preparation derived from Bacillus subtillis modified by recombinant methods to contain gene coding for enzyme from B. brevis. Used as a processing aid in the production of alcoholic malt beverages and distilled liquors. EAF

ALPHA-ALKYL-OMEGA-HYDROXY-POLY (OXYETHYLENE) • An indirect additive, it is used as a soap and surfactant. Toxicity to humans, including carcino-genicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity. The FDA says it "may be safely used in surface lubricants employed in the manufacture of metallic articles that contact food."

ALPHA-AMYLASE ENZYME PREPARATION FROM BACILLUS STEARO-THERMOPHILUS • An enzyme used to modify food starch. See Modified Starch and Bacillus Stearothermophilus. GRAS. EAF

ALPHA-GALACTOSIDASE FROM MORTIERELLA VINACEAE • An enzyme used in the production of sugar from sugar beets to increase sugar yield. No residue is permitted in finished product.

(ALPHA RS, 2R)-FLUVALINATE (RS)-ALPHA-CYANO-3-PHENOXYBEN-ZYL(R)-2[2-CHLORO-4-TRIFLUOROMETHYL)ANILINO]3-METHYLBUTO-NATE • An insecticide. FDA residue tolerances are 1 ppm as a residue on cottonseed; 1 ppm as a residue in cottonseed oil; 0.3 ppm in cottonseed hulls; 0.05 ppm as a residue in meat by-products and fat of cattle, goats, hogs, poultry, and sheep; 0.01 ppm as residues in milk, eggs, fat, meat of cattle, goats, hogs, poultry, and sheep. Contains cyanide (see).

ALPHA-HYDRO-OMEGA-HYDROXY POLY (OXYETHELENE) POLY (OXYPROPYLENE) POLY (OXYETHYLENE)(15 MOLE MINIMUM)BLOCKED CO-POLYMER, LOW ERUCIC ACID RAPESEED OIL POLYMERS • A pesticide and defoaming agent. See Polyoxyethylene and Rapeseed Oil. EAF

ALPHA-ISOBUTYLPHENETHYL ALCOHOL • Benzyl isobutyl carbinol. Colorless, slightly oily liquid with a green-floral, fresh, slightly sweet odor. In 2001, the JECFA (see) said it was acceptable with no safety concern at current levels of intake when used as a flavoring agent. ASP

ALPHA-METHYLBENZYL ACETATE • Used in film production. Harmful. See Chloroprene. ASP

ALPHA-METHYLBENZYL BUTYRATE • Colorless oily liquid with a fruity, floral odor. The JECFA has no safety concern at current levels of intake when used as a flavoring agent. ASP

ALPHA-METHYLBENZYL ISOBUTYRATE • Synthetic flavoring additive. A colorless oily liquid with a sweet, floral-green odor. The JECFA has no safety concern about it.

ALPHA-PROPYLPHENYETHYL ALCOHOL • Flavoring. See Phenyethyl alcohol. ASP

ALPHA TOCOPHEROL • There is reported use of the chemical; it has not yet been assigned for toxicology literature. See Tocopherols and Vitamin E. GRAS. E

ALTHEA FLOWERS or ROOT • Marshmallow Root. A natural flavoring substance from a plant grown in Europe, Asia, and the United States. The dried root is used in strawberry, cherry, and root beer flavorings for beverages. The boiled root is used as a demulcent in ointments to soothe

mucous membranes. The roots, flowers, and leaves are used externally as a poultice. There is reported use of the chemical; it has not yet been assigned for toxicology literature. NUL for flowers. ASP for root.

ALUM • Potash Alum. Aluminum Ammonium. Potassium Sulfate. A colorless, odorless, crystalline, water-soluble solid used as a styptic (stops bleeding). A double sulfate of aluminum and ammonium potassium, it is also employed to harden gelatin. Has produced gum damage and fatal intestinal hemorrhages. It has a low toxicity in experimental animals but ingestion of 30 grams (an ounce) has killed an adult human. In concentrated solutions alum is also known to cause kidney and gum damage. GRAS when used in packaging only. NUL

ALUMINUM • Silvery white, crystalline solid. It is frequently used in food additives. Ingestion or inhalation of aluminum can aggravate kidney and lung disorders. Aluminum deposits have been found in the brains of Alzheimer's victims but its part, if any, in this degenerative brain disorder is not clear. The European Parliament in 2003 said these aluminum-containing additives cause free aluminum, which can lead to intoxications and which seem to contribute to Alzheimer's disease. People suffering from certain kidney dysfunctions can accumulate aluminum in their organs. Therefore, the Parliament said these additives should be banned. On the other hand at this writing, it is approved by the European Union (see). E.

ALUMINUM AMMONIUM SULFATE • Odorless, colorless crystals with a strong astringent taste. Used in purifying drinking water, in baking powders, as a buffer and neutralizing additive in milling, and in the cereal industries. Used also for fireproofing and in the manufacture of vegetable glue and artificial gems. In medicine, it is an astringent and styptic (stops bleeding). Ingestion of large amounts may cause burning in mouth and pharynx, vomiting, and diarrhea. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practice. ASP. E

ALUMINUM CALCIUM SILICATE • Anticaking additive used so that it is 2 percent of table salt. Used also in vanilla powder to prevent caking. Essentially harmless when given orally. GRAS. NIL

ALUMINUM CAPRATE • Salt of aluminum used in processing food. See Caprylic Acid and Aluminum Salts. NUL

ALUMINUM CAPRYLATE • Salt used in processing. See Caprylic Acid and Aluminum Salts. NUL

ALUMINUM DISTEARATE • A binder that holds loose powders together when compressed into a solid cake form. See Aluminum Stearates.

ALUMINUM HYDROXIDE • An alkali used as a leavening additive in the production of baked goods. Also used as a gastric antacid in medicine. Aluminum hydroxide has a low toxicity but may cause constipation if ingested. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging only, with no limitations other than good manufacturing practices. ASP

ALUMINUM ISOSTEARATES/LAURATES/STEARATES • The aluminum salt of a mixture of isostearic acid, lauric acid, and stearic acid (see all). Used as a gelling additive.

ALUMINUM ISOSTEARATES/MYRISTATES • Myristates is the aluminum salt of a mixture of isostearic acid and myristic acid (see both). Used as a gelling additive.

ALUMINUM ISOSTEARATES/PALMITATES • Palmitate is the aluminum salt of palmitic acid (see) and isostearic acid (see). Used as a gelling additive.

ALUMINUM LACTATE • The aluminum salts of lactic acid (see both).

ALUMINUM LAURATE • Used as anticaking additive or free-flow additive, emulsifier or emulsifier salt. NUL

ALUMINUM MONOSTEARATE • Anticaking additive, binder, emulsifier, and stabilizer used in packaging materials and various foods. Must conform to FDA specifications for salts, fats, or fatty acids derived from edible oils.

ALUMINUM MYRISTATES/PALMITATES • Myristate is the aluminum salt of a mixture of palmitic acid and isostearic acid (see both). Used as a gelling additive. NUL

ALUMINUM NICOTINATE • Used as a source of niacin in special diet foods, also as a medication to dilate blood vessels and to combat fat. Tablets of 625 milligrams are a complex of aluminum nicotinate, nicotinic acid, and aluminum hydroxide. Side effects are flushing, rash, and gastrointestinal distress when taken in large doses. NIL

ALUMINUM OLÉATE • A yellow, thick, acidic mass practically insoluble in water. Used in packaging, as lacquer for metals, in waterproofing, and for thickening lubricating oils. Low toxicity. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging only, with no limitations other than good manufacturing practices. NUL

ALUMINUM PALMITATE • White granules, insoluble in water, used as a lubricant and waterproofing and packaging material. Also used to thicken petroleum and as an antiperspirant. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging only, with no limitations other than good manufacturing practices. NUL

ALUMINUM PHOSPHIDE • Used to fumigate processed foods including corn grits, brewer's malt, and brewer's rice. The FDA requires that processors aerate the finished food for forty-eight hours before it is offered to the consumer. It further warns that under no conditions should the formulation containing aluminum phosphide be used so that it or its unreacted residues will come into contact with any processed food. Reacts with moist air to produce the highly toxic phosphine. Residues of phosphine in or on processed food may not exceed .01 parts per million, according to the FDA. Phosphine may cause pain in the region of the diaphragm, a feeling of coldness, weakness, vertigo, shortness of breath, bronchitis, edema, lung damage, convulsions, coma, and death.

ALUMINUM POTASSIUM SULFATE • Colorless, odorless, hard, transparent crystals or powder with a sweet antiseptic taste used for clarifying sugar and as a firming additive and carrier for leaching additives. It is used in the production of sweet and dill pickles, cereal, flours, bleached flours, and cheese. Ingestion of large quantities may cause burning in the mouth and throat and stomach distress. GRAS. ASP

ALUMINUM SALTS • Aluminum Acetate. Aluminum Caprate. Aluminum Caprylate. Aluminum Chloride. Aluminum Chlorohydrate. Aluminum Diacetate. Aluminum Distearate. Aluminum Glycinate. Aluminum Hydroxide. Aluminum Lanolate. Aluminum Methionate. Aluminum Phenolsulfonate. Aluminum Silicate. Aluminum Stearate. Aluminum Sulfate. Aluminum Tristearate. These are both the strong and weak acids of aluminum used in food processing. The strong salts may cause skin irritation.

ALUMINUM SALTS OF FATTY ACIDS • Used as binders, emulsifiers, and anti-caking additives. Regulated and used according to good manufacturing practices. See Aluminum Sodium Sulfate. ASP

ALUMINUM SILICATE • Kaolin. Obtained naturally from clay or synthesized, used as an anticaking and coloring ingredient. Essentially harmless when given orally. E

ALUMINUM SODIUM SULFATE • Colorless crystals used as a buffer, firming additive, neutralizing additive, and carrier for bleaching additives. For other uses, see Aluminum Potassium Sulfate. A weak sensitizer. Local contact may cause skin rash. GRAS. ASP. E

ALUMINUM STEARATES • Hard, plasticlike materials used in waterproofing fabrics, thickening lubricating oils, and as a chewing-gum base

ALUMINUM STEARATES • Hard, plastic-like materials used in waterproofing fabrics, thickening lubricating oils, and as a chewing gum base component and a defoamer component used in processing beet sugar and yeast. Aluminum tristearate is a hard plastic material used as a thickener and coloring in cosmetics. NUL

ALUMINUM SULFATE • Cake Alum. Patent Alum. Colorless crystals, soluble in water. Odorless, with a sweet, mildly astringent taste. Used in producing sweet and dill pickles and as a modifier for starch. It is used in packaging materials, pickle relish, potatoes, and shrimp packages. Moderately toxic by ingestion and injection. May affect reproduction. GRAS. ASP. E

AMARANTH • Red No. 2, banned by the FDA in 1976 and reaffirmed in 1980. E

AMARANTH FLOUR • A grain grown in Central and South America for thousands of years, it is high in protein and fiber. Because it costs more than other grains, it is usually found only in health food stores.

AMBERGRIS • Concretion from the intestinal tract of the sperm whale found in tropical seas. About 80 percent cholesterol, it is a gray to black waxy mass used for fixing delicate odors in perfumery. It is also used in flavoring foods and beverages. GRAS. EAF

AMBRETTE • A natural flavoring additive from the seed of the hibiscus plant, clear yellow to amber as a liquid, with a musky odor. Seed used in berry and floral flavorings for beverages, ice cream, ices, candy, baked goods. The tincture is used in black walnut and vanilla flavorings for the same products and in cordials. The seed oil is used in fruit flavoring for beverages, ice cream, candy, and baked goods. GRAS. ASP

AMBRETTOLID • Formed in ambrette seed oil. Used as a flavoring, perfume fixative. EAF.

AMBUSH • Ectiban. Exmin. Permethrin. A pesticide, poisonous by inhalation and injection. Moderately toxic by ingestion. May be mutagenic. A skin irritant.

AMDR • The abbreviation for acceptable macronutrient distribution range.

AMERICAN DILLSEED OIL • See Dill.

AMES TEST • Dr. Bruce Ames, a biochemist at the University of California, developed a simple, inexpensive test in the early 1970s using bacteria that reveals whether a chemical is a mutagen. Almost all chemicals that are known carcinogens have also been shown to be mutagenic on the Ames Test. Whether the test can identify carcinogens is still controversial.

AMINE OXIDES • Surfactants derived from ammonia (see both).

2-AMINOACETOPHENONE • Used in flavorings, particularly in beer and wines. EAF

AMINO ACIDS • The body's building blocks, from which proteins are constructed. Of the twenty-two known amino acids, eight cannot be manufactured in the body in sufficient quantities to sustain healthy growth. These eight are called “essential” because they are necessary to maintain good health. A ninth, histidine, is thought to be necessary for growth only in childhood. Widely used in moisturizers and emollients because they are thought to help penetrate the skin. Certain amino acid deficiencies appear to have tumor-suppressing action. The amino acids of protein foods are separated by digestion and go into a general pool from which the body takes the ones it needs to make its own personal proteins.

4-AMINO-6-tert-BUTYL-3-(METHYL THIO)-1,2,4-TRIAZIN-5-ONE • Sencoral. Secorex. An herbicide used on barley and sugarcane and in potato chips, processed potatoes, molasses, and wheat, except flour. Under the EPA Genetic Toxicology Program. Poison by ingestion. A selective residue herbicide.

DL-(3-AMINO-3-CARBOXYPROPYL)DIMETHYLSULFONIUM CHLORIDE • Flavoring. ASP

4-AMINO-6-(1,1-DIMETHYL-ETHYL)-3-(METHYLTHIO)-1,2,4-TRIAZINE-5 (4H)-ONE • Metribuzin. Herbicide found in processed potatoes, including potato chips. Herbicide is applied on the raw agricultural commodity. The FDA tolerances are 3 ppm in processed potatoes and potato chips; 3 ppm in animal feed using wheat; 2 ppm in animal feed using tomato pomace; 0.3 ppm in animal feed using sugarcane molasses; and 0.5 ppm in animal feed using sugarcane bagasse. Toxic.

AMINOGLYCOSIDE 3'-PHOSPHOTRANSFERASE II • An enzyme implicated in antibiotic resistance. Bacterial resistance to antibiotics is an increasing concern. By evolving characteristics such as altered antibiotic targets, or enzymes able to chemically modify antibiotics, bacteria are increasingly able to evade their effects. Aminoglycosides are a class of antibiotic commonly used in the treatment of hospital-related infections. The enzyme is used to combat antibiotics in food. ASP

AMINO TRI(METHYLENE PHOSPHONIC ACID), SODIUM SALT •

Corrosion and scale inhibitor, water softening additive. NUL

1-AMINO-2-PROPANOL • Used in processing some food additives such as vitamins and fats and beverages, confectionery frostings, frozen dairy, gelatins, hard candies, and instant coffee. Corrosive, causes burns. Harmful by inhalation, ingestion, and through skin absorption. Causes severe eye irritation, with possible burns. Very destructive of mucous membranes. EAF

4-AMINO-3,5,6-TRICHLOROPICOLINIC ACID • Amdon Grazon. Borolin. Chloramp. An herbicide and defoliant used on barley, oats, and wheat. An experimental cancer-causing additive and teratogen. Moderately toxic by ingestion. para-AMINOBENZOIC ACID • See p-Aminobenzoic Acid. p-AMINOBENZOIC ACID • PABA. Acid found in vitamin B complex. Miscellaneous uses. An antioxidant that helps in the formation of red blood cells, aids in the maintenance of healthy intestinal flora, and acts as a coenzyme in the breakdown and utilization of protein. PABA is found in liver, brewer's yeast, wheat germ, molasses, eggs, organ meats, yogurt, and green leafy vegetables; reportedly protects against secondhand smoke, ozone, and other air pollutants; improves flexibility; helps keep skin smooth; has been used to prevent and reverse accumulation of abnormal fibrous tissue, as occurs in various connective tissue diseases. Deficiency may cause extreme fatigue, eczema, irritability, depressions, nervousness, constipation, headaches, digestive disorders, and hair turning prematurely gray. The FDA has said it should be used at less than 30 milligrams per day as a food additive. It is used medicinally to treat arthritis. However, it can cause eczema (see) and a sensitivity to light in susceptible people, who may react to sunlight by erupting with a rash, sloughing, and/or swelling. GRAS. NUL

AMINOBENZYLPENICILLIN • Acillin. Ado Bacillin. Alpen. Penbritin. Vicilin. Animal drug used in beef, milk, and pork. Under the EPA Genetic Toxicology Program. Moderately toxic by injection. Human systemic effects by ingestion: fever, agranulocytosis, and other blood effects. May be mutagenic.

6-AMINOCAPROIC ACID • See Amino Acids and Caproic Acid.

AMINOGLYCOSIDE 3'-PHOPHOTRANS FERASE II • There is reported use of the chemical; it has not yet been assigned for toxicology literature.

1-AMINO-2 PROPANOL • Crystals made from nitrogen compounds that are soluble in alcohol and mixable with water. Used as an emulsifying ingredient in mineral oils.

AMINOMETHYL PROPANOL • An alcohol made from nitrogen compounds; mixes with water. Soluble in alcohol and used as an emulsifying ingredient. Used in medicines that reduce body water. Prolonged skin exposure may cause irritation due to alkalinity, but in most commercial products the alkalinity is neutralized. It is used in cosmetics up to 10 percent.

AMINOPEPTIDASE FROM LACTOCOCCUS LACTIS • Enzyme used to make cheddar cheese and protein hydrolysates. There is reported use of the chemical; it has not yet been assigned for toxicology literature. GRAS. EAF

AMITRAZ • A pesticide that is tolerated in 7 ppm in citrus pulp for use in animal feeds. The toleration in milk is 0.03 ppm and in the fat of cattle and hogs, 0.1 ppm. As residues in kidney and liver of hogs, 0.2 ppm, and in meat by-products of cattle and hogs, 0.03 ppm.

AMLA • Indian Gooseberry. It has long been known in its native India for having protective antioxidant qualities, and it is increasingly being sought as an additive. It is a traditional Ayurvedic (see) rejuvenator and detoxifier. The fruits are widely used in jams, syrups, jellies, candies, pickled preserves, relishes, and tomato sauce. The fruit is also being used in functional foods (see) and cosmetics to combat free radicals (see). The fruit also contains up to 2 percent natural vitamin C.

AMMONIA • Used as a pesticide exempt from requirement of tolerance. Obtained by blowing steam through incandescent coke. Ammonia is also used in the manufacture of explosives and synthetic fabrics. It is extremely toxic when inhaled in concentrated vapors and is irritating to the eyes and mucous membranes.

AMMONIA CARAMEL • See Caramel. E

AMMONIATED COTTONSEED MEAL • As a source of protein for ruminants and chickens and nonprotein nitrogen.

AMMONIATED GLYCYRRHIZIN • See Licorice. GRAS

AMMONIATED RICE HULLS • Used in feed for beef cattle as a source of crude fiber and sole source of nonprotein nitrogen.

AMMONIUM ACETATE • Ammonium Salt of Acetic Acid (see Acetic Acid). A buffer for protein and nucleic acid purifications. Used as a preservative for meats. The weight-of-evidence judgment supports the likelihood that the substance is a human carcinogen.

AMMONIUM ALGINATE • A stabilizer and water retainer. The report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now, and it should continue its GRAS status with limitation on amounts that can be added to food. See Alginates. E

AMMONIUM BICARBONATE • An alkali used as a leavening additive in the production of baked goods, confections, and cocoa products and animal feeds. Usually prepared by passing carbon dioxide gas through concentrated ammonia water. Used medicinally as an expectorant and to break up intestinal gas. Also used in compost heaps to accelerate decomposition. GRAS. ASP

AMMONIUM BITARTRATE • White crystals, soluble in water, derived from tar-taric acid. Used in baking powder.

AMMONIUM CARBONATE • A white solid alkali derived partly from ammonium bicarbonate (see). It decomposes when exposed to air. Used in baking powders and for defatting woolens and in animal feeds. Ammonium carbonate can cause skin rashes on the scalp, forehead, or hands. See Ammonium Bicarbonate. GRAS. ASP. E

AMMONIUM CASEINATE • The ammonium salt of casein, a protein occurring in milk and cheese and bakery products. See Casein. NUL

AMMONIUM CHLORIDE • Ammonium salt that occurs naturally. Colorless, odorless crystals or white powder, saline in taste, and incompatible with alkalies. Used as a dough conditioner and a yeast food in bread, rolls, buns, and so on. Saline in taste. If ingested, it can cause nausea, vomiting, and acidosis in doses of 0.5 to 1 gram. Lethal as an intramuscular dose in rats and guinea pigs. As with any ammonia compound, concentrated solutions can be irritating to the skin. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue GRAS status for packaging only with no limitations other than good manufacturing practices. ASP

AMMONIUM CITRATE, DIBASIC • The salt of citric acid (see), it is a natural constituent of plants and animals and dissolves easily in water, releasing free acid. Used as a sequestrant, flavor enhancer, and as a firming additive. GRAS. ASP

AMMONIUM GLUCONATE • Prepared from gluconic acid with ammonia, it is used as an emulsifying additive for cheese and salad dressings. NUL

AMMONIUM HYDROXIDE • Ammonium Bicarbonate. Ammonia Water. A weak alkali formed when ammonia dissolves in water; exists only in solution. A clear colorless liquid with an extremely pungent odor. Used as a buffer and neu-tralizer in cocoa products and in animal feeds. Also used in detergents and for removing stains. It is irritating to the eyes and mucous membranes. A human poison by ingestion. A severe eye irritant. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging only, with no limitations other than good manufacturing practices. GRAS. ASP. E

AMMONIUM ISOVALERATE • See Isovaleric Acid. ASP

AMMONIUM OLEATE • The ammonium salt of oleic acid (see) used as an emulsifying additive.

AMMONIUM PECTINATE • Used in the production of beer. See Pectin and Ammonia. EAF

AMMONIUM PERSULFATE • Ammonium Peroxydisulfate. Odorless crystals or white powder. Used as an oxidizer and bleacher and as a modifier for food starches. See Modified Starch. ASP

AMMONIUM PHOSPHATES • Monobasic and Dibasic. Ammonium Salt. An odorless white or colorless crystalline powder with a cooling taste used in mouthwashes. They are used as acidic constituents of baking powder. They are used as buffers, acid regulators, leavening additives, and bread, roll, and bun improvers up to 10 percent of product. Used in brewing industry. They are also used for purifying sugar, and in yeast cultures and fertilizers. Monobasic is used as baking powder with sodium bicarbonate. Medically used for their saline action. They have a diuretic effect (reducing body water), and they make urine more acid. GRAS. ASP

AMMONIUM PHOSPHATIDES • Manufactured either synthetically or from a mixture of glycerol and partially hardened rapeseed oil (see both). Used mainly as an emulsifier, to lower the surface tension of water, thus allowing the better combining of oils, fats, and water, and as a stabilizer, to prevent separation. Also used as an emulsifier in chocolate and vegetable fat coatings at levels up to 0.7%. Similar in use to lecithin (see). Limited use as an antioxidant. Vegetarians should note that although industrial manufacturing based on propylene or sugar accounts for a large percentage of glycerol production, it can be obtained as a by-product in making soap from animal and vegetable fats and oils. The FDA has no question about the noti-fier's request for GRAS status.

AMMONIUM POTASSIUM HYDROGEN • A stabilizer used in packaging.

AMMONIUM SACCHARIN • See Saccharin.

AMMONIUM SULFATE • Ammonium salt. A yeast food, dough conditioner, and buffer in bakery products. Used medicinally to prolong analgesia. Fatal to rats in large doses. See uses for Ammonium Phosphates. GRAS. ASP. E

AMMONIUM SULFIDE • A salt derived from sulfur and ammonia used as a synthetic spice flavoring additive for baked foods and condiments. ASP

AMMONIUM SULFITE • A processing additive in foods, medicines, and cosmetics. See Sulfites. EAF

AMOXICILLIN TRIHYDRATE • An animal antibiotic used in meat and milk. Tolerance is 0.01 ppm in milk and uncooked edible tissues of meat. Moderately toxic.

AMP • The abbreviation for aminomethyl propanol (see).

AMPD • The abbreviation for aminomethyl propanediol (see).

AMPHO • Means double or both.

AMPHOTERIC • A material that can display both acid and basic properties.

AMPICILLIN • Veterinary drug used in uncooked edible tissues of cattle and swine and in milk.

AMPICILLIN TRIHYDRATE • Amcill. Princillin. Vidopen. Animal drug used in meat. FDA tolerance is 0.01 ppm residue in uncooked tissue of cattle and swine and in milk.

AMPROLIUM • Crystals from methanol and ethanol (see both) used as an animal antibiotic in beef, chicken, eggs, pheasants, and turkey. Limitation in chickens and turkeys of 1 ppm in liver and kidney, 0.5 ppm in muscle. Limitation of 8 ppm in egg yolks, 4 ppm in whole eggs.

AMS • Abbreviation for U.S. Department of Agriculture's Agricultural Marketing Service. After an AMS inspection, products that don't conform to assigned specifications are reported back to the company. The produce industry relies on AMS's inspectors to provide impartial review and certification of shipments in various stages of marketing.

AMYL- • Prefix meaning derived from amyl alcohol (see).

AMYL ACETATE • Banana Oil. Pear Oil. Obtained from amyl alcohol, with a strong fruity odor. Used in nail finishes and nail polish remover as a solvent, and as an artificial fruit essence in perfume. Also used in food and beverage flavoring and for perfuming shoe polish. Amyl acetate is a skin irritant and causes central nervous system depression when ingested. Exposure of 950 ppm for one hour has caused headache, fatigue, chest pain, and irritation of the mucous membranes.

AMYL ALCOHOL • A synthetic berry, chocolate, apple, banana, pineapple, liquor, and rum flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Used as a solvent in nail polish. It occurs naturally in cocoa and oranges and smells like camphor. Highly toxic and narcotic; ingestion of as little as 30 milligrams has killed humans. Inhalation causes violent coughing. ASP

AMYL ALDEHYDE • See Valeraldehyde.

AMYL BUTYRATE • A synthetic flavoring additive, colorless, with a strong apricot odor. Occurs naturally in cocoa. Used in raspberry, strawberry, butter, butterscotch, fruit, apple, apricot, banana, cherry, grape, peach, pineapple, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, cherry syrup, and chewing gum. Used in some perfume formulas for its apricotlike odor. ASP

AMYL CAPRATE • See Cognac Oil.

AMYL CINNAMIC ALDEHYDE • Liquid with a strong floral odor in perfumes and flavorings. See Cinnamic Acid. ASP

AMYL DECANOATE • Approved as a synthetic flavoring, but there is no current reported use of the chemical, and therefore, although toxicology information may be available, it is not being updated by the FDA. NIL

AMYL FORMATE • A synthetic flavoring. ASP

AMYL 2-FUROATE • A synthetic rum and maple flavoring additive for beverages, candy, baked goods, and condiments. ASP

AMYL GÁLLATE • An antioxidant obtained from nutgalls and from molds. See Gallates.

AMYL HEPTANOATE • A synthetic lemon, coconut, fruit, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, and chewing gum. ASP

AMYL HEXANOATE • A synthetic citrus, chocolate, fruit, and liquor flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

2-AMYL-59 or 60-KETO-1, 4-DIOXANE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, and shortening. ASP

AMYL METHYL DISULFIDE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. EAF

AMYL OCTANOATE • Occurs naturally in apples. A synthetic chocolate, fruit, and liquor flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

AMYL PROPIONATE • Colorless liquid with a fruity, applelike odor used in perfumes, flavors, and in lacquers. When heated to decomposition, it emits acrid smoke and irritating fumes.

AMYL SALICILATE • Derived from salicylic acid. A pleasant-smelling liquid used as a flavoring and in sunscreen lotions and perfumes. Insoluble in water. See Salicylates. NIL

AMYLASE (Bacterial) • Aspergillus flavus, A. niger, or A. oryzae, or Bacillus sub-tilis. Enzymes from various fungi used as antibacterial additives.

AMYLASE (Swine) • An enzyme prepared from the hog pancreas used in flour to break down starch into smaller sugar molecules. Then, in turn, the enzymes produced by yeast in the dough again split these sugar molecules to form carbon dioxide gas, which causes the dough to rise. It improves crumb softness and shelf life. It is also used medically to combat inflammation.

AMYLASE FROM ASPERGILLUS FLAVUS • An enzyme from aspergillus (see) used in starch modification. ASP

AMYLASE FROM ASPERGILLUS NIGER • An enzyme used in starch modification and in syrup, ethanol, and animal feed. See Aspergillus. ASP

AMYLASE FROM ASPERGILLUS ORYZAE • Enzyme from a mold. Used in starch, syrup, ethanol, and animal feed. ASP

AMYLASE FROM BACILLUS SUBTILIS • Enzyme preparation used in modifying starch. Produced by the controlled fermentation of Bacillus subtilis containing the gene for amylase from Bacillus stearothermophilus. The strain of Bacillus subtilis is nonpathogenic and nontoxicogenic. ASP

a-AMYLCINNAMALDEHYDE • A synthetic additive, yellow, with a strong floral odor of jasmine, used in strawberry, apple, apricot, peach, and walnut flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Moderately toxic by ingestion. Amild skin irritant. Susceptible to oxidation by air. ASP a-AMYLCINNAMALDEHYDE DIMETHYL ACETAL • A synthetic fruit flavoring additive for beverages, ice cream, candy, and baked goods. ASP

AMYLCINNAMATE • Colorless to pale yellow liquid with a cocoa odor. Used as a flavoring additive.

a-AMYLCINNAMYL ACETATE • A synthetic chocolate, fruit, and honey flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. a-AMYLCINNAMYL ALCOHOL • A synthetic chocolate, fruit, and honey flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. a-AMYLCINNAMYL FORMATE • A synthetic chocolate, fruit, nut, and maple flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum.

a-AMYLCINNAMYL ISOVALERATE • A synthetic chocolate, fruit, grape, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum.

AMYLOGLUCOSIDASE • A sweet enzyme derived from Rhizopus niveus with a growth-encouraging potential. Used in the production of gelatinized

AMYLOGLUCOSIDASE • A sweet enzyme derived from Rhizopus niveus with a growth encouraging potential. Used in the production of gelatinized starch into sugars and in the production of distilled spirits and vinegar. ASP

AMYLOPECTIN • Amioca. Derived from starch, it is the almost insoluble outer portion of the starch granule. The gel constituent of starch. Forms a paste with water. Used as a texturizer in foods and cosmetics. Obtained from corn. Gives a red color when mixed with iodine and does not gel when mixed with water.

2-AMYL-5-OR 6-KETO-1,4-DIOXANE • See Dioxane and Amyl-. ASP

AMYLOSE • Starches commonly processed from plants contain 18 to 27 percent amylose. It is the inner, relatively soluble portion of starch granules. Cornstarch solutions often form opaque gels after cooking and cooling; this is because of the presence of amylose. It is used as a dispersing and mixing additive for oleoresins (see).

AMYRIS OIL • Sandalwood Oil. The volatile oil obtained from a gummy wood and used as a flavoring additive in chewing gum and candy. It is a clear, pale yellow, viscous liquid with a distinct odor of sandalwood. EAF

ANAPHYLAXIS • Severe hypersensitivity reaction to an allergen. Symptoms may include rash, swelling, breathing difficulty, and collapse. A severe form is anaphy-lactic shock, which can be fatal.

ANCHUSIN EXTRACT • See Alkanet Root.

ANETHOLE • A flavoring additive used in fruit, honey, licorice, anise, liquor, nut, root beer, sarsaparilla, spice, vanilla, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (1,500 ppm), and liquors (1,400 ppm). Obtained from anise (see) oil, fennel, and other sources. Colorless or faintly yellow liquid with a sweet taste and a characteristic aniselike odor. Chief constituent of anise. Anethole is affected by light and caused irritation of the gums and throat when used in a denture cream. When applied to the skin, anethole may produce hives, scaling, and blisters. GRAS

ANETHUM CRAVEOLENS • See Dill.

ANGELIC ACID • See Angelica.

ANGELICA • Essential oil used in inexpensive fragrances, toothpastes, and mouth-washes. Grown in Europe and Asia, the aromatic seeds, leaves, stems, and roots have been used in medicine for flatus (gas), to increase sweating, and to reduce body water. The bark is used medicinally as a purgative and emetic. The root oil is used in fruit, gin, and rum flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and liquors. The root extract is used in berry, liquor, wine, maple, nut, walnut, and root beer flavorings for the same foods, up to baked goods, plus syrups. The seed extract is used in berry, fruit, walnut, maple, and spice flavorings for beverages, candy, baked goods, syrups, and condiments. The seed oil is used for fruit and gin flavoring for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and liquors. The stem oil is used for fruit flavoring for the same foods as seed oil, excepting liquors. Angelica can induce sensitivity to light. GRAS. EAF

ANGOLA WEED • Essential oil from a weed from West Africa used as a flavoring additive in alcoholic beverages only. NUL

ANGOSTURA EXTRACT • Cusparia Bark. Flavoring additive from the bark of trees, grown in Venezuela and Brazil. Unpleasant musty odor and bitter aromatic taste. The light yellow liquid extract is used in bitters, liquor, root beer, and spice flavorings for beverages and liquors (1,700 ppm). Formerly used to lessen fever. GRAS. EAF

ANHYDRIDE • A residue resulting from water being removed from a compound. An oxide—combination of oxygen and an element—that can combine with water to form an acid, or that is derived from an acid by the abstraction of water. Acetic acid (see) is an example.

ANHYDROUS • Describes a substance that contains no water.

ANHYDROUS AMMONIA • Source of crude fiber and nonprotein nitrogen in animal feed. See Anhydrous and Ammonia.

ANILINE • One of the most commonly used of the organic bases, it is the parent substance for many dyes and drugs. It is derived from nitrobenzene or chloroben-zene and is among the top five organic chemicals produced each year in the United States. It is used as a rubber accelerator to speed vulcanization, as an antioxidant to retard aging, and as an intermediate (see); it is also used in dyes, photographic chemicals, the manufacture of urethane foams, pharmaceuticals, explosives, petroleum refining, resins and adhesive products, paint removers, herbicides, and fungicides. It is toxic when ingested, inhaled, or absorbed through the skin. It causes allergic reactions. It is a potential human cancer-causing ingredient. It caused cancer in mice when injected under the skin or administered orally. It can also cause contact dermatitis. A 1991 report of a study of 1,749 workers at the Goodyear Tire & Rubber Company plant in Niagara Falls, New York, revealed that workers exposed directly to aniline had 6.5 times the rate of bladder cancer of the average state resident.

ANIMAL COLLAGEN AMINO ACIDS • The major protein of the white fibers of connective tissue, cartilage, and bone that is insoluble in water, but easily altered to gelatins by boiling in water, dilute acids, or alkalies. See Hydrolyzed Protein.

ANIMAL KERATIN AMINO ACIDS • A mixture of amino acids from the hydrolysis of keratin (see). See also Hydrolyzed Keratin.

ANIMAL LIPASE • See Lipase from Animal Tissue.

ANIMAL PROTEIN HYDROLYSATE • A source of animal protein used in feed. p-ANISALDEHYDE • A colorless oil with a hawthorn odor, it is used as a flavoring additive in various foods. Moderately toxic by ingestion. A skin irritant.

ANISE • Anise Seed. Dried ripe fruit of Asia, Europe, and the United States. Used in licorice, anise, pepperoni sausage, spice, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, condiments (5,000 ppm), and meats (1,200 ppm). The oil is used for butter, caramel, licorice, anise, rum, sausage, nut, root beer, sar-saparilla, spice, vanilla, wintergreen, and birch beer flavorings for the same foods as above, excepting condiments but including chewing gum (3,200 ppm) and liquors. Sometimes used to break up intestinal gas. Can cause contact dermatitis. See Star Anise. GRAS. ASP

p-ANISIC ACID • Dermosoft 688. A plant-based natural fungicidal ingredient. A flavoring ingredient. Prepared from methoxybenzene. See Benzene.

ANISÓLE • An artificial flavoring and solvent with a pleasant odor used in licorice, root beer, sarsaparilla, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, and baked goods. Also used in perfumery. Causes behavioral changes in mice. It is a mutagen, and in humans it is a skin irritant. See Phenol. GRAS. EAF

ANISYL ACETATE • Colorless liquid with a lilac odor used in perfumery and flavorings. See Anise and Anisyl Alcohol. ASP

ANISYL ALCOHOL • A synthetic berry, chocolate, cocoa, fruit, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

ANISYL BUTYRATE • A synthetic fruit and licorice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ANISYL FORMATE • Formic Acid. A synthetic raspberry, fruit, licorice, and vanilla flavoring additive for beverages, ice cream, ices, baked goods, and gelatin desserts. Found naturally in currant and vanilla. See Formic Acid for toxicity. ASP

ANISYL PHENYLACETATE • A synthetic honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ANISYL PROPIONATE • Occurs naturally in quince, apple, banana, cherry, peach, and pineapple. A raspberry, cherry, and licorice flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

ANNATTO • Bixa orellana. Bixin. Norbixin. Extract and Seed. A vegetable dye from a tropical tree, yellow to pink, it is used in dairy products, baked goods, margarine, and breakfast cereals. It is also used to color such meat-product casings as bologna and frankfurters. A spice flavoring for beverages, ice cream, baked goods (2,000 ppm), margarine, and breakfast cereals (2,000 ppm). Because of widespread consumer exposure to annatto, one of the most widely used colorings in the U.S. food supply, and because there is a lack of toxicity data for bixin and norbixin (see both), which are concentrated in annatto extract and oils, it is now undergoing testing by industry and FDA-sponsored testing has been deferred. Permanently listed in 1963 but certification not necessary for use (see Certified). The JECFA recommended that populations that have a high intake of annatto extracts continue to be monitored and that annatto extracts be reevaluated. ASP. E

ANOXOMER • An antioxidant used up to 5,000 ppm. ASP

ANTHOCYANINS • Intensely colored, water-soluble pigments responsible for nearly all the reds and blues of flowers and other plant parts. Such color, which is dissolved in plant sap, is markedly affected by the acidity and alkalinity of substances: red at low pH (see) and blue at higher pH values. There are about two hundred known anthocyanins, including those obtained from grapes, cranberries, cherries, and plums. They can be used to color acid compounds, such as wines and cranberry juice cocktail. The twenty anthocyanins in grapes are the major source of anthocyanin pigment for food color. E

ANTHRACENE • A PAH (see). There is no information available from studies on humans to determine effects from being exposed to individual PAHs such as anthracene. Breathing and skin contact with PAHs seem to be associated with cancer in humans. Anthracene is on the EPA's Top Seven Priority List for study. It is also a high-priority dangerous chemical to be eliminated from contaminating water by the EU (see).

ANTHRACITE COAL, SULFONATED • A resin for miscellaneous uses, according to the FDA. NUL

ANTHRANILIC ACID • o-Aminobenzoic Acid. Yellowish crystals with a sweet taste used in flavorings, and dyes. See Benzoic Acid.

ANTHRANILIC ACID, CINNAMYL ESTER • Reddish yellow powder with the odor of balsam used in baked goods, beverages, and candy as a flavoring additive. May be a cancer-causing additive.

ANTHRANILIC ACID, METHYL ESTER • A flavoring additive used in various foods. May cause tumors. Moderately toxic by ingestion. A skin irritant.

ANTIBIOTICS • For growth promotion and feed efficiency. See Bacitracin, Bambermycin, Chlortetracycline, Erythromycin, Lincomycin, Monensin, Oleandomycin Hydrochloride, Oxytetracycline, Tylosin, Salinomycin, Flavophospholipol, and Virginiamycin. The EU has recommended phasing out all such antibiotic growth promoters.

ANTIBODY • Protein in blood formed in response to invasion by a germ, virus, or other foreign body. In sensitive individuals, a special antibody, IgE (see), is responsible for the allergic reaction.

ANTICAKING ADDITIVES • These keep powders and salt free-flowing, such as with calcium phosphates (see) in instant breakfast drinks and other soft-drink mixes.

ANTIFOAMING ADDITIVE • Defoaming Additive. A substance used to reduce foaming due to proteins, gases, or nitrogenous materials that may interfere with processing.

ANTIGEN • Any substance that provokes an immune response when introduced into the body.

ANTIMONY • A metallic element found at very low levels in the environment, so low that often it cannot be measured. Food usually contains small amounts of antimony, and you most likely eat and drink about 5 micrograms (5 millionths of a gram) of antimony every day. The average concentration of antimony in meats, vegetables, and seafood is 0.2-1.1 ppb. The amount and the form in food or water will affect how much antimony enters your blood. If you eat or drink very large doses of antimony, you may vomit. This will prevent most of it from entering through the stomach and intestines into your blood. Antimony in your lungs will enter your blood after several days or weeks. The amount of antimony that will enter your blood from your lungs is unknown. After antimony enters your blood, it goes to many parts of your body. Most of the antimony goes to the liver, lungs, intestines, and spleen. Antimony will leave your body in feces and urine over several weeks. Exposure to 9 milligrams per cubic meter of air (mg/m^3) of antimony for a long time can irritate your eyes, skin, and lungs. It is unknown whether antimony can cause cancer or birth defects, or affect reproduction in humans. Antimony can have beneficial effects when used for therapeutic reasons, such as a medicine to treat people infected with parasites.

ANTIMYCOTICS • Substances that migrate from food-packaging material such as calcium propionate, sodium benzoate, and sorbic acid (see all).

ANTIOXIDANTS • Substances added to food to keep oxygen from changing the food's color or flavor. Apples, for instance, will turn brown when exposed to air, and fats will become rancid after exposure. Among the most widely used antioxidants are butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) (see both). Vitamin E and vitamin C are natural antioxidants.

ANTIPROTOZOAL • A medication that combats single-celled parasites that are slightly bigger than bacteria. Many live in human and animal intestines and are harmless, but some cause a variety of ills, including dysentery.

AOX • The abbreviation for antioxidant.

APIGENIN • Coloring. See Chamomile.

6-APO-8'-CAROTENAL • A fine crystalline powder used as a color additive in orange beverages, cheese, desserts, and ice cream. See Carotene. ASP

APPLE ACID • See Malic Acid.

APPLE ESSENCE, NATURAL • A flavoring. ASP

APPLE EXTRACT • Researchers from the University of Hong Kong and Rutgers University reported in the Journal of Agricultural and Food Chemistry in 2008 that apple extract may reduce the formation of gene toxic heterocyclic amines (see) in foods, especially processed meats.

APRAMYCIN • Ambylan. An animal drug used in pork. FDA tolerance: 0.1-0.4 ppm in swine.

APRICOT • Fruit and Oil. Persic Oil. The tart orange-colored fruit is used as a natural cherry flavoring additive for beverages, ice cream, ices, candy, baked goods, and soups. GRAS. ASP

APRICOT KERNEL OIL • Persic Oil. The oil from the kernel of Prunus armeni-aca. Natural flavoring. There is reported use of the chemical; it has not yet been assigned for toxicology literature. It is, however, listed as GRAS.

ARABIC GUM • See Acacia.

ARABINOGALACTAN • A polysaccharide extracted with water from larch wood used in the minimum quantity required to be effective as an emulsifier, stabilizer, binder, or bodying additive in essential oils. Used in nonnutritive sweeteners, flavor bases, nonstandardized dressings, and pudding mixes. See Larch. ASP

L-ARABINOSE • A common vegetable gum, especially from gum arabic. Used as a culture medium. ASP

ARACHIDIC ACID • A fatty acid, also called eicosanoic acid, that is widely distributed in peanut oil fats and related compounds. It is used in lubricants, greases, waxes, and plastics.

ARACHIDONIC ACID • A liquid unsaturated fatty acid that occurs in liver, brain, glands, and fat of animals and humans. The acid is generally isolated from animal liver. Used essentially for nutrition and to soothe eczema and rashes in skin creams and lotions.

ARACHIDYL PROPIONATE • The ester of arachidyl alcohol and n-propionic acid used as a wax. See Arachidic Acid.

ARBUTIN • A diuretic and antiinfective derived from the dried leaves of the berry family, including blueberries, cranberries, bearberries, and most pear plants. This may explain why cranberry juice is reputed to ward off and/or treat urinary tract infections.

L-ARGININE • An essential amino acid (see), strongly alkaline. It plays an important part in urea excretion. It has been used for the treatment of liver disease. Banned as not safe by the FDA, February 10, 1992, for use in over-the-counter diet pills but as of this writing a number of dietary supplement producers are asking the FDA to allow the claim for it as a precursor of nitric oxide, which plays a role in female sexual response. ASP

ARGON • A colorless and odorless gas. Argon is very inert and is not known to form true chemical compounds. E

ARHEOL • See Sandalwood Oil, Yellow.

ARNICA • Wolfsbane. The dried flower head has long been used as an astringent to treat skin disorders. It is used as a flavoring in alcohol beverages only. Ingestion can lead to severe intestinal upset, nervous disturbances, irregular heartbeat, and collapse. Ingestion of one ounce has caused severe illness but no death. It should not be used on broken skin. EAF

ARNOTTA EXTRACT and SEED • See Annatto.

AROMA • Term Europeans use instead of listing individual components of a flavor. In the United States labels merely say “flavor.”

AROMATIC • In the context of flavorings, a chemical that has an aroma.

AROMATIC BITTERS • Usually made from the maceration of bitter herbs and used to intensify the aroma of perfume. The herbs selected for aromatic bitters must have a persistent fragrant aroma. Ginger and cinnamon are examples.

ARROWROOT STARCH • Obtained from the rhizome of Maranta arundinacea, a plant of tropical America. It is used as a thickener in fruit sauce, pie fillings, and puddings. Easily digestible.

ARSANILIC ACID • Aminobenzene Arsonic Acid. An arsenical pesticide that has been used as a feed additive for intestinal ills in pigs and poultry. It may cause blindness and is toxic to the animals' ears and kidneys. Used in animal feed for stimulating growth and improving feed conversion. Poison by ingestion and injection. A human cancer-causing additive. Supposed to be at least five days before treated birds are slaughtered for use in food.

ARSENIC • Silvery black crystals used as an animal drug to promote growth for livestock and poultry. Tolerance set by the FDA of 0.5 ppm in muscle, 2 ppm in uncooked edible by-products, 0.5 ppm in eggs from chickens and turkeys. Arsenic and its compounds are on the Community Right-to-Know List (see). Can cause blindness. It is number one on the CERCLA Priority List of Hazardous Substances (see).

ARTEMISIA OIL • Mugwort. A shrub and herb, native to north and south temperate climates, having strongly scented foliage and small rayless flower heads. Used as a flavoring in alcoholic beverages. The FDA says there is no reported use of the extract and there is no toxicology information available. As for the oil, the FDA has not yet done a toxicology search. See Wormwood. EAF

ARTICHOKE LEAVES • A tall herb that resembles a thistle. Used as a flavoring in alcoholic beverages only. EAF

ARTIFICIAL • In foods, the term follows the standard meaning: a substance not duplicated in nature. A flavoring, for instance, may have all natural ingredients, but it must be called artificial if it has no counterpart in nature.

ARTIFICIAL SWEETENERS • Under EU rules, sugar alcohols (see) can only claim to contain 2.4 kcal/g of a sweetener, as opposed to 4 kcal/g for sugar. See Intense Sweeteners.

AS PACKAGED • Refers to the state of the product as it is marked for purchase, while “as prepared” refers to the product after it has been made ready for consumption (e.g., ingredients added per instructions and cooked, such as a cake mix that has been prepared and baked, or a condensed or dry soup that has been reconstituted).

ASAFETIDA EXTRACT • Asafoetida. Devil's Dung. A gum or resin obtained from the roots or rhizome of Ferula assafoetida, any of several plants grown in Iran, Turkestan, and Afghanistan. The soft lumps, or “tears,” have a garlicky odor and are used as a natural flavoring. The fluid extract is used in sausage, onion, and spice flavorings for beverages, ice cream, ices, candy, baked goods, meat, condiments, and soups. The gum is used in onion and spice flavorings for beverages, ice cream, ices, candy, baked goods, and seasonings. The gums have also been used medicinally as an expectorant and to break up intestinal gas. The oil is used for spice flavoring in candy, baked goods, and condiments. Asafetida has a bitter taste, an offensive charcoal odor, and is used in India and Iran as a condiment. The FDA has not yet been assigned it for toxicology literature search. GRAS. EAF

ASAFETIDA OIL • Ferula. Savory green onion vegetable flavoring. Toxicity not determined. See Asafetida Extract. GRAS. ASP

ASCORBATE • Calcium and Sodium. Vitamin G salts. Antioxidants used in concentrated milk products, cooked, cured, or pulverized meat products, and in the brine in which pork and beef products are cured or packed.

ASCORBIC ACID • Vitamin C. A preservative and antioxidant used in frozen fruit, particularly sliced peaches, frozen fish dip, dry milk, beer and ale, flavoring oils, apple juices, soft drinks, fluid milk, candy, artificially sweetened jellies and preserves, canned mushrooms, cooked, cured, pulverized meat food products, brine in which beef or pork is cured or packed (75 ounces of vitamin C per 100 gallons). Vitamin C is necessary for normal teeth, bones, and blood vessels. The white or slightly yellow powder darkens upon exposure to air. Reasonably stable when it remains dry in air, but deteriorates rapidly when exposed to air while in solution. GRAS. ASP. E

ASCORBYL PALMITATE • A salt of ascorbic acid (see), it is used as a preservative and antioxidant for candy. Like ascorbic acid, it prevents rancidity and browning of cut apples and other fruits and is used in meat curing. Nontoxic. GRAS. ASP

ASCORBYL STEARATE • Nontoxic salt of a fatty acid. See Ascorbyl Palmitate. NIL

ASEPTIC PROCESSING • Dates back to at least the mid-1940s but has yet to realize its full potential. The most widely used of these new technologies, aseptic processing involves sterilizing a food product in a continuous process through a heat exchanger and then filling that food in an aseptic filler. The aseptic filler is a highly specialized piece of equipment designed to sterilize the packaging material, fill the sterile product into its container in a sterile environment, and then seal the package.

ASP • The U.S. Food and Drug Administration's designation that a food additive's fully up-to-date toxicology information has been sought.

ASPARGINASE ENZYME PREPARATION FROM ASPERGILLUS NIGER EXPRESSING THE ASPARAGINASE GENE FROM A. NIGER. • The FDA has no

questions about the application for GRAS status.

ASPARAGINASE ENZYME PREPARATION FROM ASPERGILLUS ORYZAE EXPRESSING THE ASPARAGINASE GENE FROM A. ORYZAE • As an enzyme for use in reducing asparagine levels in wheat dough-based products such as cookies and crackers, fabricated potato chips, and cut or sliced potato products. A company notified the FDA that it wanted a GRAS listing. The FDA (see) said in 2007 the ADI (see) was "not specified." Based on the information provided by Novo-zymes, as well as other information available to the FDA, the agency had no questions at the time regarding the producer's conclusion the food additive is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status. As always, it is the continuing responsibility of Novozymes to ensure that the food ingredients it markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements. Its use in the opinion of the JECFA (see), does not represent a hazard to health.

ASPARAGINE • L Form. A nonessential amino acid (see), widely found in plants and animals both free and combined with proteins. It is used as a dietary supplement, a culture medium, and as a medicine. ASP

ASPARAGUS SEED and ROOT EXTRACT • Asparagus officinalis. Sparrow Grass. The root is used in Chinese medicine as a tonic. In India, it is used as a hormonal tonic for women to promote fertility, relieve menstrual pains, increase breast milk, and generally nourish and strengthen the female reproductive system. It is also used as a tonic for the lungs in consumptive diseases and for AIDS wasting. In 1992, the FDA proposed a ban on asparagus in oral menstrual drug products because it has not been shown to be safe and effective for its stated claims. There is reported use of this chemical. ASP

ASPARTAME • NutraSweet. Equal. NatraTaste. SugarTwin. A compound prepared from aspartic acid and phenylalanine (see both), with about two hundred times the sweetness of sugar, discovered during routine screening of drugs for the treatment of ulcers. It is used in more than six thousand products worldwide. Once aspartame enters the digestive tract, it is split into its component parts, with the body absorbing the amino acids as though they were proteins and the methyl group eventually being broken down into carbon dioxide. Aspartame is found in soft drinks, puddings, gelatin, frozen desserts, breakfast cereals, hot cocoa mix, yogurt, teas, breath mints, chewing gum, and tabletop sweeteners. It generally is not used in foods requiring cooking because it is not considered heat stable and therefore there is a loss of sweetness when heated.

The G.D. Searle Company sought FDA approval in 1973, and it was approved in 1974, but objections that aspartame might cause brain damage led to legal postponement of that approval. Subsequently, an FDA investigation of records of animal studies conducted raised questions. The FDA arranged for an independent audit, which took more than two years and concluded that the aspartame studies and results were authentic. The agency then organized an expert board of inquiry and the members concluded that the evidence did not support the charge that aspartame might kill clusters of brain cells or cause other damage. However, persons with phenylketonuria, or PKU, must avoid protein foods such as meats that contain phenylalanine—one of two components of aspartame. The board then recommended aspartame not be approved until further long-term animal testing to rule out a possibility that aspartame might cause brain tumors. The FDA's Bureau of Foods reviewed the study data already available and concluded that the board's concern was unfounded. Aspartame was approved for use as a tabletop sweetener in certain dry foods on October 22, 1981. It was also approved for breath mints, hard and soft; as a flavor enhancer in chewing gum, hard candy, instant coffee and tea beverages, ready-to-serve nonalcoholic beverages, fruit juice-based beverages, concentrates or syrup for malt beverages containing less than 3 percent alcohol, and for frosting, toppings, fillings, glazes, and icings for precooked baked goods.

In 1984, news reports fueled by the announcement that the Arizona Department of Health Services was testing soft drinks containing aspartame, to see if it deteriorated into toxic levels of methyl alcohol under storage conditions, created alarm. The Arizona Health Department acted after the director of the Food Sciences and Research Laboratory at Arizona State submitted a study alleging that higher than normal temperatures could lead to a dangerous breakdown in the chemical composition. I checked with representatives of the Food and Drug Administration. They said that there are higher levels of methyl alcohol in regular fruit juices, and as far as the agency was concerned, the fears about decomposition products were unfounded. Aspartame lowers the acidity of urine and therefore reportedly makes the urinary tract more susceptible to infection. In 1988, the Mexican government stopped soda and food processors from using nutra in the name because it was "misleading." The Mexicans also required labeling that carries the following warning: "This product should not be used by individuals who are allergic to phenylalanine. The sweetener has caused much controversy amid suspicions on whether it is entirely safe, with studies linking the ingredient and cancer in rats. It has also previously been found that aspartame consumption can cause neurological and behavioral disturbances in sensitive individuals. Symptoms that have been reported include headaches, insomnia and seizures."

Despite strong concerns being raised from some quarters over the sweetener, both the European Food Safety Authority (EFSA) and the U.S. FDA have not changed their guidelines regarding the safety and intake of the ingredient. In 2007, the journal Critical Reviews in Toxicology published a review of five hundred studies, articles, and reports about aspartame over the last twenty-five years. That review concluded: "The weight of existing evidence is that aspartame is safe at current levels of consumption. No credible evidence was found that aspartame is carcinogenic, neurotoxic, or has any other adverse effect on health when consumed even at quantities many times the established ADI [acceptable daily intake] levels." Writing in the European Journal of Clinical Nutrition, in 2008, however, scientists from the University of Pretoria in South Africa said the aim of their study was to determine the direct and indirect effects of aspartame on the brain. They wanted to see if excessive aspartame ingestion might be involved in the cause of certain mental disorders and also in compromised learning and emotional functioning." They found aspartame can disturb the metabolism of amino acids (see), protein structure and metabolism, the integrity of genetic material, nerve function, and hormone balances, leading to degeneration of the nerves in the brain. As a result of their study, the researchers said more testing is required to further determine the health effects of aspartame and bring an end to the controversy. The FDA declared it GRAS with no limitations other than good manufacturing practices. ASP E

ASPARTIC ACID • DL and L Forms. Aminosuccinate Acid. A nonessential amino acid (see) occurring in animals and plants, sugarcane, sugar beets, and molasses. It is usually synthesized for commercial purposes and used as a nutrient. ASP

ASPERGÍ LLUS • A genus of fungi including molds found worldwide, especially in the autumn and winter in the Northern Hemisphere. It contains many species of molds and spores that produce the antibiotic aspergillic acid and is used primarily for the fermentation production of citric acid (see). An Aspergillus flavus-oryzae group of molds has been cleared by the U.S. Department of Agriculture's Meat Inspection Division to soften tissues of beef cuts: "Solutions containing water, salt, monosodium glutamate, and approved proteolytic enzymes applied or injected into cuts of beef shall not result in a gain of more than 3 percent above the weight of the untreated product." It is also used in bakery products such as bread, rolls, and buns. It is increasingly being used to produce enzymes for food additives. It is an allergen, irritant, and can cause hypersensitivity pneumonitis and/or dermatitis. There is reported use of the chemical but it has not yet been assigned for toxicology literature. EAF

ASTAXANTHIN • The principal pigment that imparts the pink or red coloring characteristic of the flesh of wild salmonids. These fish obtain astaxanthin from the crustaceans that constitute a significant portion of their diet. A similar flesh color may be obtained in farm-raised salmon by feeding them a diet supplemented with astaxanthin. The carotenoid (see), mostly associated with eye health, may enhance the burning of fat during exercise and lead to improved muscle endurance. Mice supplemented with astaxanthin were found to have accelerated body fat reduction or "fat

burning" when combined with exercise, compared with just exercise alone, according to a report in the journal Biochemical & Biophysical Research Communications in 2008. In the April 1995 final rule, the FDA concluded astaxanthin was safe for use in the feed of salmonid fish. This conclusion was based on the following facts: The petitioned use of astaxanthin would result in deposition of a very small amount of astaxanthin in salmonid flesh. Human exposure to astaxanthin from consumption of aquacultured salmon fed synthetic astaxanthin is comparable to the exposure to astaxanthin from wild salmon. In addition, the results of the toxicity studies submitted by the petitioner supported the conclusion that there was reasonable certainty of no harm from the petitioned use of astaxanthin.

ASTRINGENT • A substance that causes skin or mucous membranes to pucker and shrink by reducing their ability to absorb water. NUL

ATOPIC DERMATITIS • A chronic, itching inflammation of the skin also called eczema (see).

ATP • The abbreviation for adenosine triphosphate. ATP serves as the major energy source within the cell to drive a number of biological processes such as photosynthesis, muscle contraction, and the synthesis of proteins.

ATRAZINE • Most commonly used herbicide in the United States on a variety of crops—including maize, sorghum, and sugarcane—and for the pre- and postemergent control of broad-leaved weeds. It was presumed safe by the EPA in 2002, and pesticide manufacturers claimed it causes no effects below 3 ppb, but researchers reported in the same year that the pesticide produces frogs with both male and female sex organs at levels thirty times lower than this. Researchers revealed in 2006 in the Journal of Environmental Toxicology that when combined with nitrate (see), it disturbs the breeding cycles of amphibians and is one of the major causes of the frog population decline. In 2008, tadpoles developed deformed hearts and impaired kidneys and digestive systems when exposed to atrazine in their early stages of life, according to research by Tufts University biologists. The results present a more comprehensive picture of how this common weed killer—once thought to be harmless to animals—disrupts growth of vital organs in amphibians during multiple growth periods. In recent years, worldwide amphibian population declines have fueled concerns over the potentially harmful effects of pesticides on "sentinel" organisms. Previous research had reported negative effects of atrazine on amphibians extremely early and late in development. The Tufts study, published in the February 2008 edition of Environmental Health Perspectives, examined tadpoles during an often overlooked period of development. Both atrazine and nitrate have been found to be endocrine disrupters. It is considered a dangerous chemical by the EU and should be elminated as a pollutant in water.

ATSDR • The abbreviation for Agency for Toxic Substances and Disease Registry (see).

ATTAR OF ROSES • See Rose Bulgarian.

ATTENTION DEFICIT HYPERACTIVITY DISORDER • ADHD. Commonly called hyperactivity, ADHD is a clinical diagnosis based on specific criteria. These include excessive motor activity, impulsiveness, short attention span, and low tolerance to frustration and onset before seven years of age.

ATTRACTANT • Pesticide to get rid of insects, birds, other vertebrates. See Pesticides.

AUBEPINE LIQUID • See Hawthorn Berry.

AUTOLYZED YEAST • The concentrated, nonextracted, partially soluble digest obtained from food-grade yeasts. Solubilization (see) is accomplished with enzymes. Food-grade salts and enzymes may also be added. The additive is composed primarily of amino acids (see), peptides (see), proteins, carbohydrates, fats, and salts. Individual products may be in grains, powder, flake, or paste form. It is used as a flavoring additive or enhancer, a protein source, and as a binder. See Yeast and MSG.

AVERMECTIN B and DELTA • Broad-spectrum antiparasitic and antibiotics used on dried citrus pulp and cottonseeds. FDA tolerance 0.1 ppm on citrus pulp and 0.005 ppm on cottonseed. As a residue in or on tomato pomace 0.07; as residues in meat and meat by-products, 0.02 ppm; as a residue in milk, 0.005.

AVG • The abbrevation for average.

AVICIDE • Pesticide to get rid of birds. See Pesticide.

AVOIDANCE • Measures taken to avoid contact with allergy-producing substances. Since there are no cures for allergies as of yet, avoiding allergens is the best way to combat them.

AYURVEDIC EXTRACTS • Ayurvedic medicine is an ancient system of health care that is native to the Indian subcontinent and means the "knowledge of life, "life" itself is defined as the "combination of the body, sense organs, mind and soul, the factor responsible for preventing decay and death, which sustains the body over time, and guides the processes of rebirth."

AZAPERONE • A tranquilizer and sedative used to treat swine.

AZINPHOS METHYL • Crystals or brown waxy solid used as an insecticide for citrus pulp, soybean oil, and sugarcane. Poison by inhalation, ingestion, skin contact, intravenous, intraperitoneal, and possibly other routes. May cause tumors and birth defects.

AZO DYES • A large category of colorings used in both the food and cosmetic industries, these dyes are characterized by the way they combine with nitrogen. Made from diazonium compounds and phenol, the dyes usually contain a mild acid, such as citric or tartaric acid. Among the foods in which they are used are "penny" candies, caramels and chews, Life Savers, fruit drops, filled chocolates (but not pure chocolate); soft drinks, fruit drinks and ades; jellies, jams, marmalades, stewed fruit sauces, fruit gelatins, fruit yogurts; ice cream, pie fillings, vanilla, butterscotch, and chocolate puddings; caramel custard, whips, dessert sauces such as vanilla, and cream in powdered form; bakery goods (except plain rolls), crackers, cheese puffs, chips, cake and cookie mixes, waffle/pancake mixes, macaroni and spaghetti (certain brands); mayonnaise, salad dressings, ketchup (certain brands), mustard, ready-made salads with dressings, rémoulade, béarnaise, and hollandaise sauces, as well as sauces such as curry, fish, onion, tomato, and white cream; mashed rutabagas, purees, packaged soups and some canned soups; canned anchovies, herring, sardines, fish balls, caviar, cleaned shellfish. Azo dyes can cause allergic reactions, particularly hives. People who become sensitized to permanent hair dyes containing phenylenediamine (see) also develop a cross-sensitivity to azo dyes. That is, a person who is allergic to permanent phenylenediamine dyes will also be allergic to azo dyes. Also used in nonpermanent hair rinses and tints. There are reports that azo dyes are absorbed through the skin.

AZODICARBONAMIDE • A bleaching and maturing additive for flour. Used in amounts up to 45 ppm. The FDA wants further study of this chemical for both short-term and long-term effects. Although allowed as a food additive, there is no current reported use of the chemical, and, therefore, although toxicology information may be available, it is not being updated. This is a potentially serious problem. See Semicarbazide. NIL

AZORUBINE, CARMOISINE • Food Red No. 3. May be a cancer- and tumor-causing agent according to U.S. National Institute of Occupational Safety and Health (NIOSH). Not approved in the United States. The British and European parliaments are seeking to ban this color, at this writing, because it has been reported to have an effect on hyperactivity in young children. See FD and C Red No. 3. E

BACILLUS STEAROTHERMOPHILUS • A harmless bacteria used to detect antibiotics in milk and to produce an enzyme used in modifying food starch.

BACITRACIN • An antibiotic. White to pale with a slight odor. Used as an animal drug in beef, chicken, eggs, milk, pheasant, pork, and turkey. Used to increase weight gain, improve feed efficiency, and treat bacterial infections in swine. Tolerance set by the FDA is 0.5 ppm in uncooked tissue of cattle, swine, chickens, turkeys, pheasants, quail, and in milk and eggs. Moderately toxic by ingestion and injection. Possibly mutagenic.

BACTERIA • Microscopic single-cell organisms. Bacteria are among the most common microorganisms responsible for diseases in humans. Many are harmless. Those from lactic acid and propionic acid are harmless and used to produce cheeses and margarine.

BACTERIAL CATALASE • A catalase is an enzyme in plant and animal tissues. It exerts a chemical reaction that converts hydrogen peroxide into water and oxygen. Derived from bacteria by a pure culture fermentation process, bacterial catalase may be used safely, according to the FDA, in destroying and removing the hydrogen peroxide that has been used in the manufacture of cheese—providing the organism Micrococcus lysodeikticus used to derive the catalase reportedly is nontoxic and nonpathogenic.

BACTERIAL CATALASE FROM MICROCOCCUS LYSODEIKTICUS • Enzyme from a bacteria used in making cheese and as an emulsifier, thickener, stabilizer, or texturizer in salad dressing, frozen desserts, sour cream, cheese spread, and sour cream-flavored snack dips. NUL

BACTERIALLY DERIVED CARBOHYDRASE ENZYME PREPARATION • This enzyme preparation is obtained from a pure culture fermentation of a nonpathogenic and nontoxigenic strain of Bacillus subtilis or B. amyloliquefaciens. The ingredient is used as an enzyme to process starch and other carbohydrates. GRAS

BACTERIALLY DERIVED PROTEASE ENZYME PREPARATION • Obtained from the culture filtrate resulting from a pure culture fermentation of a nonpathogenic and nontoxigenic strain of Bacillus subtilis or B. amyloliquefaciens. The preparation is characterized by the presence of the enzymes subtilisin and neutral proteinase, which process proteins. GRAS

BACTERICIDE • Pesticide that is active against bacteria.

BACTERIOCINS • Antibodies having bactericidal activity, such as nisin preparation (see).

BACTERIOPHAGE • A virus with a particular affinity for a bacteria. They are named after the bacterial strain, group, or species for which they are specific. The FDA put a petition for a mixture of several monoclonal bacteriophages for use as antimicrobial additives in ready-to-eat foods, fresh meat, meat products, fresh poultry, and poultry products in abeyance (see).

BACTERIOPHAGE P100 PREPARATION FROM LISTERIA INNOCUA • Antimicrobial to control L. monocytogenes in brie, cheddar, swiss, and other cheeses that are normally aged and ripened. For control of L. monocytogenes in foods in general, including meat and poultry products, at levels up to 109 plaque-forming units per gram. The FDA has no questions about the application for GRAS status.

BAKER'S YEAST EXTRACT • The amino acids present add a bouillon-type brothy taste without adding any specific notes. Contributes to the overall savory aroma in soups, sauces, broths, stocks, bouillon. See Baker's Yeast Protein. GRAS. ASP

BAKER'S YEAST GLYCAN • Used as an emulsifier, thickener, and stabilizer in frozen desserts, sour cream, cheese spread, and cheese-flavored and flavored snack dips. See Baker's Yeast Protein. ASP

BAKER'S YEAST PROTEIN • Saccharomyces cerevisiae. A yeast strain yielding high growth and used in leavening bakery products and as a dietary supplement. ASP

BAKING POWDER • In baking, any powder used as a substitute for yeast, usually a mixture of sodium bicarbonate, starch as a filler, and harmless acid such as tartaric.

BAKING SODA • A common name for sodium bicarbonate (see).

BALM • Melissa officinalis. A variation of the word balsam. Usually means a soothing ointment, especially a fragrant one, or a soothing application. A sweet-tasting herb introduced into Britain by the Romans, it has been used from early times in England for nervousness, menstrual irregularity, and for surgical dressings. The Greeks used it for fevers and to treat scorpion stings and the bites of mad dogs. A hot tea made from it causes perspiration and is said to stop the early symptoms of a cold. See also Melissa Oil. NIL.

BALM, LEMON • See Balm Leaves Extract. GRAS

BALM LEAVES EXTRACT • Lemon Balm. A member of the mint family, balm has long been considered a “calming” herb. It has been used since the Middle Ages to reduce stress and anxiety, promote sleep, improve appetite, and ease pain and discomfort associated with digestion (including flatulence and bloating as well as colic). Even before the Middle Ages, balm leaves were steeped in wine to lift the spirits, help heal wounds, and treat venomous insect bites and stings. EAF. NUL

BALM OIL • Melissa officinalis. A natural fruit and liquor flavoring additive for beverages, ice cream, ices, candy, and baked goods. The balm leaves extract is also used in fruit flavors for beverages. The FDA has not yet done a search of the toxicology literature concerning this additive. GRAS. EAF

BALSAM FIR, OIL • Abies balsamea. One of the more important conifers in the northern United States and Canada. The buds, resin, and/or sap are used in folk remedies for cancers, corns, and warts and wounds. See Balsam Peru. ASP

BALSAM FIR, OLEORESIN • A natural fruit and spice flavoring for beverages, ice cream, ices, candy, and baked goods. It has a pinelike smell and a bitter aftertaste. It is also used in the manufacture of chocolate. See Basalm Peru. ASP

BALSAM PERU • Myroxylon Pereirae Klotzch. Obtained from Peruvian balsam in Central America near the Pacific coast. A dark brown viscous liquid with a pleasant lingering pinelike odor and a warm bitter taste extracted from a variety of evergreens. Used in strawberry, chocolate, cherry, grape, brandy, rum, maple, walnut, coconut, spice, and vanilla flavoring for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and syrups. The oil is used in berry, coconut, fruit, rum, maple, and vanilla flavoring for beverages, ice cream, ices, candy, and baked goods. Balsam fir oil is a natural pineapple, lime, and spice flavoring for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Mildly antiseptic and irritating to the skin and may cause contact dermatitis and a stuffy nose. It is one of the most common sensitizers and may cross-react with benzoin, rosin, ben-zoic acid, benzyl alcohol, cinnamic acid, essential oils, orange peel, eugenol, cinnamon, clove, Tolu balsam, storax, benzyl benzoate, and wood tars (see all). ASP

BAMBERMYCINS • Antibiotics used as antibacterials in feed for poultry, cattle, and swine. See Antibiotics.

BAN • The U.S. Food and Drug Administration's designation that a food additive formerly approved is now banned; there is usually new toxicology data available.

BANTHIONINE • See Acimeton.

BARIUM • A silver-white metal, it is approximately 0.05 percent of the earth's crust. In nature, it combines with other chemicals such as sulfur or carbon to form numerous barium salts. You can be exposed to barium in air, water, and food. Certain foods, such as Brazil nuts, are exceptionally high in barium. The health effects of barium depend on the dose, chemical form, water solubility, and route of exposure. Toxicity is rare, but barium can block potassium in the body, resulting in very low potassium. Symptoms include vomiting, diarrhea, weakness, paralysis, high blood pressure, and irregular heartbeat. Lethal dose of ingested barium has been reported to be between 0.8 and 0.9 grams.

BARLEY • Hordeum vulgare. Used in many food additives, but primarily employed in the production of beer and malted grain (brewer's yeast). A considerable amount is used for cereal and bread making. Also commonly used in barley soup, Scotch broth, stews, vegetable dishes, and dressings. The words beer and barn are derived from the word barley. The seeds are used by Chinese herbalists as an antiinflammatory diuretic. Barley is hazardous to cook in a pressure cooker unless a small amount of oil or fat is added to the barley and water mixture prior to cooking; barley forms a starch foam that may clog the safety valve of the pressure cooker and cause the pot to blow up. It is also used in the formulation of some pesticides.

BARLEY FIBER • Used in food in general, except for infant formula and meat and poultry products. Based on the information provided by the producer, Cargill, as well as other information available to the FDA, the agency had no questions in December 2006 regarding Cargill's conclusion that barley fiber is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the use of barley fiber and noted it was up to Cargill to continue to evaluate the GRAS status.

BARLEY FLOUR • A cereal grass cultivated since prehistoric times. Used in the manufacture of malt beverages, as a breakfast food, and as a demulcent (see) in cosmetics.

BASES • Alkalies, such as ammonium hydroxide (see), used to control the acidity-alkalinity balance of food products. See pH.

BASIL EXTRACT • Sweet Basil. The extract of the leaves and flowers of Ocimum basilicum, an herb having spikes of small white flowers and aromatic leaves used as a seasoning. A natural flavoring distilled from the flowering tops of the plant has a slightly yellowish color and a spicy odor. Used in sausage and spice flavorings for beverages, candy, ice cream, baked goods, condiments, and meats. The oleoresin is used in spice flavorings for baked goods and condiments. The oil is used in loganberry, strawberry, orange, rose, violet, cherry, honey, licorice, basil, muscatel, meat, and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. Moderately toxic by ingestion. A skin irritant. GRAS. EAF

BASIL OIL • Ocimum basilicum. Basil, both the wild and the sweet, furnishes an aromatic, volatile, camphoraceous oil, and on this account is much employed in France for flavoring soups, especially turtle soup. GRAS. ASP

BASIL, OLEORESIN • Ocimum basilicum. A flavoring. See Basil. ASP

BASSU OIL • A nondrying edible oil expressed from the kernels of the babassu palm, which grows in Brazil. Used in foods and soaps but is expensive.

BAY • Laurus nobilis. L. myrcia Oil. The shrub has been cultivated in Britain since the sixteenth century and was the source of the ancients' crowns and wreaths for heroes and poets. The word bachelor, given for degrees, is believed to be derived from bacca-laureus, or laurel-berry, through the French bachelier. Bay leaves are widely used in cooking for flavoring. They are used fresh and may be gathered year-round. Leaves, berries, and oil have excitant and narcotic properties. The leaves are also regarded to induce sweating and in large doses to induce vomiting. Except as a stimulant in veterinary practice the leaves and fruit are very rarely used internally. They were formerly employed in hysteria, amenorrhea, and flatulent colic. The berries have been used to promote abortion. Oil of Bays is used externally for sprains, bruises, and sometimes dropped into the ear to relieve pain. The leaves were formerly infused and taken as tea, and the powder or infusion of the berries was taken to remove obstructions, to create appetite, or to counteract nausea. Four or five moderate doses were said to cure the ague (the chills). The berries were formerly used in several French stomach gas preparations. GRAS. ASP

BAY LEAVES • Pimenta racemosa. The West Indian extract is a natural flavoring used in vermouth and spice flavorings for beverages, ice cream, ices, candy, baked goods, meat, and soups. The oil is used in fruit, liquor, and bay flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. The oleoresin (see) is used in sausage flavoring for meats and soups. GRAS. ASP

BAY, SWEET • Laurus nobilis. A natural flavoring native to a Mediterranean plant with stiff, glossy, fragrant leaves. Used in vermouth, sausage, and spice flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. See Bay. ASP

BBC • See b-Cyclodextrin.

BC • FDA abbreviation for boiler compound (see).

BEECHWOOD, CREOSOTE • See Creosote. ASP

BEEF TALLOW • See Tallow Flakes. GRAS for packaging.

BEESWAX • From virgin bees and primarily used as an emulsifier. Practically insoluble in water. Yellow beeswax from the honeycomb is soft to brittle and has a honeylike odor. White beeswax has a slightly different taste but otherwise has the same properties as yellow beeswax. Used as a candy glaze and polish. Can cause contact dermatitis (see). See Beeswax, Bleached. GRAS. ASP. E

BEESWAX, BLEACHED • White Wax. Yellow wax bleached and purified from the honeycomb of the bee. Remains yellowish white, is solid, somewhat translucent, and fairly insoluble in water. Differs slightly in taste from yellow beeswax. Used in fruit and honey flavorings for beverages, ice cream, ices, baked goods, and honey. GRAS. ASP

BEET • Juice and Powder. Beet Root Red. Betainin. Vegetable dye used to color dairy products. Listed for food use in 1967. Exempt from color certification. E.

BEETROOT JUICE POWDER • The powdered stem base of the beet used for its reddish color in powders and rouges. Exempt from color certification. A research report in 2008 concluded drinking 17 ounces of beetroot juice a day may reduce blood pressure. Within an hour of drinking the juice, blood pressure fell and continued to do so for 24 hours. The premise is that beetroot contains nitrates (think nitroglycerin) that help blood vessels dilate, increasing blood flow and reducing pressure. E

BEHENIC ACID • Docosanoic Acid. Colorless, water-soluble constituent of seed fats, animal fats, and marine animal oils. It is a fatty acid (see).

BENOMYL • Methyl-1-(Butyl Carbamoyl)-2-Benzimidazole-Carbamate. Tersan 1991. It is the generic name for a fungicide used on peaches, apples, and other fruits after they are picked. The residues in animal feed are 70 ppm in dried apple pomace resulting from application to apples as a residue, 125 ppm in dried grape pomace and raisin waste resulting from application to growing grapes, 50 ppm in raisins resulting from application to growing grapes, 50 ppm in dried citrus pulp when present therein as a result of application to the raw agricultural citrus fruits, 50 ppm in concentrated tomato products resulting from application to growing crop; and 50 ppm in rice hulls resulting from application to raw agricultural rice. It is also used as an oxidizer in sewage treatment. It is extremely toxic by ingestion. It may cause birth defects. It is a mild irritant to human skin.

BENSULFURON METHYL ESTER • Herbicide. Tolerance for residue in or on rice, 0.02 ppm.

BENTAZON • Herbicide. FDA residue tolerance is 4 ppm in or on mint hay used for feed resulting from application to growing mint.

BENTONITE • A colloidal clay (aluminum silicate) that has a high swelling capacity in water. Used as a food additive, as a thickener, and as a colorant in wine. Also used in animal feed. Poison if given by vein, causing blood clots, and may cause tumors. GRAS. ASP. E

BENZALDEHYDE • Artificial Almond Oil. A colorless liquid that occurs in the kernels of bitter almonds. Lime is used in its synthetic manufacture. As the artificial essential oil of almonds, it is used in berry, butter, coconut, apricot, cherry, peach, liquor, brandy, rum, almond, pecan, pistachio, spice, and vanilla flavorings. Occurs naturally in cherries, raspberries, tea, almonds, bitter oil, cajeput oil, and cassia bark. Used in beverages, ice cream, ices, candy, baked goods, chewing gum, and cordials. Also used in cosmetic creams and lotions, perfumes, soaps, and dyes. May cause allergic reactions. A skin irritant, contact may cause a rash. Highly toxic. Produces central nervous system depression and convulsions. Fatal dose is estimated to be 2 ounces. See Benzyl Acetate. GRAS. ASP

BENZALDEHYDE DIMETHYL ACETAL • A synthetic additive used in fruit, cherry, nut, and almond flavorings for beverages, ice cream, ices, candy, baked goods, gelatin, and puddings. See Benzyl Acetate. ASP

BENZALDEHYDE GLYCERYL ACETAL • A synthetic additive used in fruit, cherry, nut, and almond flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. See Benzyl Acetate. ASP

BENZALDEHYDE PROPYLENE GLYCOL ACETAL • A synthetic additive used in fruit, cherry, nut, and almond flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. See Benzyl Acetate. ASP

BENZALKONIUM CHLORIDE (BAK) • A widely used ammonium detergent. It is a germicide with an aromatic odor and a very bitter taste. Soluble in water and alcohol but incompatible with most detergents and soaps. Highly toxic. The FDA proposed a ban in 1992 for the use of benzalkonium chloride to treat insect bites and stings and in astringent (see) drugs because it has not been shown to be safe and effective for stated claims in OTC products.

BENZATHINE CLOXACILLIN • A veterinary antibiotic. The FDA tolerance for residues in milk is 0.02 ppm.

BENZENE • A solvent obtained from coal and used in modified hop extract for beer regulated by the FDA at 1 ppm. Derived from toluene or gasoline, it is used in the manufacture of a solvent for waxes, resins, and oils. It is also used in modified hop extract for beer. Poisonous when ingested and irritating to the mucous membranes. Harmful amounts may be absorbed through the skin. Also can cause sensitivity to light in which the skin may break out in a rash or swell. Inhalation of the fumes may be toxic. The Consumer Product Safety Commission voted unanimously in February 1978 to ban the use of benzene in the manufacture of many household products. The commission took the action in response to a petition filed by the Consumer Health Research Group, an organization affiliated with consumer advocate Ralph Nader. Earlier in the year, OSHA and the EPA both cited benzene as a threat to public health.

For more than a century, scientists have known that benzene is a powerful bone marrow poison, destroying the marrow's ability to produce blood cells, causing such conditions as aplastic anemia. In the past several decades, evidence has been mounting that it also causes leukemia. The U.S. Food and Drug Administration announced in May 2006 that it found benzene in some samples of five beverages at levels far higher than the 5 parts per billion (ppb) that federal regulations allow in bottled or tap water. (There is currently no standard for benzene in soft drinks.) Benzene can form in beverages containing benzoate salts (antimicrobials) and either vitamin C (ascorbic acid) or erythorbic acid, a related substance, if certain minerals are present. Heat or light during shipping or storage can increase the amount of benzene formed. The five beverages identified by the USDA had not been pulled from store shelves by the manufacturers or the FDA. Laura Tarantino, director of the agency's office of food-additive safety at the time, said: “The levels found do not pose an acute health hazard. All five have been reformulated or are being changed to minimize their benzene content, and the agency will continue to monitor the market.” The FDA learned from the beverage industry itself in 1990 that benzene can form in soft drinks. Since then monitoring has occasionally turned up high levels, but the agency has never set a limit. “We haven't seen a need,” says Judy Kidwell, an FDA consumer-safety officer. She added that the highest exposure to benzene is from breathing auto emissions. The FDA did not treat the soft-drink finding as a public health issue, and neither did the American Beverage Association, the organization representing U.S. soft-drink makers and distributors.

Consumers Union, a nonprofit advocate group, tested fourteen drinks containing both vitamin C and sodium benzoate, bought in stores around New York from March to May 2006, and found at least 2 ppb of benzene in some samples. The FDA then acknowledged cancer-causing benzene has been found in sodas at levels that exceed the standards for benzene in drinking water. This admission corrected the record, after the FDA had earlier claimed only insignificant amounts of benzene had been found. The FDA and the beverage industry point out that benzene exposure in other circumstances, such as cigarette smoking, is higher than the exposure in sodas. In 2008, a study into benzene levels in soft drinks sold in Belgium found that some still have higher levels than drinking water, and more research is needed into several possible contributing factors. Although the beverage industry says significant efforts have been made to curb the formation of the carcinogen in products, the Belgian researchers say their findings “indicate that the problem of benzene formation in soft drinks is still a valid topic.” In addition, their analysis suggests that there may be other factors at play besides sodium benzoate and ascorbic acid, such as packaging and shelf life and storage conditions.

The ingestion of food contaminated with benzene can result in nausea, vomiting, dizziness, convulsions, and death. Individuals may also be exposed to benzene in their homes by breathing the fumes of some cleaning supplies, lubrications, glues, or paints. Although listed as a food additive, the FDA says there is no current reported use of the chemical in food and therefore it is not being updated in its data bank. Benzene has been identified as a priority hazardous substance by the EU and is number six on the CERCLA Priority List of Hazardous Substances (see). NUL

BENZENE ACETALDEHYDE • Oily, colorless liquid that grows thicker on standing. Has a hyacinth odor. Used as a flavoring additive in bakery products, beverages, chewing gum, confections, gelatin desserts, ice cream, maraschino cherries, and puddings. Moderately toxic by ingestion. Human skin irritant.

BENZENE CARBOXYLIC ACID • See Benzoic Acid.

BENZENE HEXACHLORIDE • BHC. Hexachlorane. Hexylan. A pesticide widely used. Poison by ingestion and by subcutaneous injection. Moderately toxic by skin contact. An experimental cancer-causing and tumor-causing additive by ingestion and skin contact. Human systemic effects by inhalation: headache, nausea or vomiting, and fever. Implicated in aplastic anemia. Possible reproductive effects. It is persistent in the environment and accumulates in mammalian tissue.

BENZENETHIOL • Thiophenol. Phenyl Mercaptan. Flavoring additive. The FDA says there are no safety concerns at current levels of intake when used as a flavoring additive. ASP

BENZIN • Dark straw-colored to colorless liquid made from coal and oil. Used to dilute color, as a solvent, and as a protective coating for eggshells, fresh fruits, and vegetables. A human poison if injected into the vein. Chronic exposure may cause headache, lack of appetite, dizziness, and other symptoms of intoxication. The FDA permits its use at a level not in excess of the amount reasonably required to accomplish intended use. See Benzene.

1,2-BENZISOTHIAZOL-3 (2H)-ONE-1,1-DIOXIDE • Benzosulfimide. Zaharina. Saccharina. Saccharin Acid. Sucrette. Saccarinose. White crystals or

1,2-BENZISOTHIAZOLE-3-(2H)-ONE-1,1-DIOXIDE • Benzosulfimide. Saccharin. Saccharin Acid. Sucrette. Saccharose. White crystals or powder, odorless with a sweet taste. Used as a masticatory substance in chewing-gum base. A nonnutritive sweetener used in artificial sweetener, bacon, beverage mixes, beverages, chewing gum, desserts, fruit juice drinks, and jams. The FDA limits it to 12 mg per fluid ounce in beverages, fruit juice drinks, and beverage mixes. Limitation of 20 mg per teaspoon of sugar sweetening equivalent and 230 mg per designated size in processed foods. Sufficient evidence of carcinogenicity in animals but not in humans, although it is a possible human cancer-causing additive. Mild acute toxicity by ingestion.

BENZOATE OF SODA • See Sodium Benzoate.

BENZOATES • The salts of benzoicacid (see) used primarily as preservatives. The JECFA (see) concluded in June 1998: "The potential exists for high consumers of benzoate to exceed the ADI [acceptable daily intake], but the available data were insufficient to estimate the number of consumers with high intake or the magnitude and duration of intake above the ADI." The committee is reviewing this additive's level in cheeses, vegetables in vinegar or brine, fish products, liquid eggs, and carbonated water-based soft drinks. Benzoic acid and other benzoates are used as food preservatives to prevent yeasts and molds from growing, most commonly in soft drinks. They occur naturally in fruit and honey. Benzoates could make the symptoms of asthma and eczema worse in children who already have these conditions.

1,2-BENZODIHYDROPYRONE • See Dihydrocoumarin.

BENZOE • See Benzoin.

BENZOEPIN • Brown crystals used as an insecticide in dried tea. Residue tolerance of 25 ppm in dried tea. Poison by ingestion, inhalation, and skin contact and other routes. Causes tumors in laboratory animals and birth defects. A central nervous system stimulant producing convulsions in humans. A highly toxic organochlorine pesticide that does not accumulate in human tissue. Absorption is normally slow, but is increased by alcohol, oil, and emulsifiers.

BENZOFLUORANTHENE • Identified as a priority hazardous substance by the EU. See Benzoic Acid.

2-BENZOFURANCARBOXALDEHYDE • Flavoring additive. The JECFA said in 2000 that there was no safety concern at current levels of intake when used as a flavoring additive. ASP

BENZOFUROLINE • 5-Benzyl-3-Furyl Methyl(+)-cis, trans-Chrysanthemate. A pesticide used in various food products. Poison by inhalation, ingestion, and intravenous routes. Moderately toxic by skin contact. When heated to decomposition, it emits acrid and irritating fumes.

BENZO (G,H,I) PERYLENE • A component of polycyclic aromatic hydrocarbons (PAHs) (see) content in the environment usually resulting from the incomplete combustion of organic matters, especially fossil fuels and tobacco. The International Program on Toxic Chemicals says data are insufficient on the effect of this substance on human health; therefore, utmost care must be taken. This substance may be hazardous to the environment; special attention should be given to air and water. Identified as a priority hazardous substance by the EU.

BENZOIC ACID • Used as a preservative, it occurs in nature in cherry bark, raspberries, tea, anise, and cassia bark. First described in 1608 when it was found in gum benzoin. Used in chocolate, lemon, orange, cherry, fruit, nut, and tobacco flavorings for beverages, ice cream, ices, candy, baked goods, icings, fruit produce, condiments, and chewing gum. Also used in margarine and pickles, as an antifungal additive, and as a chemical preservative and a dietary supplement up to 0.1 percent. It is also used as an additive at levels of between 0.015 percent and 0.075 percent to bleach. The JECFA (see) assessed the intake of benzoates from information provided by nine countries—Australia, China, Finland, France, Japan, New Zealand, Spain, the United Kingdom, and the USA—in 1999. Because diets differ among countries, the foods that contribute to benzoate intake would be expected to vary. The food category that contributed most to benzoate intake was soft drinks (carbonated, water-based, flavored drinks) for Australia/New Zealand, France, the United Kingdom, and the USA. In Finland, 40 percent was in soft drinks. Soya sauce was the main source of benzoate in China and the second-most important in Japan. Examples of upper concentrations allowed in food are up to 0.1 percent benzoic acid (USA) and between 0.15% and 0.25% (other countries). The European Commission limits for benzoic acid and sodium benzoate are 0.015-0.5 percent. A mild irritant to the skin, it can cause allergic reactions such as asthma, hives, red eyes, and skin rashes, especially in people sensitive to aspirin. Listed by the FDA as GRAS in a reevaluation of safety in 1976. See Benzoyl Peroxide. GRAS. ASP. E

BENZOIC ALDEHYDE • See Benzaldehyde.

BENZOIC RESIN • A flavor additive. See Benzoic Acid and Benzoin Resin.

BENZOIN • Gum Benjamin. Gum Benzoin. Any of several resins containing benzoic acid (see), obtained as a gum from various trees. The resin is used as a flavoring additive in chocolate, cherry, rum, spice, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. Benzoin also is a natural flavoring additive for butterscotch, butter, fruit liquor, and rum. It was tested by the National Cancer Institute and found not to be a cancer-causing additive in rats and mice but may be mutagenic. The National Toxicology Program, however, found it caused kidney damage in rats. ASP

BENZOIN RESIN • Styrax spp. Flavoring. A natural resin from the small tree Styrax tonkinensis, a native of Indochina. The balsamic latex flows from wounds in the bark and outer wood where incisions are made. The odor is pleasant, sweet, balsamic with a distinct note of vanillin. ASP

BENZOPHENONES (1–12) • At least a dozen different benzophenones exist. Synthetic additives used in berry, butter, fruit, apricot, peach, nut, and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. Have a delicate, persistent, roselike odor, and soluble in most fixed oils and in mineral oil. They help prevent deterioration of ingredients that might be affected by the ultraviolet rays found in ordinary daylight. May produce hives and contact sensitivity. Toxic when injected. ASP.

BENZOPYRENE, BENZO-a-PYRENE • A hydrocarbon found in coal tar, cigarette smoke, and in the atmosphere as a product of incomplete combustion. Highly toxic and a cancer-causing additive. Mice exposed to 923 ppm of benzopyrene in food for months developed problems in the liver and blood. Identified as a priority hazardous substance by the EU. It is number nine on the CERCLA Priority List of Hazardous Substances (see).

2,3-BENZOPYRROLE • See Indole.

BENZOTHIAZOLE • BT. Used in organic synthesis. ASP

BENZOYL EUGENOL • See Eugenyl Benzoate.

BENZOYL PEROXIDE • A widely used bleaching additive for flours, blue cheese, Gorgonzola, and milk. Used to bleach whey (see) at maximum concentration of 100 mg per kg and in flour up to 40 mg per kg of flour. The JECFA (see) has concluded almost all benzoyl peroxide used in food processing is coverted to benzoic acid (see) during heat treatment or storage, and traces of benzoyl peroxide ingested will be degraded to benzoic acid in the intestine and will be excreted in the urine. Clinical studies have shown that benzoyl proxide can be a severe skin irritant and is a skin-sensitizing agent in humans. Assuming that 15 percent of cheese whey were bleached, the intake of benzoic acid per capita was estimated to be 0.01 mg/kgbw per day. The JECFA considered benzoyl peroxide safe but noted that it was possible that the intake by some consumers could exceed the ADI (see) and more precise intake data were required to estimate the number of such consumers and the magnitude and duration of intakes greater than the ADI. Toxic by inhalation. A skin allergen and irritant. GRAS. ASP

BENZYL ACETATE • A synthetic raspberry, strawberry, butter, violet, apple, cherry, banana, and plum flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Can be irritating to the skin, eyes, and respiratory tract. Ingestion causes intestinal upset, including vomiting and diarrhea. The JECFA (see) has studied this additive a number of times. The committee noted brain damage involving the cerebellum and/or hippocampus in rats and mice given benzyl acetate at a dose level of 5 percent in the diet for thirteen weeks. No such effect was observed in the long-term toxicity-carcinogenicity studies in mice or rats at lower doses. In the long-term study in rats, no adverse effects were observed at levels of up to 550 mg per kg of body weight per day in the diet. In long-term study, treated male and female mice showed lower body weights than controls. The committee has noted the absence of reproductive/birth defect studies for substances in this group, and has recommended that a full review of benzyl acetate, benzoic acid, the benzoate salts, benzaldehyde, and benzyl alcohol be performed to determine "whether these or other studies are required." ASP

BENZYL ACETIC ACID • See Cinnamic Acid.

BENZYL ACETOACETATE • A synthetic berry and fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. See Benzyl Acetate for toxicity. ASP

BENZYL ACETONE • See 4-Phenyl-3-Buten-2-One.

BENZYL ACETYL ACETATE • See Benzyl Acetoacetate. ASP

BENZYL ALCOHOL • A flavoring that is derived as a pure alcohol and is a constituent of jasmine, hyacinth, and other plants. It has a faint, sweet odor. Used in synthetic blueberry, loganberry, raspberry, orange, floral, rose, violet, fruit, cherry, grape, honey, liquor, muscatel, nut, walnut, root beer, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Irritating and corrosive to the skin and mucous membranes. Ingestion of large doses causes intestinal upsets. It may cross-react with balsam Peru in hypersensitive persons (see). ASP E

BENZYL BENZOATE • Plasticizer in nail polishes, solvent and fixative for perfumes. Occurs naturally in balsams Tolu and Peru and in various flower oils. Colorless, oily liquid or white crystals with a light floral scent and sharp burning taste. ASP

BENZYL BUTYL ETHER • Synthetic fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and puddings. ASP

BENZYL BUTYRATE • Butyric Acid. A synthetic flavoring additive, colorless, liquid, with a plumlike odor. Used in loganberry, raspberry, strawberry, butter, apricot, peach, pear, liquor, muscatel, cheese, and nut flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

BENZYL CARBINOL • See Phenethyl Alcohol.

BENZYL CINNAMATE • Sweet Odor of Balsam. Colorless prisms, used to give artificial fruit scents to perfumes. A synthetic flavoring additive found in balsams of Peru, Tolu, styrax, copaiba, and others. Used in raspberry, chocolate, apricot, cherry, peach, pineapple, plum, prune, honey, liquor, and rum for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Moderately toxic by ingestion. A mild allergen and skin irritant. See Balsam Peru for toxicity. ASP

BENZYL DIMETHYL CARBINYL ACETATE • See a, a-Dimethylphenethyl Acetate. ASP

BENZYL DIMETHYL CARBINYL BUTYRATE • See a, a-Dimethylphenethyl Butyrate.

BENZYL DIMETHYL CARBINYL FORMATE • See a,a-Dimethylphenethyl Formate.

BENZYL 2,3-DIMETHYLCROTONATE • A synthetic fruit and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

BENZYLDIMETHYLDODECYLAMMONIUM CHLORIDE • Benzyl Ammonium Chloride. An antimicrobial additive used in beets and sugarcane. A skin and eye irritant.

BENZYL Dl PROPYL KETONE • See 3-Benzyl-4-Heptanone.

BENZYL DISULFIDE • A synthetic fruit flavoring additive for beverages, ice cream, ices, and candy. ASP

BENZYLETHYL ALCOHOL • See Benzyl Alcohol.

BENZYL ETHYL ETHER • Colorless, oily liquid, aromatic odor, insoluble in water, miscible in alcohol. Used in flavoring for beverages, ice cream, ices, candy, and baked goods. Narcotic in high concentrations. May be a skin irritant. NIL

BENZYL FORMATE • Formic Acid. A synthetic chocolate, apricot, cherry, peach, pineapple, plum, prune, honey, and liquor flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. Pleasant fruity odor. There is no specific data for toxicity, but it is believed to be narcotic in high concentrations. ASP

3-BENZYL-4-HEPTANONE • Synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

BENZYL HEXANOATE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. EAF

BENZYL o-HYDROXYBENZOATE • See Benzyl Salicylate.

BENZYL ISOAMYL ALCOHOL • See a-Isobutylphenethyl Alcohol.

BENZYL ISOBUTYL CARBINOL • See a-Isobutylphenethyl Alcohol.

BENZYL ISOBUTYRATE • A synthetic strawberry and fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

BENZYL ISOEUGENOL • A synthetic spice flavoring for beverages, ice cream, ices, candy, and baked goods.

BENZYL ISOVALERATE • A synthetic raspberry, apple, apricot, banana, cherry, pineapple, walnut, and cheese flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

BENZYL MERCAPTAN • A synthetic coffee flavoring additive used for beverages, ice cream, ices, candy, and baked goods. ASP

BENZYL METHOXYETHYL ACETAL • Synthetic fruit and cherry flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

1-BENZYLOXY (B-METHOXY) ETHOXY ETHANE • See Benzyl Methoxyethyl Acetal.

BENZYL PHENYLACETATE • A synthetic butter, caramel, fruit, and honey flavoring additive for beverages, ice cream, ices, candy, baked goods, and toppings. A colorless liquid with a sweet floral odor; occurs naturally in honey. ASP

BENZYL B-PHENYL ACRYLATE • See Benzyl Cinnamate.

BENZYL PROPIONATE • A synthetic flavoring substance, colorless liquid, with a sweet fruity odor. Used in berry, apple, banana, grape, pear, and pineapple flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and icings. ASP

BENZYL PROPYL ACETATE • See a,a-Dimethylphenethyl Acetate.

BENZYL PROPYL ALCOHOL • See a,a-Dimethylphenethyl Acetate.

BENZYL PROPYL CARBINOL • See a-Propylphenethyl Alcohol.

BENZYL SALICYLATE • Salicylic Acid. Used in floral and peach flavorings for beverages, ice cream, ices, candy, and baked goods. It is a thick liquid with a light, pleasant odor; it is mixed with alcohol or ether. As with other salicylates it may interact adversely with such medications as antidepressants and anticoagulants, and it may cause skin to break out with a rash and swell when exposed to sunlight. See Salicylates. ASP

BENZYL THIOL • See Benzyl Mercaptan.

BERGAMOL • See Linalyl Acetate.

BERGAMOT • Bergamot Orange or Red. Oswego Tea. An orange flavoring extracted from a pear-shaped fruit, whose rind yields a greenish brown oil. Used in strawberry, lemon, orange, tangerine, cola, floral, banana, grape, peach, pear, pineapple, liquor, spice, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and icings. The oil can cause brown skin stains (berloque) when exposed to sunlight and is considered a prime photo-sensitizer (sensitivity to light). GRAS. ASP

BERRY BARK • Myrica Oil. A yellow essential oil used in rum and other flavorings and fragrances. GRAS

BERYLLIUM • The lightest of all metals, it can be found in mineral rocks, coal, soil, and volcanic dust. Low-level exposure occurs through breathing air, eating food, or drinking water containing the metal. Small amounts can enter the air from burning coal and oil and from cigarettes. It can be harmful if inhaled. The effects depend on the concentration and duration of exposure. Skin contact may produce dermatitis, especially in people who are hypersensitive to the metal.

BETA-APO-8'-CAROTENAL • Orange coloring additive for solid or semisolid foods. Limited to 15 mg per pound of solid or semisolid food. Does not require certification. E

BETA-CAROTENE • Provitamin A. Beta-Carotene. Found in all plants and in many animal tissues. It is the chief yellow coloring matter of carrots, butter, and egg yolks. Extracted as red crystals or crystalline powder, it is used as a coloring in food and cosmetics and as a direct food additive. It is exempt from certification. Also used in the manufacture of vitamin A. Too much carotene in the blood can lead to carotenemia, a pale yellow-red pigmentation of the skin that may be mistaken for jaundice. It is a benign condition, and withdrawal of carotene from the diet cures it. Beta-carotene has less serious side effects than vitamin A and was given to twenty-two thousand physicians as part of a five-year study to determine whether aspirin could protect against heart disease and beta-carotene against tumors. It is nontoxic. The JECFA (see) concluded that there was no objection to the use of vegetable extracts as coloring additives, providing the past specifications for carotenes were revised to include material derived from carrots, alfalfa, and palm oil, which are known to be used commercially. Beta-carotene is being studied for cancer-causing properties because it is positive as a mutagen in salmonella. GRAS

BETA-GLUCANS • Polysaccharides (see) that yield sugars (glucose) on hydrolysis when exposed to water treatment. Beta-glucan is in cellulose and is found in edibles such as oat fiber and barley.

BETAINE • Used as a coloring and as a dietary supplement. Occurs in common beets and in many vegetables as well as animal substances. Used in resins. Has been employed to treat muscle weakness medically.

BETAINE, ANHYDROUS • Betaine (see) with the water removed.

BETULA • Obtained from the European white birch and a source of asphalt and tar. Used in hair tonics; it reddens the scalp and creates a warm feeling due to an increased flow of blood to the area. Also used in moisturizing creams and astringents. Betula leaves were formerly used to treat rheumatism. See Salicylates.

BHA • See Butylated Hydroxyanisole.

BHT • See Butylated Hydroxytoluene.

BIACETYL • See Diacetyl.

BICARBONATE OF SODA • A buffer and neutralizing additive used in self-rising cornmeal. See Sodium Bicarbonate. GRAS

BIFENTHRIN • A synthetic pyrethroid pesticide. Used to combat insects and mites. FDA tolerances are 0.02 ppm in milk; 0.10 ppm in fat, meat, and meat by-products of cattle, goats, hogs, and sheep; and 0.50 ppm as a residue in cottonseed. Lower toxicity than most pesticides.

BIFIDOGENIC FACTOR • Increases bifidobacteria either in the intestine, or in other conditions (e.g., fermented dairy products). When bifidobacteria in the intestine are stimulated, a bifidogenic factor may be considered prebiotic (see), but only if this stimulation has a beneficial effect on the host.

BILBERRY EXTRACT • The extract of Vaccinium myrtillus, a plant found in North America and the Alps that differs from the typical blueberries in having single flowers or very small buds.

BILE SALTS and OX BILE EXTRACT • See Ox Bile. GRAS

BINDER • Substances such as gum arabic, gum tragacanth, glycerin, and sorbitol (see all) that dispense, swell, or absorb water, increase consistency, and hold ingredients together. For example, binders are used to make powders in women's compacts retain their shape; binders in toothpaste provide for the smooth dispensing of the paste.

BIOCHEMICAL • A substance that is produced by a chemical reaction in a living organism. Some biochemicals can also be made in the laboratory.

BIOFLAVONOIDS • Vitamin P Complex. Citrus-flavored compounds needed to maintain healthy blood vessel walls. Widely distributed among plants, especially citrus fruits and rose hips. Usually taken from orange and lemon rinds and used as a reducing additive (see).

BIOTECHNOLOGY • Use of living cells or parts of cells to perform procedures and to make products.

BIOTIN • Vitamin H. Vitamin B Factor. A whitish crystalline powder used as a texturizer in cosmetic creams. Present in minute amounts in every living cell and in larger amounts in yeast and milk. Vital to growth, it acts as a coenzyme in the formation of certain essential fatlike substances and plays a part in reactions involving carbon dioxide. It is needed by humans for healthy circulation and red blood cells. GRAS. ASP

BIPHENYL • Derived from benzene (see). Used as a fungistat in packaging of citrus fruits and in manufacturing processes. ASP. E

BIRCH FAMILY • Betulaceae. Sweet Oil and Tar Oil. A flavoring additive from the bark and wood of deciduous trees common in the Northern Hemisphere. The oils are obtained by distillation and used for flavorings. Birch sweet oil is used in synthetic strawberry, pineapple, maple, nut, root beer, sarsaparilla, spice, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, baked goods, gelatins, puddings (4,300 ppm), and syrups. Birch tar oil, which is refined, is used in chewing gum. The medicinal properties of the plant tend to vary, depending upon which part of the tree is used. It has been used as a laxative, as an aid for gout, to treat rheumatism and dropsy, and to dissolve kidney stones. See Betula. ASP

BIS- • A prefix meaning twice.

BISABOLENE • A colorless oily sesquiterpene found in many essential oils, such as oil of bisabol and lime oil. Used as a flavoring. ASP

3,6-BIS(2-CHLORPHENYL)-1,2,4,5-TETRAZINE • A pesticide with a tolerance of 20 ppm in apple pomace as a result of application to apples.

1,1-BIS(p-CHLOROPHENYL)-2,2,2-TRICHLOROETHANOL • Acarin. Deco-fol. An insecticide used on dried tea. Poison by ingestion and skin contact.

1,1-BIS(p-CHLOROPHENYL)-2,2,2-TRICHLOROETHANOL • Kelthn. Dicofol. An insecticide used on dried tea. Poison by ingestion and skin contact. May cause cancer and mutations in humans.

BIS(DIMETHYL-3-FURYL) DISULFIDE • Flavoring additive. The JECFA (see) said there was no safety concern about it. ASP

2,4-BIS(ETHYLAMINO)-6-CHLORO-s-TRIAZINE • Aktinit S. Aquazine. Zeapur. An herbicide used in animal feed, molasses, potable water, sugarcane byproducts, sugarcane syrups. The FDA's residue tolerances are 1 ppm in sugarcane by-products, molasses, and syrup, and 0.01 ppm in potable water. Limitation of 1 ppm in sugarcane by-product molasses when used for animal feed. It is in the EPA Genetic Toxicology Program (see). Poison by intravenous route. Causes tumors in experimental animals. A skin and eye irritant in humans.

BIS(2-ETHYLHEXYL)PHTHALATE • BEHP. Witcizer312. A plasticizer used in packaging materials for foods of high water content. Suspected human cancer-causing additive and teratogen. Affects the human gastrointestinal tract. A mild skin and eye irritant. See Phthalates.

BISGLYCINATES • The EFSA (see) panel found them safe for use in foods and food supplements in 2008. However, the EFSA failed to deliver an opinion on the chromium source bisglycinate nicotinate for a lack of evidence. No specific use levels for the mineral bisglycinates were under consideration in the opinion. However, it was assumed that under the intended conditions of use, the daily intake would not exceed those levels anticipated through existing supplementation of the listed minerals and would be similar to other forms of copper, zinc, calcium, magnesium, and chromium that are already approved for use in foods in the EU (see).

N,N-BIS(2-HYDROXYETHYL)DODECAN AMIDE • Lauryl Diethanolamide. Lauric Acid. Diethanolamide. Antistatic additive used in packaging materials and limited to 0.5 percent in polyethylene containers.

BIS(2-METHYL-3-FURYL) DISULFIDE • Flavoring additive. ASP

BIS(2-METHYL-3-FURYL) TETRASULFIDE • Flavoring additive. ASP

BIS-(METHYLTHIO)METHANE • Flavoring additive. EAF

BIS(S-OXYQUINOLINE) COPPER • Bioquin. Quinondo. Furitdo. A preservative for wood. Copper and its compounds are on the Community Right-to-Know List (see).

BISPHENOL A • In polycarbonate (see), used extensively in plastic baby bottles, food and beverage can linings, dental sealants, and those ubiquitous plastic water bottles athletes and dieters carry around. Unfortunately, BPA doesn't stay put. It has been found to leach from bottles into babies' milk or formula; it migrates from can liners into foods and soda and from epoxy resin-lined vats into wine; and it is found in the mouths of people who've recently had their teeth sealed. Ninety-five percent of Americans were estimated to have the chemical in their urine in a 2004 biomon-itoring study by the Centers for Disease Control and Prevention (CDC). The FDA set a daily safe limit for humans of 0.05 milligrams of BPA per milligram of body weight. Since then academic scientists in several countries have done more than ninety studies that have found BPA effects on animals and human cell cultures occur well below this level. It has been linked in animals to altered brains, behavior, and sex. Increased blood pressure and decreased heart rate variability in developmen-tally exposed children have been reported at doses well below the EPA's "no effect" level.

A report published in 2007 by the Environmental Working Group (EWG) (see) showed the chemical could leach into canned food at levels reaching two hundred times the "acceptable" amount. A report from the National Toxicology Program and the NIH concludes that BPA presents "some concern" about exposure of fetuses and children at current human exposure. Depending on who is commenting, BPA is either perfectly safe or a dangerous health risk. The plastics industry says it is harmless, but a growing number of scientists are concluding, from some animal tests, that exposure to BPA in the womb raises the risk of certain cancers, hampers fertility, and could contribute to childhood behavioral problems such as hyperactivity. According to its critics, it is a potential endocrine disrupter by mimicking naturally occurring estrogen, a hormone that is part of the endocrine system that controls the development of the brain, the reproductive system, and many other systems in the developing fetus, notes Frederick vom Saal, Ph.D., a developmental biologist at the University of Missouri. Pressure, at this writing, is growing on the FDA to set new restrictions on the use of bisphenol in food packaging. As yet, the FDA has set no maximum exposure levels. Meanwhile, health officials in Canada are reported to be considering declaring BPA a toxin, which could lead to its ban in food packaging. The levels that leach into food are well below the safety thresholds set by the EPA, according to the plastics industry website. Bisphenol-A, the organization says, is completely safe unless you ingest 1,300 pounds of canned and bottled food daily.

Although completely eliminating exposure to BPA may not be possible, you can take steps to reduce contact. All U.S. manufacturers use BPA-based lining on the metal portions of the formula containers. Tests of liquid formulas by FDA and EWG show that BPA leaches into the formula, and EWG (see) calculates that some infants' daily exposures can exceed the toxic doses in animal studies. Choose powdered formula, which is more diluted with water, or buy liquid formula in glass containers. Studies show canned foods are a predominant source of daily BPA exposure in our lives. Try to avoid plastic food containers that are marked on the bottom with the letters "PC" recycling label #7. (Not all #7 labeled products are polycarbonate but this is a guideline for a category of plastics to avoid.) Polycarbonate plastics are rigid and transparent and used for sippy cups, baby bottles, food storage, and water bottles.

Some polycarbonate water bottles are marketed as "nonleaching" for minimizing plastic taste or odor; however, there is still a possibility that trace amounts of BPA will migrate from these containers, particularly if used to heat liquids, according to the EWG Plastics with the recycling labels #1, #2, and #4 on the bottom are safer choices and do not contain BPA. Find baby bottles in glass versions, or those made from the safer plastics including polyamine, polypropylene, and polyethylene (see all) as well as rigid plastics and epoxy resins (see). Soft or cloudy-colored plastic does not contain BPA. Many metal water bottles are lined with a plastic coating that contains BPA. Look for stainless steel bottles that do not have a plastic liner. Although the levels of BPA that leach from hard plastics is generally low, EWG recommends avoiding use of plastic containers to heat food in microwaves. Avoid using old and scratched plastic bottles. In the past, some plastic wraps were thought to contain BPA. But brands such as Saran claim to be BPA free.

Members of a Senate consumer affairs subcommittee faulted federal agencies for reacting too slowly to concerns that children are exposed to bisphenol. A Senate Democrat in 2008 demanded more independent research into the possible hazards of the estrogenlike compound and better labeling of products that include it. Senator Charles E. Schumer (D-NY) pushed for legislation he has introduced to prohibit BPA in all products designed for and intended to be used by children age seven and younger. In 2008, the European Chemicals Bureau (ECB) said that there is no risk to consumers from using packaging containing Bisphenol-A. The bureau, one of the seven scientific institutes in the European Commission's Joint Research Centre (JRC), published its updated EU Risk Assessment Report on BPA in June 2008. "We found that the margin of safety is high enough in relation to consumer exposure of BPA in plastic packaging and, as a result, there is no need for further information, testing or risk reduction measures beyond those which are being applied already."

BIS(TRIS[BETA, BETA-DIMETHYLPHENETHYL]TIN)OXIDE • Bendex. An insecticide used in animal feed, dried apples, dried citrus pulp, dried grapes, dried prunes, and raisins. The FDA's tolerances are 20 ppm in prunes, 20 ppm in raisins. Limitations of 75 ppm in dried apple pomace, 35 ppm in dried citrus pulp, 100 ppm in dried grape pomace, 20 ppm in raisin waste when used for animal feed. Moderately toxic by ingestion and skin contact.

BITTER ALMOND OIL • Almond Oil. Sweet Almond Oil. Expressed Almond Oil. A colorless to pale yellow, bland, essential and expressed oil from the ripe seed of the small sweet almond grown in Italy, Spain, and France. It has a strong almond odor and a mild taste. Used as a flavoring and emulsifier. Can cause stuffy nose and skin rashes in the allergic. GRAS when free of prussic acid.

BITTER ASH EXTRACT • See Quassia Extract.

BITTER ORANGE OIL • Seville Orange. Sour Orange. Zhi shi. The pale yellow volatile oil expressed from the fresh peel of a species of citrus is used in flavorings. Synephrine, a stimulant that makes it popular for diet supplements but like its cousin, epinephrine, it can also raise blood pressure. The National Institute of Standards and Technology (NIST), the government body that has published the standard, implied safety concerns announced in 2008. It says bitter orange may cause skin irritation and allergic reactions. Bitter orange is used in traditional Chinese medicine and by indigenous people of the Amazon rain forest for nausea, indigestion, and constipation.

BITTER PRINCIPLES • A group of chemicals in plants that are bitter tasting. They differ chemically, but most belong to the iris or pine families. Bitter principles reputedly stimulate the secretion of digestive juices and stimulate the liver. They are being investigated scientifically today as antifungals and antibiotics as well as anticancer additives. The bitter principle in mallow plants is being investigated as a male contraceptive. Other bitter principles in herbs are used to combat coughs and as sedatives.

BITTER WOOD EXTRACT • See Quassia Extract.

BIURET • A nutrient in animal feed for ruminants except for those producing milk for human consumption. See Urea.

BIXIN and NORBIXIN • The active ingredients of annatto, carotenoidlike compounds, but with five times the coloring power of carotene, and with better stability. They impart a yellow coloring to food. See Annatto. E

BIX ORELLANA • A solvent extraction of Bixa orellana seeds. A yellow carotenoid (see) solution or powder, it is a color additive in ink used for marking foods and is used in oleomargarine, poultry, sausage casings, and shortening. May cause contact dermatitis.

BL • The abbreviation for bleaching agent or flour-maturing agent.

BLACK CATECHU EXTRACT • In dry powder form for edible use in blending with alcoholic beverages.

BLACK COHOSH • Cimicifuga racemosa. Cimicifuga. Snakeroot. Bugbane. Black Snakeroot. Rattleroot. It is used in ginger ale flavoring. A perennial herb with a flower that is supposedly distasteful to insects. Grown from Canada to North Carolina and Kansas, it has a reputation for curing snakebites. The root contains various glycosides (see), including estrogenic substances and tannins. Herbalists have used it to relieve nerve pains, menstrual pains, and the pain of childbirth; also used to speed delivery and reduce blood pressure. Black cohosh is believed to have sedative properties. In 1992, the FDA proposed a ban on black cohosh in oral menstrual drug products because it had not been shown to be safe and effective as claimed.

BLACK CURRANT EXTRACT • The extract of the fruit of Ribes nigrum, a European plant that produces hanging yellow flowers and black aromatic fruit.

BLACK CUTCH EXTRACT • Possesses strong astringent properties. It is used for arresting mucous discharges when excessive and for checking hemorrhages. See Catechu Extract.

BLACK PEPPER OIL • From steam distillation of dried fruit of Piper nigrum. A greenish liquid with the odor and taste of pepper. A flavoring additive used in meat, salads, soups, and vegetables. A moderate skin irritant.

BLACK WALNUT EXTRACT • Extract of the leaves or bark of the black walnut tree, Juglans nigra, found in eastern North America. It produces nuts with a thick oil and is used as a black coloring.

BLACKBERRY BARK EXTRACT • Rubus fruticosus. A natural flavoring additive extracted from the woody plant. Used in berry, pineapple, grenadine, root beer, sar-saparilla, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, baked goods, and liquor. The berries, leaves, and root bark are also used to treat fevers, colds, sore throats, vaginal discharge, diarrhea, and dysentery. The berries contain isocitric and malic acids, sugars, pectin, monoglycoside of cyanidin, and vitamins C and A. The leaves and bark are said to lower fever, are astringent, and stop bleeding. The leaves are used for a soothing bath. ASP

BLACKBERRY FRUIT EXTRACT • Rubus fruticosus. Flavoring. The berries, leaves, and root bark are used to treat fevers, colds, sore throats, vaginal discharge, diarrhea, and dysentery. The berries contain isocitric and malic acids, sugars, pectin, monoglycoside of cyanidin, and vitamins C and A. See Malic Acid. ASP

BLACKTHORN BERRIES • See Sloe Berries.

BLEACHING ADDITIVES • Used by many industries, particularly flour milling, to make dough rise faster. Certain chemical qualities, which pastry chefs call “gluten characteristics,” are needed to make an elastic, stable dough. Such qualities are acquired during aging, but in the process flour oxidizes, that is, combines with oxygen, and loses its natural gold color. Although mature flour is white, it possesses the qualities bakers want. But proper aging costs money and makes the flour more susceptible to insects and rodents, according to food manufacturers. Hence, the widespread use of bleaching and maturing additives.

BLOOM INHIBITOR • Bloom is an “undesirable effect” caused by the migration of cocoa fat from the cocoa fibers to the chocolate's surface. Chocolate that has bloomed has a gray-white appearance. Nonbloomed chocolate has a bright, shiny surface, with a rich appearance. The bloom inhibitor—a surfactant (see) such as sor-bitan or lecithin (see both)—controls the size of the chocolate crystals and reduces the tendency of the fat to mobilize.

BLUE • See FD and C Blue No. 1.

BLUE NO. 1 • See FD and C Blue No. 1.

B&N • Buffer and neutralizing additive.

BOILER COMPOUNDS • Boiler Water Additives. Most are used in food processing as cleaning additives. Those regulated by the FDA include ammonium algi-nate, cobalt sulfate, and many others that might be in contact with food.

BOIS DE ROSE OIL • Aniba Rosaedodora Ducke. A fragrance from the chipped wood of the tropical rosewood tree obtained through steam distillation. The volatile oil is colorless, pale yellow, with a light camphor odor. Used in citrus, floral, fruit, meat, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. There is reported use of the chemical; it has not yet been assigned for toxicology literature. GRAS. ASP

BOLDUS LEAVES • Flavoring from a Chilean fir tree with a sweet edible fruit used in alcoholic beverages only. There is no toxicology information available. NIL

BOLETIC ACID • See Fumaric Acid.

BONITO, DRIED • Related to mackerel, the Japanese dry them and use them in soups. They're often shaved into thin flakes called bonito flakes or

hanakatsuo. NUL

BORAGE EXTRACT • The extract of the herb Borago officinalis. Contains potassium and calcium, has emollient properties and is used in a “tea” for sore eyes.

BORAX • Illegal for use in foods, including wax coating for fruits and vegetables. It is permitted for use in export meats. NUL. E

BORIC ACID • An antiseptic with bactericidal and fungicidal properties used as a fungus control on citrus fruit (FDA tolerance 8 ppm boron residues). It is still widely used despite repeated warnings from the American Medical Association of possible toxicity. Severe poisonings have followed both ingestion and topical application to abraded skin. NUL. E

BORNEO CAMPHOR • See Borneol. ASP

BORNEOL • A flavoring additive with a peppery odor and a burning taste. Occurs naturally in coriander, ginger oil, oil of lime, rosemary, strawberries, thyme, cit-ronella, and nutmeg. Toxicity is similar to camphor oil (see). Used as a synthetic nut or spice flavoring for beverages, syrups, ice cream, ices, candy, baked goods, chewing gum. Can cause nausea, vomiting, convulsions, confusion, and dizziness. ASP

BORNYL ACETATE • It may be obtained from various pine needle oils. Strong piney odor. As a yarrow herb and iva herb extract, it is used as synthetic fruit and spice flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and syrups. Also used as a solvent. ASP

BORNYL BUTYRATE • Synthetic flavoring from valerian (see). EAF

BORNYL FORMATE • Formic Acid. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, and syrups. Used in perfumes, soaps, and as a disinfectant. See Borneol. ASP

BORNYL ISOVALERATE • A synthetic fruit flavoring additive with a camphorlike smell used for beverages, ice cream, ices, candy, baked goods, and syrups. Also used medicinally as a sedative. See Borneol. ASP

BORNYL VALERATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Borneol. NIL

BORNYVAL • See Bornyl Isovalerate.

BORON SOURCES • Boric Acid. Sodium Borate. Boron occurs in the earth's crust (in the form of its compounds, not the metal), and borates are widely used as antiseptics even though toxicologists warn about possible adverse reactions. Used in modified hop extract. Boric acid and sodium borate are astringents and antiseptics. Borates are absorbed by the mucous membranes and can cause symptoms such as gastrointestinal bleeding, skin rash, and central nervous system stimulation. The adult lethal dose is 30 grams (1 ounce). Infants and young children are more susceptible. Boron is used as a dietary supplement up to 1 milligram per day. Cleared for use by the FDA in modified hops extract up to 310 ppm.

BORONIA, ABSOLUTE • Boronia megastigma. A synthetic violet and fruit flavoring additive extracted from a plant. Used as a flavoring for beverages, ice cream, ices, and baked goods. There is reported use of the chemical; it has not yet been assigned for toxicology literature. EAF

BOSWELLIA SPECIES • See Olibanum Extract.

BOULLION • Vegetable Smoke. There is reported use of the chemical; it has not yet been assigned for toxicology literature. ASP

b-BOURBONENE • See Ethyl Vanillin. NIL

BOVINE GLOBULIN • Ingredient in dairy foods, juices, snack foods, beverages, and meal replacements at maximum levels of 5 percent of the finished product. GRAS pending.

BOVINE MILK BASIC PROTEIN FRACTION • BMBPF. Produced from pasteurized bovine skim milk with acid milk proteins and lactose removed. GRAS for use as an ingredient in certain foods and beverages at 10–40 milligrams per serving. Based on the information provided by Snow Brand, as well as other information available to the FDA, the agency has no questions at this time regarding Snow Brand's conclusion that BMBPF is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of BMBPF. It is the continuing responsibility of Snow Brand to ensure that the food ingredients it markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements, including listing milk, a potential major food allergen.

BOVINE MILK-DERIVED LACTOFERRIN • Used as an antimicrobial spray on beef carcasses that will subsequently be washed to reduce the levels of the applied lactoferrin (see). GRAS

BOVINE SOMATOTROPIN • BST. Bovine growth hormone (BGH) is a natural protein produced by the pituitary gland of all cattle. It is a protein hormone and is not structurally or functionally related to steroid hormones. Biotechnology has enabled scientists to produce a recombinant form of this protein called BST. They have found that supplementing cows' natural levels of BST improves their efficiency as milk producers by 5 to 10 percent without proportionately increasing production costs. The mammary glands of such dairy cows take in more nutrients from the bloodstream and produce more milk. Introduced on the market in 1994, the producers of the hormone, the FDA, and some other experts claim that there is no difference in the milk of cows given the hormone since cows' milk naturally contains the hormone anyway. Consumer groups, some scientists, small farmers, and a number of dairy product producers are against the use of the hormone. Among the reasons: it increases inflammation of the udder in cows, has unknown potential effects on humans, and is unnecessary since the U.S. government already supports milk prices because there is an overabundance of milk on the market. Certain states have enacted laws that direct farmers who use BST or BGH to say that the cows have or have not been treated. They are Maine, Minnesota, West Virginia, and Wisconsin. You can obtain more information about the addition of the hormone to milk by contacting the agencies listed on pages 47–51.

BPA • See Bisphenol.

BRAN • The outer indigestible shell of cereal grain that is usually removed before the grain is ground into flour. It provides bulk and fiber.

BRASSICA ALBA • See Mustard.

BREWER'S YEAST • Originally used by beer brewers, it is a good source of vitamins and protein. It can cause allergic reactions.

BRILLIANT BLACK • Black Bn. This food color was evaluated by the JECFA (see) in 1974 and 1977. Since the previous evaluation additional data became available and was equivocal. The coloring did not cause tumors in rats and mice but caused cysts in the intestines of pigs. Used in dairy-based drinks, flavored and/or fermented (e.g., chocolate milk, cocoa, eggnog, drinking yogurt, whey-based drinks) in Europe. A violet-black synthetic coal tar and azo dye. Used in decorations and coatings, desserts, fish paste, flavored milk drinks, ice cream, mustard, red fruit jams, sauces, savory snacks, soft drinks, soups, and sweets. Not recommended for consumption by children. Banned in Denmark, Australia, Austria, Belgium, Canada, Finland, France, Germany, Japan, Norway, Switzerland, Sweden, the United States, and Norway. E

BRILLIANT BLUE • See FD and C Blue No. 1. E

BROMATED • Combined or saturated with bromine, a nonmetallic, reddish, volatile liquid element. See Bromates.

BROMATED FLOUR • A white flour to which potassium bromate (see) is added as a flour improver, strengthening the dough and allowing higher rising. It is an oxidizing agent, and under the right conditions, will be completely used up in the baking bread. However, if too much is added, or if the bread is not cooked long enough or not at a high enough temperature, then a residual amount will remain, which may be harmful if consumed.

the bread is not cooked long enough or not at a high enough temperature, then a residual amount will remain, which may be harmful if consumed. The regulations say it is not to exceed 50 parts per million.

BROMATES • Calcium bromate is a maturing additive and dough conditioner in bromated flours and bromated whole-wheat flour. Potassium bromate is a bread improver. Sugar contaminated with potassium bromate caused a food poisoning outbreak in New Zealand. The lethal dose is uncertain but 2 to 4 ounces of a 2 percent solution causes serious poisoning in children. Death in animals and humans apparently is due to kidney failure, but central nervous system problems have been reported. Bromates may also cause skin eruptions. Topical application to abraded skin has caused poisoning.

BROMELAIN • Bromelin. A protein-digesting and milk-clotting enzyme found in pineapple. Used for tenderizing meat, chill-proofing beer, and as an antiinflamma-tory medication. “Solutions consisting of water, salt, monosodium glutamate, and approved proteolytic enzymes applied or injected into cuts of beef shall not result in a gain of more than 3 percent of the weight of the untreated product.” GRAS. ASP

BROMIC ACID, POTASSIUM SALT • White crystals used as a dough conditioner and maturing additive in baked goods, beverages, and confectionery products. A poison by ingestion. An experimental carcinogen. A powerful oxidizer. An irritant to skin, eyes, and mucous membranes.

BROMIDES, INORGANIC • Potassium and Sodium. Used as fumigants. Bromides can cause skin rashes; large doses can cause central nervous system depression, and prolonged intake may cause mental deterioration. When sunlight mixes with bromide and chlorine in water, the cancer-causing agent bromate forms. Bromide is naturally present in groundwater and chlorine is used to kill bacteria, but sunlight is the final ingredient in the potentially harmful mix. See chlorine.

BROMINATED DIPHENYL ETHERS • Identified as priority hazardous substance by the EU. See Bromides, Inorganic.

BROMINATED VEGETABLE OIL • Bromine, a heavy, volatile, corrosive, nonmetallic liquid element, added to vegetable oil or other oils. Dark brown or pale yellow, with a bland or fruity odor. These high-density oils are blended with low-density essential oils to make them easier to emulsify (see). Used largely in soft drinks, citrus-flavored beverages, ice cream, ices, and baked goods. The FDA has them on the “suspect list.” Less than 15 ppm in fruit-flavored beverages are allowed, according to the FDA. In 2003, the agency ruled that the food additive brominated vegetable oil may be safely used in accordance with the following prescribed conditions: (1) The additive as free fatty acids (such as oleic) shall not exceed 2.5 percent and iodine value shall not exceed 16; and (2) the additive is used on an interim basis as a stabilizer for flavoring oils used in fruit-flavored beverages, for which any applicable standards of identity do not preclude such use, in an amount not to exceed 15 ppm in the finished beverage, pending the outcome of additional toxicological studies on which periodic reports at six-month intervals are to be furnished and final results submitted to the FDA promptly after completion of the studies. As of 2003, the agency had not yet received further information. See Bromates for toxicity. ASP

BROMOMETHANE • A colorless, volatile liquid that is used as a fumigant in animal feed, apples, barley, cereal grains, corn, cracked rice, fava beans, fermented malt beverages, flour, grain sorghum, kiwifruit, lentils, macadamia nuts, oats, pistachio nuts, rice, rye, sweet potatoes, and wheat. FDA residue tolerances include 125 ppm in cereal grain, 25 ppm in fermented malt beverages, 400 ppm in dog food, and 125 ppm in barley, corn, grain sorghum, oats, rice, rye, and wheat when used for animal feed. Extremely hazardous, especially by inhalation. Death following acute poisoning is usually caused by lung irritation. In chronic poisoning, death is due to injury to the central nervous system.

BROOM EXTRACT • See Genet, Absolute.

BROWN ALGAE • See Algae, Brown.

BROWN FK • Coloring. A highly suspect brown mixture of six synthetic azo dyes together with other colorings and sodium chloride and/or sodium sulfate. Found mainly in kippers and smoked mackerel but also occasionally in cooked hams and potato chips. Not recommended for consumption by children. Banned throughout the EU (except in the United Kingdom where its use is still permitted!). Also prohibited in Australia, Austria, Canada, Finland, Ireland, Japan, Norway, Sweden, and the United States. E

BROWN HT • A brown synthetic coal tar and azo dye found mainly in chocolate-flavored cakes. It appears to cause allergic and/or intolerance reactions, particularly among those with an aspirin intolerance and asthma sufferers; also known to induce skin sensitivity. Not recommended for consumption by children. Its use is banned in Australia, Austria, Belgium, Denmark, France, Germany, Norway, Sweden, Switzerland, and the United States. E

BROWN RICE • In 2008, it was added to the FDA-approved list of whole grains that may make health claims including reducing the risk of heart disease and some cancers. Brown rice, along with many other grains, was previously excluded because its dietary fiber content was considered too low, but this requirement has been relaxed. The health claim means brown rice products will be able to bear a whole grains logo and information pointing out the benefits of consuming whole grains. The claim states: “Diets rich in whole grain foods and other plant foods and low in total fat, saturated fat and cholesterol may reduce the risk of heart disease and some cancers.” U.S. Dietary Guidelines recommend “making half of all grain servings whole” or consuming three whole grain servings per day in the average 2,000-calorie diet.

BROWN SUGAR • Sweetener consisting of sugar crystals covered with a film of cane molasses giving it color and flavor. There are three grades: light, medium, and dark, which vary in sugar content and color. It is used in baked goods, glazes, toppings, and fillings.

BROWNING AGENT • Usually consists of starches and natural and synthetic flavors and colors such as caramel. Liquid smoke (see) is used often. The ingredients are aimed at the bakery, meat, and vegetable industries. In meat-based or poultry-based applications, browning accelerates the caramelized color. Other applications include crisping pie crusts, preventing moisture migration, and adhering seeds such as sesame seeds to baked goods. Browning is used for pizza toppings, caramelized onions, and individual quick freezing (IQF) roasted vegetables. The application is done by spraying, tumbling, or glazing. Browning agents rarely add nutritional value to food products. Benefits include no need for egg washes and reduced cook time. See possible adverse effects from browning on pages 14–15 of the introduction.

BRYONIA • A small herb used for flavoring in alcoholic beverages only.

BST • The abbreviation for bovine somatotropin (see) hormone. NUL

BUCHU LEAF OIL • Barosma betulina and B. crenulata. A natural flavoring additive from a South African plant used in berry, fruit, chocolate, mint, and spice flavorings for beverages, ice cream, ices, candy, baked goods, liquors, and condiments. Has been used as a urinary antiseptic and mild diuretic. EAF

BUCKBEAN LEAVES • Menyanthes trifoliata. Flavoring in alcoholic beverages only. NUL

BUCKTHORN • Frangula. A shrub or tree grown on the Mediterranean coast of Africa, it has thorny branches and often contains a purgative in the bark or sap. Its fruits are used as a source of yellow and green dyes.

BUFFER • Usually a solution with a relatively constant acidity-alkalinity ratio, which is unaffected by the addition of comparatively large amounts of acid or alkali. A typical buffer solution would be hydrochloric acid (see) and sodium hydroxide (see).

BUQUINOLATE • An animal drug used in chicken feed to combat parasites. FDA limitations are 0.4 ppm in uncooked liver, kidney, and skin of chickens and 0.1 ppm in uncooked chicken muscle. Limitation of 0.5 ppm in egg yolks and 0.2 ppm in whole eggs.

BUTADIENE-STYRENE COPOLYMER • A component for a chewing-gum base. Butadiene is produced largely from petroleum gases and is used in the manufacture of synthetic rubber. It may be irritating to the skin and mucous membranes and narcotic in high concentrations. University of Texas professor of environmental toxicology Johnathan Ward believes the link between butadiene and genetic mutations means butadiene may be carcinogenic. Indeed, he reported in 2003 that he found that many rubber plant workers exposed to butadiene either had leukemia or had died from it. Styrene, obtained from ethyl benzene, is an oily liquid with a penetrating odor. It has the same uses and toxicity. Under study by NTP (see) as a carcinogen. 1,3 Butadiene is a known carcinogen. It is in food packaging, but the FDA believes it will not migrate into food.

BUTADIENE-STYRENE RUBBER • Latex. A chewing-gum base. ASP

BUTANAL • See Butyraldehyde.

BUTANDIONE • See Triacetyl Glycerin.

BUTANE • N-butane and Iso-butane. Methylsulfonal. Bioxiran. Dibutadiene Dioxide. A flammable, easily liquefiable gas derived from petroleum. A solvent, refrigerant, and food additive. Also used as a propellant or aerosol in cosmetics. The principal hazard is that of fire and explosion, but it may be narcotic in high doses and cause asphyxiation. It has been determined by the National Institute of Occupational Safety and Health to be an animal carcinogen. GRAS. NUL. E

1,4-BUTANE DICARBOXYLIC ACID • See Adipic Acid.

1,3-BUTANEDIOL • 1,3-BD. A thick liquid used as a flavoring additive and solvent for flavorings. Mildly toxic by ingestion. An eye irritant. A relative, 1,4-Butanediol, was reported to be responsible for children becoming unconscious after eating Chinese-made beads containing the chemical. It turns into GBH, the “date rape” drug. Both are derived from butane (see). A research study published in the journal American Society for Pharmacology and Experimental Therapeutics concluded the data indicate that, like ethanol, 1,3-BD depresses central nervous system activity and induces physical dependence.

2,3-BUTANEDIONE • A greenish yellow liquid with a strong odor used as a flavoring additive with margarine. Moderately toxic by ingestion. A skin irritant. GRAS

1,2 BUTANEDITHIOL • Flavoring additive. The JECFA (see) says there is no safety concern. ASP

1,3-BUTANEDITHIOL • Flavoring additive. The JECFA (see) says there is no safety concern. ASP

2,3-BUTANEDITHIOL • Flavoring additive. The JECFA (see) says there is no safety concern. ASP

1-BUTANETHIOL • Flavoring additive. The JECFA (see) says there is no safety concern. ASP

2-BUTANONE • Flavoring additive. The JECFA (see) says there is no safety concern. It is number 208 on the CERCLA Priority List of Hazardous Substances (see). ASP

BUTAN-3-ONE-2-YL BUTANOATE • Flavoring additive. The JECFA (see) says there is no safety concern. ASP

BUTANOIC ACID • See Butyric Acid.

1-BUTANOL • See Butyl Alcohol. ASP

4-BUTANOLIDE • A colorless liquid with a caramel odor, it is used as a flavoring additive in candy and soy milk. Moderately toxic by ingestion. May cause skin tumors. GRAS

2,3-BUTANOLONE • See Acetoin.

2-BUTANONE • Colorless liquid with an acetonelike odor used as a flavoring additive in various foods. On the Community Right-to-Know List and in the EPA Genetic Toxicology Program (see both). Moderately toxic by ingestion, skin contact, and injection.

BUTAN-3-ONE-2YL BUTYRATE • White to yellow liquid used as a flavoring additive in various foods. GRAS. ASP

BUTANEDIOIC ACID • See Fumaric Acid. EAF

1-BUTEN-1-YL METHYL SULFIDE • Flavoring additive. The JECFA (see) says it has no safety concern at current levels of intake when used as a flavoring additive. EAF

BUTOXYPOLYETHYLENE • A synthetic antifoaming additive used in beet sugar manufacture.

BUTTER ACIDS • Butter contains a wide variety of fatty acids that contribute to its functional advantages and characteristics. See Butters. ASP

BUTTER, CLARIFIED • Butter that has undergone purification by removal of solid particles or impurities, which may affect the color, odor, or taste.

BUTTER ESTERS • Widely used fractionated fats that have been separated into solid and liquid components. Used to make flavorings. See Butters. ASP

BUTTER FAT, ENZYME-MODIFIED, WITH ADDED BUTYRIC ACID • A concentrated butter flavoring and a method of manufacturing the same for addition to food to impart a butterlike flavor comprising a lipase enzyme-modified milk fat, flavor and aroma principles, a diluent, and a bicarbonate buffering agent.

Flavoring substances comprising an enzyme modified milk fat and a fatty material and heating the mixture to provide flavoring substances adapted to impart butter and/or animal notes to foodstuffs are disclosed, together with a method of making same. The butter notes are derived from the enzyme-modified milk fat, which may be selected from the group consisting of enzyme-modified butter, enzyme-modified butter oil, enzyme-modified cheese, enzyme-modified cream or any mixture or equivalents thereof. The fatty material may be selected from the group consisting of fatty acids and fatty acids glycerides. The flavoring substances impart animal notes to foodstuffs when the fatty material selected is derived from animal fats such as bacon grease, fatty-pork tissue, fatty-poultry tissue, suet, tallow or the like. In addition, optional meat flavoring agents such as sulfur-containing compounds and amino acids may be added. Fully up-to-date toxicology information has been sought. ASP

BUTTERMILK • The fluid remaining after butter has been formed from churned cream. It can also be made from sweet milk by the addition of certain organic cultures.

BUTTER OIL • See Ghee.

BUTTERS • Acids, Esters, and Distillate. Substances that are solid at room temperature but that melt at body temperature are called butters. Butter acids are synthetic butter and cheese flavoring additives for beverages, ice cream, ices, candy (2,800 ppm), and baked goods. Butter esters are synthetic butter, caramel, and chocolate flavoring additives for beverages, ice cream, ices, baked goods, toppings, and popcorn (1,200 ppm). Butter starter distillate is a synthetic butter flavoring additive for ice cream, ices, baked goods, and shortening (12,000 ppm). Cocoa butter is one of the most frequently used in both foods and cosmetics. Newer butters are made from natural fats by hydrogenation (see), which increases the butter's melting point or alters its plasticity. See Trans Fatty Acids.

BUTTER STARTER DISTILLATE • A flavoring. GRAS. ASP

BUTYL • Prefix for any class of synthetic rubbers.

BUTYL ACETATE • Acetic Acid, Butyl Ester. A synthetic flavoring additive, a clear liquid with a strong fruit odor, prepared from acetic acid and butyl alcohol. Used in raspberry, strawberry, butter, banana, and pineapple flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. It is an irritant and may cause eye irritation (conjunctivitis). It is a narcotic in high concentrations, and toxic to humans when inhaled at 200 ppm. ASP

BUTYL ACETOACETATE • A synthetic berry and fruit flavoring additive for beverages, ice cream, candy, and baked goods. ASP

BUTYL ACETYL RICINOLEATE • See Ricinoleate.

BUTYL ALCOHOL • A synthetic butter, cream, fruit, liquor, rum, and whiskey flavoring additive for beverages, ice cream, ices, candy, baked goods, cordials, and cream. A colorless liquid with an unpleasant odor, it occurs naturally in apples and raspberries. A solvent for waxes, fats, resins, and shellac. It may cause irritation of the mucous membranes and cause headache, dizziness, and drowsiness when ingested. Inhalation of as little as 25 ppm causes pulmonary problems in humans. It can also cause contact dermatitis when applied to the skin. ASP

BUTYL ALDEHYDE • See Butyraldehyde.

BUTYL ANTHRANILATE • A synthetic grape, mandarin, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

n-BUTYL n-BUTANOATE • Colorless liquid with pineapple odor used as a flavoring additive in various foods. Mildly toxic by ingestion. Moderately irritating to eyes, skin, and mucous membranes by inhalation. Narcotic in high concentrations.

2-BUTYL-2-BUTENAL • In food flavorings, sweet, light roasted, weak, fatty and hazelnutlike notes; in perfumes, green, slight fruity aromas; in tobaccos, a natural, sweet and rum note and/or enhanced hazelnut flavors. ASP

BUTYL BUTYRATE • A colorless liquid used as a flavoring. It is an irritant and narcotic. ASP

BUTYL BUTYROLLACTATE • Colorless liquid with a buttery, creamlike odor used as a flavoring additive in baked goods and candy. A skin irritant. ASP

BUTYL BUTYRYLLACTATE • A colorless, synthetic flavoring additive from butyl alcohol, with a fruity odor. Used in berry, butter, apple, banana, peach, pineapple, liquor, scotch, and nut flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP.

BUTYL CARBOBUTOXYMETHYL PHTHALATE • A plasticizer used in packaging material. Mildly toxic via injection. Causes birth defects in laboratory animals. An eye irritant in humans.

a-BUTYL CINNAMALDEHYDE • A synthetic fruit, nut, spice, and cinnamon flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

BUTYL CINNAMATE • A synthetic chocolate, cocoa, and fruit flavoring for beverages, ice cream, ices, candy, baked goods, and liquor. ASP

BUTYL 2-DECENOATE • A synthetic apricot and peach flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum (2,000 ppm). ASP

BUTYL DECYLENATE • See Butyl 2-Decenoate.

BUTYL DODECANOATE • See Butyl Laurate. ASP

BUTYL ETHYL DISULFIDE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association.

BUTYL ETHYL MALONATE • A synthetic fruit and apple flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

BUTYL FORMATE • Formic Acid. A synthetic fruit, plum, liquor, and rum flavoring for beverages, ice cream, ices, candy, and baked goods. See Formic Acid for toxicity. ASP

BUTYL HEPTANOATE • A synthetic fruit and liquor flavoring for beverages, ice cream, ices, candy, and baked goods. NIL

BUTYL HEXANOATE • A synthetic butter, butterscotch, pineapple, and rum flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

Tert-BUTYL HYDROQUINONE (TBHQ) • White crystalline solid used as an antioxidant in beef products, dry cereals, edible fats, margarine, meat, pizza toppings, pork, potato chips, poultry, sausage, and vegetable oils. Moderately toxic by ingestion. May be mutagenic. The JECFA (see) concluded in June 1998, “The potential exists for high consumers of TBHQ to exceed the ADI (see) but the available data were insufficient to estimate the number of high consumers or the magnitude and duration of intake above the ADI.” The committee is reviewing this additive's level in edible fats and oils, fish and fish products, and carbonated water-based soft drinks. ASP

BUTYL p-HYDROXYBENZOATE • Butyl Paraben. Butyl p-Oxybenzoate. Almost odorless, small colorless crystals or white powder used as an antimicrobial preservative. ASP.

BUTYL ISOBUTYRATE • A synthetic raspberry, strawberry, butter, banana, and cherry flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum (2,000 ppm). ASP

BUTYL ISOTHIOCYNATE • Butyl Mustard Oil. No safety concern (conditional) at current levels of intake when used as a flavoring agent, according to the JECFA. The evaluation is conditional because the estimated daily intake is based on the anticipated annual volume of production. The conclusion of the safety evaluation of this substance will be revoked if use levels or poundage data are not provided before the end of 2007. At the June 2008 meeting of the JECFA, complete information was not yet available. EAF

BUTYL ISOVALERATE • A synthetic chocolate and fruit flavoring for beverages, ice cream, ices, candy, puddings, and gelatin desserts. ASP

2-BUTYL-5 (or 6)-KETO-1, 4-DIOXANE • A synthetic fruit and spice flavoring for beverages, ice cream, ices, candy, baked goods, and shortenings. See Ketones and Dioxanes. ASP

BUTYL LACTATE • A synthetic butter, butterscotch, caramel, and fruit flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

BUTYL LAURATE • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

BUTYL LEVULINATE • A synthetic butter, fruit, and rum flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

N-BUTYL 2-METHYLBUTYRATE • See Methyl Butyrate. ASP

BUTYL OLÉATE SULFATE • See Sulfated Butyl Oleate. EAF a-BUTYL-OMEGA-HYDROXYPOLY(OXYETHYLENE) POLY(OXYPROPYL-ENE • Inert ingredient used in pesticides. NIL

BUTYL PARASEPT • See Butyl p-Hydroxybenzoate.

BUTYL PHENYLACETATE • Synthetic butter, honey, caramel, chocolate, rose, fruit, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and puddings. ASP

BUTYL PHOSPHOROTRITHIOATE • Butifos. A defoliant used in animal feed and cottonseed hulls. A poison by ingestion, skin contact, and possibly

other routes. Caused mutations in animals and affected nerve transmission. FDA limitations of 6 ppm in cottonseed hulls when used for animal feed.

BUTYL PROPIONATE • A synthetic butter, rum butter, fruit, and rum flavoring additive for beverages, ice cream, ices, candy, and baked goods. May be an irritant. ASP

BUTYL RUBBER • A synthetic rubber used as a chewing-gum base component.

BUTYL SALICYLATE • See Salycilates. ASP

BUTYL SEBACATE • See Dibutyl Sebacate.

BUTYL STEARATE • A synthetic antifoaming additive used in the production of beet sugar. Also a synthetic banana, butter, and liquor flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and liqueurs. ASP

BUTYL SULFIDE • A synthetic floral, violet, and fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

BUTYL 10-UNDECENOATE • A synthetic butter, apricot, cognac, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, icing, and liquor. ASP

BUTYL VALERATE • A synthetic butter, fruit, and chocolate flavoring additive for beverages, ice cream, ices, candy, baked goods, puddings, and gelatin desserts. ASP

BUTYLAMINE • Colorless, volatile liquid with an ammonia odor derived from butanol or butyl chloride with ammonia. Used as an intermediate for emulsifying additives, insecticides, and dyes. ASP

SEC-BUTYLAMINE • Tutane. A fungicide used in animal feed, citrus molasses, and dried citrus pulp. Limitations of 90 ppm in citrus molasses and dried citrus pulp when used for cattle feed. Poisonous by ingestion. A powerful irritant. Moderately toxic by skin contact. EAF

BUTYLATED HYDROXYANISOLE • BHA. A petroleum-derived preservative, antioxidant, and stabilizer used in many products, including beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, soup bases, potatoes, glacéed fruits, potato flakes, sweet potato flakes, dry breakfast cereals, dry yeast, dry mixes for desserts, lard, shortening, unsmoked dry sausage, and in emulsions for stabilizers for shortenings. Retards spoilage due to oxidation. Total content of antioxidants is not to exceed 0.02 percent of fat or oil content of food; allowed up to 1,000 ppm in dry yeast; 200 ppm in shortenings; 50 ppm in potato flakes; and 50 ppm with BHT (butylated hydroxytoluene) in dry cereals. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that while no evidence in the available information demonstrates a hazard to the public at current use levels, uncertainties exist, requiring that additional studies be conducted. The FDA said in 1980 that GRAS status should continue while tests on BHA are being completed and evaluated. In the 1990 Annual Review of Pharmacology and Toxicology, scientists from the United Kingdom and the United States reviewed Japanese reports of a high incidence of cancerous and benign tumors in the forestomach of rats fed BHA. The reviewers concluded that because we humans don't have forestomachs and because the doses of BHA administered to the rats were so high, there was nothing to be alarmed about.

In November 1990, Glenn Scott, M.D., a Cincinnati physician, filed a petition with the FDA asking the agency to prohibit the use of BHA in food. Before acting on Scott's petition, however, the FDA asked the Federation of American Societies for Experimental Biology (FASEB) to reexamine the scientific data on BHA and make a report by March 1992. The JECFA (see) concluded in June 1998, “The potential exists for high consumers of BHA to exceed the ADI [acceptable daily intake], but the available data were insufficient to estimate the number of high consumers or the magnitude and duration of intake above the ADI.” The committee is reviewing this additive's level in edible fats and oils, dried vegetables, cocoa products, processed meat, frozen fish, ready-to-eat soup and broth, and food supplements—now thirteen years after the report in the scientific journal that cited it as a potential cancer-causing agent. Notper-mitted in infant foods. Can provoke an allergic reaction in some people. Used in edible oils, chewing gum, polyethylene food wraps. May trigger hyperactivity and other intolerances; serious concerns over carcinogenicity and estrogenic effects.

BHA is banned in Japan. In 1958 and in 1963, official committees of experts recommended that BHA be banned in the UK; however, reportedly, industry objections killed the ban.

BHA affects the liver and kidney functions (the liver detoxifies it). BHA may be more rapidly metabolized than BHT (see), and in experiments at Michigan State University it appeared to be less toxic to the kidneys of living animals than BHT. It is also used as a flavoring additive and to treat mastitis in dairy cattle. NTP (see) has concluded that under the conditions of the bioassay BHA is a suspected human carcinogen based on sufficient evidence of carcinogenicity in experimental animals according to the International Agency for Research on Cancer (IARC 1986, 1987). When administered in the diet, butylated hydroxyanisole induced papillomas and squamous cellcarcinomas of the forestomach in rats of both sexes and male SyrianGolden hamsters. No data were available to evaluate the carcinogenicity of butylated hydroxyanisole in humans (IARC 1986, 1987). BHA, however, is reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity in experimental animals when administered in the diet. GRAS. ASP. E

BUTYLATED HYDROXYMETHYLPHENOL • A new antioxidant; a nearly white crystalline solid with a faint characteristic odor. Contains phenol, which is toxic.

BUTYLATED HYDROXYTOLUENE • BHT. One of the most commonly used antioxidants in foods. Also a preservative and stabilizer, employed in many foods. Used as a chewing-gum base, added to potato and sweet potato flakes and dry breakfast cereals. An emulsion stabilizer for shortenings used in enriched rice, animal fats, and shortenings containing animal fats. Total content of antioxidants in fat or oils not to exceed 0.02 percent. Allowed up to 200 ppm in emulsion stabilizer for shortenings, 50 ppm in dry breakfast cereals and potato flakes. Used also as an antioxidant to retard rancidity in frozen fresh pork sausage and freeze-dried meats up to 0.01 percent based on fat content. It is also used as a flavoring additive and to treat mastitis in dairy cattle. Can cause allergic reactions. Loyola University scientists reported on April 14, 1972, that pregnant mice fed a diet consisting of one-half of 1 percent of BHT (or BHA, butylated hydroxyanisole) gave birth to offspring that frequently had chemical changes in the brain and subsequently abnormal behavior patterns. BHT and BHA are chemically similar, but BHT may be more toxic to the kidney than BHA (see), according to researchers at Michigan State University. The Select Committee of the American Societies for Experimental Biology, which advises the FDA on food additives, recommended further studies to determine “the effects of BHT at levels now present in foods under conditions where steroid hormones or oral contraceptives are being ingested.”

The FDA says that the possibility that BHT may convert other ingested substances into toxic or cancer-causing additives should be investigated. BHT is prohibited as a food additive in the United Kingdom. The FDA is pursuing further study. The JECFA (see) concluded in June 1998, “The potential exists for high consumers of BHT to exceed the ADI (see) but the available data were insufficient to estimate the number of high intake consumers or the magnitude and duration of intake above the ADI.” The committee is reviewing this additive's levels in edible fats and oils, chewing gum, and fish and fish products. The National Toxicology Program concluded BHT was not carcinogenic for rats or mice. Since 1959 BHT has been GRAS for use in foods. GRAS. ASP. E

1,3-BUTYLENE GLYCOL • A viscous, colorless, hygroscopic liquid; soluble in water and alcohol; used as a solvent, food additive, and flavoring, and

1,3-BUTYLENE GLYCOL • A viscous, colorless, hygroscopic liquid, soluble in water and alcohol, used as a solvent, food additive, and flavoring, and for plasticiz-ers and polyurethanes. Solvent used in the manufacturing of sausages. Hazardous irritant for skin contact, eye contact ingestion, and lung contact. May cause convulsions and death. Toxicity similar to ethylene glycol (see), one of the few humectants not on the GRAS list, although efforts have been made to place it there. ASP

3-BUTYLIDENEPHTHALIDE • Flavoring found in celery and celery stalk. Used in soups, condiments, meats; cigarettes. FEMA (see) claims it is GRAS. ASP

BUTYLPARABEN • Widely used in food and cosmetics as an antifungal preservative, it is the ester of butyl alcohol and p-hydroxybenzoic acid (see both).

3-N-BUTYLPHTHALIDE • Gives the distinctive smell and taste of celery and celery seed. Along with the compound sedanolide, an aromatic ingredient also found in celery, 3-N-butylphthalide significantly reduces the incidence of tumors in laboratory animals. Other studies suggest that this and other phthalides may also help reduce high cholesterol. Even though it's high in sodium (for a vegetable), celery is also proving to be effective at lowering blood pressure because 3-N-butylphthalide has been demonstrated to relax the smooth muscles that line blood vessels. See Celery. ASP

BUTYRALDEHYDE • A synthetic flavoring additive found naturally in coffee and strawberries. Used in butter, caramel, fruit, liquor, brandy, and nut flavorings for beverages, ice cream, ices, candy, baked goods, alcoholic beverages, and icings. Used also in the manufacture of rubber, gas accelerators, synthetic resins, and plas-ticizers. May be an irritant and a narcotic. ASP

BUTYRAMIDE • Flavoring additive. Latest evaluation in 2005 by the JECFA (see) found there was no safety concern (conditional) at current levels of the acceptable daily intake (ADI) when used as a flavoring agent. The evaluation is conditional because the estimated daily intake is based on the anticipated annual volume of production. In April 2006, the JECFA (see) said there is no concern. EAF

BUTYRIC ACID • n-Butyric Acid. Butanoic Acid. A clear, colorless liquid present in butter at 4 to 5 percent with a strong penetrating rancid-butter odor. Made by fermentation of molasses or starch. Butter, butterscotch, caramel, fruit, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, chewing gum, and margarine. Found naturally in apples, butter acids, geranium rose oil, grapes, strawberries, and wormseed oil. It is also used as an emulsifier. It has a low toxicity but can be a strong irritant to skin and tissue. GRAS. ASP

BUTYRIC ALDEHYDE • See Butyraldehyde.

BUTYRIN • See (tri-)Butyrin.

(tri-)BUTYRIN • A synthetic flavoring additive found naturally in butter. Butter flavoring for beverages, ice cream, ices, candy (1,000 ppm), baked goods, margarine, and puddings.

BUTYROIN • See 5-Hydroxy-4-Octanone.

BUTYROLACTONE • Butanolide. Liquid lactone used chiefly as a solvent for resins. It is also an intermediate (see) in the manufacture of polyvinylpyrrolidone (see). Human toxicity is unknown but betabutyrolactone is a cancer-causing agent according to the Environmental Defense Fund (see).

BUTYRONE • See 4-Heptanone.

BUXINE • See a-Amyl Cinnamaldehyde.

BUXINOL • See a-Amylcirmamyl Alcohol.

BW • The abbreviation for body weight.

C • FDA abbreviation for with.

CAC • The abbreviation for an international intergovernmental body, Codex Alimentarius Commission, administered by the Joint FAO/WHO Food Standards Programme, which was established in the early 1960s. The primary aims of the CAC are to protect the health of the consumer and to facilitate international trade in food commodities. The JECFA (see) advises three general subject committees of the CAC: the Codex Committee on Food Additives (CCFA), the Codex Committee on Contaminants in Foods (CCCF), and the Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF).

CACAO SHELL • Cacao shells of the seeds of trees grown in Brazil, Central America, and most tropical countries. Weak chocolatelike odor and taste, thin and peppery, with a reddish brown color. Used in the manufacture of caffeine (see) and theobromine, which occurs in chocolate products and is used as a diuretic and nerve stimulant. Occasionally causes allergic reactions from handling. GRAS

CACHOU EXTRACT • See Catechu Extract.

CACTUS ROOT EXTRACT • See Yucca Extract.

CADINENE • A general fixative that occurs naturally in juniper oil and pepper oil. It has a faint, pleasant smell. Used in candy, baked goods (1,200 ppm), and chewing gum (1,000 ppm). ASP

CADMIUM • A naturally occurring metal used to control molds and diseases that attack home lawns, golf courses, and other grasses. However, less than 0.1 percent of the annual U.S. consumption of 12 million pounds of cadmium is used in pesticides. Most cadmium used in the United States is obtained as a by-product from smelting zinc, lead, or copper ores. The cadmium by-product is mostly used in metal plating and to make pigments, batteries, and plastics. It is also in cigarette smoke. Most people who smoke have about twice as much cadmium in their bodies as non-smokers. Cadmium can get into your bloodstream by eating and drinking cadmium-contaminated food or water. The foods you eat most likely to be laced with small amounts of cadmium are shellfish, liver, and kidney meats. Plants absorb cadmium from soil, and the fish, in turn, absorb it from the water they swim in. Eating food or drinking water with high levels of cadmium can severely irritate the stomach and cause vomiting and diarrhea. Breathing high doses of cadmium can irritate and damage the lungs and can cause death. However, the greatest concern is from exposure to lower doses of cadmium over a long period of time. The lower and long-term exposure to cadmium through air or through diet can cause kidney damage. Cadmium in drinking water has been correlated with cancer of the pharynx, esophagus, intestines, larynx, lungs, prostate, and bladder. Cadmium is believed to cause mutations. It has an extremely long biological clearance in humans and accumulates in body tissues, particularly in the liver and kidney.

There are no available chelating additives for cadmium excretion. The JECFA (see) allocated a provisional tolerable weekly intake (PTWI) of 400 to 500 nanograms of cadmium per person. The average dietary intake, according to the United Nations, is approximately 10 to 50 nanograms per day in areas of normal exposure. The committee noted there was a question about how much biologically active cadmium is available from various foods, such as rice or grains. For example, in a study in New Zealand, the blood concentration and urinary excretion of cadmium were found to be “surprisingly low” in a population with a high dietary intake of New Zealand oysters containing high levels of cadmium. The committee set the current PTWI of 7 nanograms per kilogram of body weight pending future research. The FDA, which previously allowed cadmium as a colorant in polystyrenes, doesn't anymore. Government agencies including OSHA, NTP, FDA, and NIH (see all) now label cadmium as a human cancer-causing agent. Cadmium also is believed to cause pulmonary emphysema and bone disease. The latter has been observed in Japan (“itaiitai” disease) where residents were exposed to cadmium in rice crops irrigated with cadmium-contaminated water. Cadmium may also cause anemia, tooth discoloration, and loss of smell. The commercial use of cadmium has declined approximately 70 percent in response to environmental concerns, according to the U.S. Geological Survey 2004. It is identified as a priority hazardous substance in the EU. Cadmium is number seven on the CERCLA (see) Priority List of Hazardous Substances.

CAFFEINE • Guaranine. Methyltheobromine. Theine. Trimethylxanthine. An odorless white powder with a bitter taste that occurs naturally in coffee, cola, guarana paste, tea, and kola nuts. Caffeine is the number one psychoactive drug. Obtained as a by-product of producing caffeine-free coffee. Used as a flavor in root beer beverages and other foods. It is a central nervous system, heart, and respiratory system stimulant. Caffeine can alter blood sugar release and cross the placental barrier. It can cause nervousness, insomnia, irregular heartbeat, noises in ears, and, in high doses, convulsions. It has been linked to spontaneous panic attacks in persons sensitive to caffeine. It has been found to be addictive. It also causes increases in calcium excretion. Caffeine was considered GRAS because it was in use before 1958. However, the expert committee convened for the specific purpose of the GRAS review determined that uncertainties existed about caffeine that require additional studies. The FDA acknowledged that caffeine in cola-type beverages has been in use well before 1958. Because it causes birth defects in rats, the FDA proposed regulations to request new safety studies and to encourage the manufacture and sale of caffeine-free colas. One regulation would make the food industry's continued use of caffeine as an added ingredient in soft drinks and other foods conditional upon its funding of studies of caffeine's effects on children and the unborn. A University of Montreal study published in the Journal of the American Medical Association, December 22, 1993, said that women who consume the amount of caffeine in one and a half to three cups of coffee a day may nearly double their risk of miscarriage. Under present regulations, a soft drink, except one artificially sweetened, must contain caffeine if it is to be labeled as cola or pepper, and the FDA wants soda producers to be able to use this name when caffeine is not used. The FDA has asked for studies on the long-term effects of the additive to determine whether it may cause cancer or birth defects. The FDA and the American Medical Association have proposed quantitative labeling of caffeine content. By July 1, 2004, products sold in the European Union containing more than 150 mg of caffeine per liter were required to include the term “high caffeine content” near the product name. Such products must also indicate the caffeine content expressed in mg/100. Australia requires that caffeinated “energy drinks” state: “Not suitable for children and caffeine sensitive persons.” In 2003, the National Soft Drink Association legally objected to the FDA's proposed new labeling rules for caffeine. See page 35 for more on energy drinks. GRAS. ASP

CAFO • The abbreviation for confined animal feeding operations. See page 17.

CAJEPUT OIL • Melaleuca leucadendra. A spice flavoring from the cajeput tree native to Australia. The leaves yield an aromatic oil. Used for beverages, ice cream, ices, candy, and baked goods. EAF

CAJEPUTENE • See Limonene.

CAJEPUTOL • See Eucalyptol.

CALAMUS • Extract and Oil. Sweet Flag. Sweet Sedge. Acorus calamus. The rhizome contains essential oil, mucilage, glycosides, amino acid, and tannins. The oil is obtained by steam distillation of the stem or root and is used as a flavoring additive. Calamus root is an ancient Indian and Chinese herbal medicine used to treat stomach acid, irregular heart rhythm, low blood pressure, coughs, and lack of mental focus. Native Americans would chew the root to enable them to run long distances with increased stamina. Externally, it was used to induce a state of

Americans would chew the root to enable them to run long distances with increased stamina. Internally, it was used to induce a state of tranquillity. Banned as a food additive by the FDA.

CALC • FDA abbreviation for calculated.

CALCIUM ACETATE • Brown Acetate of Lime. It is used in the manufacture of acetic acid and acetone and in dyeing, tanning, and curing skins as well as a corrosion inhibitor in metal containers. Low oral toxicity. Used medicinally as a source of calcium. GRAS. ASP. E

CALCIUM ACID PHOSPHATE • See Calcium Phosphate.

CALCIUM ALGINATE • A stabilizer, thickener, gelling additive, and texturizer. Also used as a solvent and vehicle for flavorings. Found in ice cream and Popsicles, soft and cottage cheeses, cheese snacks, dressings and spreads, fruit drinks, beverages, and instant desserts. See Alginates. GRAS. E

CALCIUM ALUMINUM SILICATE • Anticaking agent. See Calcium Silicate and Aluminum. E

CALCIUM ASCORBATE • A preservative and antioxidant prepared from ascorbic acid (vitamin C) and calcium carbonate (see). Used in concentrated milk products; in cooked, cured, or pulverized meat products; in pickles in which pork and beef products are cured and packed (up to 75 ounces per 100 gallons). See Ascorbic Acid for toxicity. GRAS. ASP. E

CALCIUM BENZOATE • Used as a preservative, both antibacterial and antifungal. Can be found in concentrated pineapple juice. People who suffer from asthma, aspirin sensitivity, or the skin disease urticaria may have allergic reactions and/or find their symptoms become worse following consumption of benzoic acid, particularly in combination with tartrazine. Not recommended for consumption by children. See Benzoic Acid. NUL. E

CALCIUM BRÓMATE • A maturing additive and dough conditioner used in bromated flours. The FDA allows 0.0075 part per 100 parts by weight of flour used. See Bromates. NIL

CALCIUM CAPRATE • Anticaking additive and emulsifier salt. See Caprylic Acid. NUL

CALCIUM CAPRYLATE • Anticaking additive and emulsifier salt. See Caprylic Acid. NUL

CALCIUM CARBONATE • Chalk. A tasteless, odorless powder that occurs naturally in limestone, marble, and coral. Used as a white food dye and alkali to reduce acidity in wine up to 2.5 percent, a neutralizer for ice cream and in cream syrups up to 0.25 percent, in confections up to 0.25 percent, and in baking powder up to 50 percent. Employed as a carrier for bleaches. Once widely used as a white coloring in foods and cosmetics, the FDA withdrew its use as a coloring in 1988. Calcium carbonate is still used as an alkali to reduce acidity and as a neutralizer and firming additive. Also used in dentifrices as a tooth polisher. It is used as an emulsifier under FDA regulations. A gastric antacid and antidiarrhea medicine, it may cause constipation. Female mice were bred after a week on diets supplemented with calcium carbonate at 220 and 880 times the human intake of this additive. At all dosage levels, the first and second litters of newly weaned mice were lower in weight and number, and mortality was increased. The highest level caused heart enlargement. Supplementing the maternal diet with iron prevents this, so the side effects were attributed to mineral imbalance due to excessive calcium intake. In humans, 500 milligrams per kilogram of body weight was fed to ulcer victims for three weeks. The amount ingested was 145 times the normal amount ingested as an additive. Some patients developed an excess of calcium in the blood and suffered nausea, weakness, and dizziness. Calcium carbonate can cause constipation. GRAS. ASP. E

CALCIUM CARBONATE CUDEAR • Logwood, chips, and extract. Purple coloring from lichens. It is the source of litmus. Previously commonly used as a coloring in food, the FDA no longer authorizes its use.

CALCIUM CARRAGEENAN • See Carrageenan.

CALCIUM CASEINATE • Used as a nutrient supplement for frozen desserts (except water ices) and in creamed cottage cheese. See Casein. ASP

CALCIUM CHLORIDE • The chloride salt of calcium. White, hard, odorless fragments, granules, powder, or as a solution. It absorbs water. Used in its anhydrous (see) form as a drying additive for organic liquids and gases. Used as a firming additive for sliced apples and other fruits, in apple pie mix, as a jelly ingredient, in certain cheeses to aid coagulation, in artificially sweetened fruit jelly, and in canned tomatoes. It is also used to treat mastitis in dairy animals. Employed medicinally as a diuretic and a urinary acidifier. Ingestion can cause stomach and heart disturbances. GRAS. ASP. E

CALCIUM CITRATE • A fine, white, odorless powder prepared from citrus fruit. Used as a buffer to neutralize acids in confections, jellies, jams, and in saccharine at the rate of 3 ounces per 100 pounds of the artificial sweetener. It is also used to improve the baking properties of flour. See Citrate Salts for toxicity. GRAS. ASP. E

CALCIUM CYCLAMATE • See Cyclamates. BAN

CALCIUM DlACETATE • A sequestrant used in cereal. See Calcium Acetate. GRAS

CALCIUM DIGLUTAMATE • The salt of glutamic acid (see). A flavor enhancer and salt substitute. Almost odorless white powder. The FDA says that it needs further study. As of this writing, nothing has been reported. NUL. E

CALCIUM DIOXIDE • Used in cereal flours. See Calcium Peroxide.

CALCIUM DISODIUM EDTA • Edetate Calcium Disodium. Calcium Disodium Ethylenediamine Tetraacetic Acid. A preservative and sequestrant, white, odorless powder with a faint salty taste. Used as a food additive to prevent crystal formation and to retard color loss. Used in canned and carbonated soft drinks for flavor retention; in canned white potatoes and cooked canned clams for color retention; in crabmeat to retard struvite (crystal formation); in dressings as a preservative; in cooked and canned dried lima beans for color retention; in fermented malt beverages to prevent gushing; in mayonnaise and oleomargarine as a preservative; in processed dried pinto beans for color retention; and in sandwich spreads as a preservative. Residue tolerances set by the FDA for this additive are cereal flours, 25 ppm; fermented malt beverages, 25 ppm; spice extractives, 60 ppm; pecan pie filling, 100 ppm; clams (cooked canned) to promote color retention, 340 ppm; lima beans to promote color, 310 ppm; crabmeat (cooked canned) to retard struvite formation, 275 ppm; shrimp (cooked canned) to retard struvite and to promote color retention, 250 ppm; carbonated soft drinks to promote flavor, 33 ppm; canned white potatoes to promote color retention, 110 ppm; canned mushrooms, 200 ppm; pickled cucumbers or pickled cabbage to promote color, flavor, and texture retention, 220 ppm; artificially colored lemon and orange-flavored spreads, 100 ppm; potato salad preservative, 100 ppm; French dressing, mayonnaise, and salad dressing; nonstan-dardized dressings and sauces, preservative, 75 ppm; sandwich spread as a preservative, 100 ppm; by weight of egg yolk portion, 200 ppm; distilled alcoholic beverages to promote stability of color, flavor, and/or product clarity; oleomargarine as a preservative, 75 ppm. Promotes stability of color. Used medically as a chelating additive to detoxify poisoning by lead and other heavy metals. May cause intestinal upsets, muscle cramps, kidney damage, and blood in urine. On the FDA priority list of food additives to be studied for mutagenic, teratogenic, subacute, and reproductive effects. The European Parliament said in 2003 that this synthetic antioxidant is building complexes with mineral salts and long-term exposure to high doses may result in depletion of metal(s) from the body (iron).

CALCIUM FERROCYANIDE • Anticaking additive in salt and in icing for fish. E

CALCIUM FUMARATE • A calcium salt of fumaric acid (see), used as an acidifier in the food industry. ASP

CALCIUM GLUCONATE • Odorless, tasteless, white crystalline granules, stale in air. Used as a buffer, firming additive, sequestrant in jelly and preserves. Also used in animal feeds. It is soluble in water. May cause gastrointestinal and cardiac disturbances. GRAS. ASP. E

CALCIUM GLYCEROPHOSPHATE • A fine, white, odorless, nearly tasteless powder used in dentifrices, baking powder, and as a food stabilizer and dietary supplement. A component of many over-the-counter nerve-tonic foods. Administered medicinally for numbness and debility. See Calcium Sources. GRAS. ASP

CALCIUM 5'-GUANYLATE • Flavor potentiator. Odorless white crystals or powder having a characteristic taste. See Flavor Potentiator. E

CALCIUM HEXAMETAPHOSPHATE • An emulsifier, sequestering additive, and texturizer used in breakfast cereals, angel food cake, flaked fish (prevents struvite), ice cream, ices, milk, bottled beer, reconstituted lemon juice, puddings, processed cheeses, artificially sweetened jellies and preserves, potable water supplies to prevent scale formation and corrosion and in brine for curing hams. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue but at this writing, its GRAS status is under review. NUL

CALCIUM HYDROGEN SULFITE • Preservative, antibrowning agent, antioxidant, a white crystalline or granular solid with an odor of sulfur dioxide. See Sulfites. E

CALCIUM HYDROXIDE • Slaked Lime. Calcium Hydrate. Limewater. Lye. An alkali, a white powder with a slightly bitter taste. Used as a firming additive for various fruit products, canned peas, as an egg preservative, in water treatment, in animal feeds, and for debarring hides. Used in pesticides. Accidental ingestion can cause burns of the throat and esophagus; also death from shock and asphyxia due to swelling of the glottis and infection. Calcium hydroxide also can cause burns on the skin and eyes. GRAS. ASP. E

CALCIUM HYPOCHLORITE • A germicide and sterilizing additive, the active ingredient of chlorinated lime, used in the curd washing of cottage cheese, in sugar refining, as an oxidizing and bleaching additive, and as an algae killer, bactericide, deodorant, disinfectant, and fungicide. Sterilizes fruits and vegetables by washing in a 50 percent solution. Under various names, dilute hypochlorite is found in homes as laundry bleach and household bleach. As with other corrosive additives, calcium hypochlorite's toxicity depends upon its concentrations. It is highly corrosive to skin and mucous membranes. Ingestion may cause pain and inflammation of the mouth, pharynx, esophagus, and stomach, with erosion particularly of the mucous membranes of the stomach.

CALCIUM HYPOPHOSPHITE • Crystals of powder, slightly acid in solution, and practically insoluble in alcohol. It is a corrosion inhibitor and has been used as a dietary supplement in veterinary medicine. GRAS. NUL

CALCIUM 5'-INOSINATE • See Inosinate. E

CALCIUM IODATE • White, odorless, or nearly odorless powder used as a dough conditioner and oxidizing additive in bread, rolls, and buns. It is a nutritional source of iodine in foods such as table salt and used also as a topical disinfectant and as a deodorant. Low toxicity, but may cause allergic reactions. GRAS. ASP

CALCIUM IODOBEHENATE • Dietary supplement used in animal feed as a source of iodine (see). GRAS

CALCIUM LACTATE • White, almost odorless crystals or powder used as a buffer and as such is a constituent of baking powders and is employed in confections; also used in dentifrices and as a yeast food and dough conditioner. It improves crispness in canned bean sprouts. Also used in animal feeds. In medical use, given for calcium deficiency; may cause gastrointestinal and cardiac disturbances. GRAS. ASP. E

CALCIUM LACTOBIONATE • A firming additive in dry pudding mixes. See Calcium Lactate. NIL

CALCIUM LAURATE • Anticaking additive and emulsifier salt. See Lauric Acid. NUL

CALCIUM LIGNOSULFONATE • Obtained from the pulp of wood mixed with calcium and sodium salts, it may contain up to 30 percent sugar. It is used as a dispersing additive and stabilizer for pesticides. NUL

CALCIUM MALATES • Acidifiers. See Malic Acid. E

CALCIUM METASILICATE • Used as an absorbent, antacid, filler for paper coatings, and as a food additive. Use in food restricted to 5 percent in baking powder and 2 percent in table salt. Irritating dust.

CALCIUM MYRISTATE • Surfactant (see). NUL

CALCIUM OLÉATE • Dispersant. NUL

CALCIUM ORTHOPHOSPHATE • Buffer and neutralizer used in noncarbonated beverages. GRAS.

CALCIUM OXIDE • Quicklime. Burnt Lime. A hard, white or grayish white, odorless mass or powder that is used as a yeast food and dough conditioner for bread, rolls, and buns. It is also an alkali for neutralizing dairy products (including ice cream mixes) and alkalizes sour cream, butter, and confections, and it is used in the processing of tripe. Industrial uses are for bricks, plaster, dehairing hides, fungicides, insecticides, and for clarification of beet and cane sugar juices. A strong caustic, it may severely damage skin and mucous membranes. See Calcium Sources. GRAS. ASP. E

CALCIUM PALMITATE • Anticaking additive and emulsifier. See Palmitic Acid. NUL

CALCIUM PANTOTHENATE • Pantothenic Acid Calcium Salt. A B-complex vitamin, pantothenate is a white, odorless powder with a sweetish taste and bitter aftertaste. Pantothenic acid occurs everywhere in plant and animal tissue, and the richest common source is liver; jelly of the queen bee contains six times as much. Rice bran and molasses are other good sources. Acid derivatives sold commercially are synthesized. Biochemical defects from lack of calcium pantothenate may exist undetected for some time but eventually manifest themselves as tissue failures. Moderately toxic by ingestion. See Pantothenamide. GRAS. ASP

CALCIUM PANTOTHENATE CALCIUM CHLORIDE DOUBLE SALT • See Calcium Panthothenate and EDTA. ASP

CALCIUM PERIODATE • A nutrient source of iodine in salt for livestock.

CALCIUM PEROXIDE • Derived from an interaction of a calcium salt and sodium per oxide with subsequent crystallization. Used in bakery products as a dough conditioner, for bleaching of oils, modification of starches, and as a seed disinfectant. Irritating to the skin. ASP

CALCIUM PHOSPHATES • Dibasic, Monobasic, and Tribasic. Used as yeast foods, dough conditioners, and firming additives. Tribasic is an anticaking additive used in table salt, powdered sugar, malted milk powder, condiments, puddings, meat, dry-curing mixtures, cereal flours, and vanilla powder. It is tasteless. Used as a gastric antacid mineral supplement and a clarifying additive for sugars and syrups. Dibasic is used to improve bread, rolls, buns, cereal flours; a carrier for bleaching; used as a mineral supplement in cereals, in dental products, and in fertilizers. Monobasic is used in breads, rolls, and buns, artificially sweetened fruit jelly, canned potatoes, canned sweet peppers, canned tomatoes, and as a jelling ingredient. Employed as a fertilizer, as an acidulant, in baking powders, and in wheat flours as a mineral supplement. Skin and eye irritant. GRAS. ASP. E

CALCIUM PHYTATE • Used as a sequestering additive (see). When 300 milligrams per kilogram of body weight was fed to rats as a diet supplement, it successfully provided calcium for bone deposition, and the animals remained healthy. GRAS. NIL

CALCIUM PROPIONATE • Propanoic Acid. Calcium Salt. White crystals or crystalline solid with the faint odor of propionic acid. A mold and rope inhibitor in breads, rolls, and poultry stuffing, it is used in processed cheese, chocolate products, cakes, cupcakes, and artificially sweetened fruit jelly. GRAS. ASP. E

CALCIUM PYROPHOSPHATE • Used as a nutrient, an abrasive in dentifrices, a buffer, and as a neutralizing additive in foodstuffs. See Calcium Sources. GRAS. ASP

CALCIUM RESÍNATE • Used to dilute the color of eggshells. No residue is permitted.

CALCIUM 5'-RIBONUCLEOTIDES • Flavor potentiators (see), in odorless white crystals or powder, with a characteristic taste. See Inosinates. E

CALCIUM SACCHARIN • See Saccharin.

CALCIUM SALTS • Acetate, Chloride, Citrate, Diacetate, Gluconate, Phosphate (monobasic), Phytate, Sulfate. Emulsifier salts used in evaporated milk and frozen desserts, also in enriched bread. Firming additive in potatoes and canned tomatoes. Green or red sweet peppers, lima beans, and carrots. May be gastric irritants, but they have little oral toxicity. See Calcium Sulfate and Calcium Phosphates.

CALCIUM SALTS OF PARTIALLY DIMERIZED ROSIN • Used as a coating on citrus fruits. See Calcium Salts.

CALCIUM SILICATE • Okenite. An anticaking additive, white or slightly cream-colored, free-flowing powder. Vanilla powder. It is used up to 5 percent in baking powder and 2 percent of table salts. Also used in vanilla powder. Absorbs water. Also used as a coloring additive. Constituent of lime glass and cement, used in road construction. Practically nontoxic orally, except inhalation may cause irritation of the respiratory tract. GRAS. ASP. E

CALCIUM SORBATE • A preservative and fungus preventative used in beverages, baked goods, chocolate syrups, soda-fountain syrups, fresh fruit cocktail, tangerine puree (sherbet base), salads (potato, macaroni, coleslaw, gelatin), cheesecake, pie fillings, cake, cheese in consumer-size packages, and artificially sweetened jellies and preserves. GRAS. ASP. E

CALCIUM SOURCES • Harmless calcium salts: Carbonate, Citrate, Glycero-phosphate, Oxide, Phosphate, Pyrophosphate, Sulfate. Calcium is a mineral supplement for breakfast cereals, white cornmeal, infant dietary formula, enriched flour, enriched bromated flour (see Bromates), enriched macaroni, noodle products, self-rising flours, enriched farina, cornmeal and corn grits, and enriched bread and rolls. Calcium is a major mineral in the body. It is incompletely absorbed from the gastrointestinal tract when in the diet so its absorption is enhanced by calcium normally present in intestinal secretions. Vitamin D is also required for efficient absorption of calcium. Recommended daily requirements for adult females is 1.5 grams, for adult males 1.2 grams, and for children 0.8 gram. Calcium and phosphorus are the major constituents of teeth and bones. The ratio of calcium to phosphorus in cow's milk is approximately 1.2 to 1. In human milk the ratio is 2 to 1. GRAS.

CALCIUM STEARATE • Vanilla powder used in beet sugar and yeast. Prepared from lime water (see), it is an emulsifier, a coloring additive. GRAS. ASP

CALCIUM STEAROYL-2-LACTYLATE • The calcium salt of the stearic acid ester of lactyl lactate. A free-flowing, white powder dough conditioner in yeast-leavened bakery products and prepared mixes for yeast-leavened bakery products. Also a whipping additive in dried, liquid, and frozen egg whites. ASP. E

CALCIUM SULFATE • Plaster of Paris. A fine, white to slightly yellow, odorless, tasteless powder used as a firming additive and yeast food and dough conditioner. Utilized in brewing and other fermentation industries, in Spanish-type sherry, as a jelling ingredient, in cereal flours, as a carrier for bleaching additive, in bread, rolls, and buns, in blue cheese and Gorgonzola cheese, artificially sweetened fruit, jelly, canned potatoes, canned sweet peppers, and canned tomatoes. Used also in creamed cottage cheese as an alkali. Also used in toothpaste and tooth powders as an abrasive and firming additive. Used in cement, wall plaster, and insecticides. Because it absorbs moisture and hardens quickly, its ingestion may result in intestinal obstruction. Mixed with flour, it has been used to kill rodents. GRAS. ASP. E.

CALCIUM SULFITE • A white calcium salt prepared as a powder and used especially as a disinfectant and preservative. See Sulfites. E

CALCIUM TARTRATE • Derived from cream of tartar. Used as a food preservative and antacid. E

CALENDULA • Dried flowers of pot marigolds grown in gardens everywhere. Used as a natural flavoring additive. See Marigold, Pot, for foods in which it is used. GRAS

CALORIE • A unit used to express the heat output of an organism and the fuel or energy value of food. The amount of heat required to raise the temperature of 1 gram of water from 14.5 to 15.5°C at atmospheric pressure. When a caloric value for a serving of a food is less than 5 calories, the FDA allows the label to read “zero calories.” If a fat calorie is less than 0.5 gram, it can also be listed as “calories from fat zero.”

CALUMBA ROOT • A natural bitter tonic flavoring, it is used with other flavoring additives in alcoholic beverages only. EAF

CALUMBA ROOT EXTRACT • Jateorhisa palmata. Flavoring. See Calumba Root. NUL

CAMOMILE • See Chamomile.

2-CAMPHANOL • See Borneol.

CAMPHENE • A synthetic spice and nutmeg flavoring additive for beverages, ice cream, ices, candy, and baked goods. Occurs naturally in calamus oil, citronella, ginger, lemon oil, mandarin oil, myrtle, petitgrain oil, and juniper berries. May be mutagenic. ASP

CAMPHOLENE ACETATE • Flavoring. The JECFA (see) says there is no safety concern. NIL

a-CAMPHOLENIC ALCOHOL • D-Camphor. D1-Bornan-2-One. 2-Bornanone. 2-Camphanone. Formosa Camphor. Laurel Camphor. A flavoring additive. The JECFA said in 2004 there is no safety concern at current levels of intake. NIL. ASP

CAMPHOR OIL • Japanese White Oil. Camphor Tree. Distilled from trees at least fifty years old grown in China, Japan, Formosa, Brazil, and Sumatra. Camphor tree is used in spice flavorings for beverages, baked goods, and condiments. Must be saf-role (see). It is also used in embalming fluid, in the manufacture of explosives, in lacquers, as a moth repellent, and topically in liniments, cold medications, and anesthetics. It can cause contact dermatitis. In 1980, the FDA banned camphorated oil as a liniment for colds and sore muscles because of reports of poisonings through skin absorption and because of accidental ingestion. A New Jersey pharmacist had collected case reports and testified before the FDA Advisory Review Panel on Over-the-Counter Drugs in 1980. Camphor is readily absorbed through all sites of administration. Ingestion of 2 grams generally produces dangerous effects in an adult. Ingestion by pregnant women has caused fetal deaths. As of this writing, nothing new to report. ASP

CAMPHOR OIL FORMOSAN HO-SHO LEAVES • Cinnamomum camphora. Flavoring. Although the natural oil of camphor has been largely replaced by the synthetic, a number of other components are used to make synthetic flavorings. NUL

CAMPYLOBACTER JEJUNI • The leading cause of bacterial diarrhea. See Edible Film.

CANANGA OIL • Emulsifier. A natural flavor extract obtained by distillation from the flowers of the tree. Has a harsh, floral odor. Used in cola, fruit, spice, and ginger ale flavoring for beverages, ice cream, ices, candy, baked goods. May cause allergic reactions. GRAS. ASP

CANDELILLA WAX • Obtained from candelilla plants. Brownish to yellow brown, hard, brittle, easily pulverized, partially insoluble in water,

Hardens other waxes. Used as a coating for foods. GRAS. ASP. E

CANDIDIA GUILLIERMONDII • An enzyme derived from Candidia guillier-mondii; used as a production aid in citric acid. NUL

CANDIDA LIPOLYTICA • Enzyme derived from Candida lypolytica; used as a fermentation organism in the production of citric acid. NUL

CANE SUGAR • See Sucrose.

CANOLA OIL • A low erucic acid rapeseed oil (see) used in salad oils because it contains 50 percent less saturated oils than other popular oils. GRAS

CANTHAXANTHIN • A color additive derived from edible mushrooms, crustaceans, trout and salmon, and tropical birds. It produces a pink color when used in foods. It is a synthetic non-provitamin A carotinoid that is easily absorbed by fat. The FDA says the color additive canthaxanthin may be safely used for coloring foods generally if the quantity does not exceed 30 milligrams per pound of solid or semisolid food or per pint of liquid food. Permanently listed in 1969 for human food and permanently listed in 1985 in chicken feed to enhance the yellow color of chicken skin. It is exempt from certification. The JECFA (see) said that up to 25 milligrams per kilogram of body weight is acceptable. Canthaxanthin is also taken for the purpose of skin "tanning" and may be provided by tanning salons or by mail order. It is not approved as a prescription or an over-the-counter drug. A report from Vanderbilt University's Department of Pharmacy cited the case of a healthy young woman who ingested canthaxanthin given to her by a commercial tanning salon; she developed aplastic anemia and died (JAMA, Sep. 5, 1990, 264(9): 1141–12). In the August 1993 issue of American Pharmacy, Darrell Hulisz, Pharm.D., and pharmacist Ginger Boles described this condition—called "canthaxanthin-induced retinopathy"—as "a common adverse effect associated with canthaxanthin use," adding: "The patient experiencing this form of damage to the eye retina rarely is symptomatic, although decreased visual acuity has been reported." Oral intake, thus, may cause loss of night vision since there is some evidence that high intakes of the substance lead to deposition on the retina. The frequency of the adverse effects of this ingredient is unknown, Vanderbilt researchers say, because there is no current way to monitor distribution. Foods that contain canthaxanthin derived originally from animal feed do not have to be labeled. The need to declare the presence in a food of coloring agents used in the feed of food-producing animals was discussed by the EU Standing Committee for Foodstuffs at its meeting in 2002. A large majority of member states were in favor of draft legislation being prepared to deal with this issue, and the UK suggested the most appropriate legislative vehicle for this would be the food labeling directive. The EU has agreed to convene an expert group to discuss the issue. Intake estimates based on levels proposed in the draft General Standard for Food Additives and the range of foods in which use is allowed integrated with national food consumption data exceeded the ADI of 0-0.03 mg/kg bw. Indirect exposure through the use of canthaxanthin as a feed additive for food animals is the major source of intake of canthaxanthin in food. ASP. E

CAPERS • Capparis spinosa. A natural spice flavoring from the spiny shrub. The pickled flower bud is used as a condiment for sauces and salads. GRAS. ASP

CAPRALDEHYDE • See Decanal.

CAPRENIN • A 5-calorie-per-gram fat substitute for cocoa butter in candy bars. Made of capric acid and caprylic acid, two fatty acids found in coconut and palm kernel oil. The other half is made of behenic acid, a poorly digested fat taken from hydrogenated rapeseed oil (see). GRAS

CAPRIC ACID • Obtained from a large group of American plants. Solid crystalline mass with a rancid odor used in the manufacture of artificial fruit flavors. Also used to flavor lipsticks. See Decanoic Acid.

CAPRIC ALDEHYDE • See Decanal.

CAPRINALDEHYDE • See Decanal.

CAPROALDEHYDE • See Hexanal.

CAPROIC ACID • Hexanoic Acid. Occurs as glyceride in natural oils. Derived from coconut oil fatty acids, it is used in fruit flavors and as an intermediate for food-grade additives. It is also used in peeling solutions for fruits and vegetables.

CAPROLACTAM • Derived from cyclohexane (see), it is used in the manufacture of synthetic fibers—especially nylon—and for plastics, film coatings, plasticizers, and the synthesis of amino acid lysine. Toxic by inhalation. EAF

CAPROLEIC ACID • See 9-Decenoic Acid.

CAPRYLAMINE OXIDE • See Caprylic Acid and Capric Acid.

CAPRYL BETAINE • See Caprylic Acid and Betaine.

CAPRYLIC ACID • An oily liquid that occurs naturally as a fatty acid in sweat, fusel oil, in the milk of cows and goats, and in palm and coconut oil. Cleared for use as a synthetic flavoring and as a preservative. GRAS

CAPRYLIC ALCOHOL • See 1-Octanol.

CAPSANTHIN • See Paprika. E

CAPSICUM • African Chilies. Cayenne Pepper. Tabasco Pepper. The dried fruit of a tropical plant used as a natural spice and ginger ale flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, meats, and sauces. The oleoresin form is used in sausage, spice, ginger ale, and cinnamon flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, meats, and condiments. Used internally as a digestive stimulant. Irritating to the mucous membranes, it can produce severe diarrhea and gastritis. May cause a "hot" sensation and sweating. See Cayenne Pepper for toxicity. GRAS. ASP

CAPSORUBIN • Coloring from paprika (see). E

CAPTAN • Agrosol. Merpan. Orthocide. Osocide. Vanguard. Vanicide. White to creamy-colored powder, practically insoluble in water, derived from tetrahydroph-thalmide and trichloromethylmercaptan. Used to treat seeds, to preserve fruit, and as a fungicide on almonds, animal feed, apples, beans, beef, beets, broccoli, cabbage, carrots, corn, garlic, kale, lettuce, peaches, peas, pork, potatoes, raisins, spinach, and strawberries. The FDA permits residues of up to 50 ppm in raisins, 100 ppm on corn seed for cattle and hog feed. It is a fungicide of lower toxicity than most, but in large doses can cause diarrhea and weight loss. A skin and lung irritant, and a suspected cause of human birth defects. Pregnant women should avoid exposure to it. Also suspected of causing cancer. Moderately toxic to humans by ingestion.

CARAMEL • Plain Caramel, Caustic Caramel, or Spirit Caramel. The additive contains sugar and sometimes acids, alkalis, and salts other than ammonium and sulphite compounds. Caustic sulphite caramel may contain sulphite compounds. Carmels are in a chemically ill-defined group of material produced by heating carbohydrates. They are basically burnt sugar with a pleasant, slightly bitter taste. Made by heating sugar or glucose and adding small quantities of alkali or a trace mineral acid during heating. Caramel color prepared by ammonia process has been associated with blood toxicity in rats. Because of this, the JECFA temporarily removed the acceptable daily intake for ammonia-made caramel. It was found to inhibit the metabolism of B6 in rabbits. Caramel coloring is the most widely used food coloring and is found in almost every kind of industrially produced food, including beer, brown bread, buns, chocolate, biscuits, brandy, chocolate flavored flour-based confectionery, coatings, decorations,

fillings and toppings, crisps, dessert mixes, doughnuts, fish and shellfish spreads, frozen desserts, glucose tablets, cough drops, gravy browning, ice cream, jams, milk desserts, pancakes, pickles, sauces and dressings, stouts, sweets, vinegar, whiskey, ice cream, baked goods, soft drinks, and confections. As a flavoring, it is used in strawberry, butter, butterscotch, caramel, chocolate, cocoa, cola, fruit, cherry, grape, birch beer, liquor, rum, brandy, maple, black walnut, walnut, root beer, spice, ginger, ginger ale, vanilla, and cream soda beverages (2,200 ppm), candy, syrups, and wines. The International Programme on Chemical Safety (IPCS) has concluded that commercially produced caramel has the same toxicological properties as caramel produced by cooking or heating sucrose, except for those prepared using ammonium are safe. Ammonia caramel, baker's caramel, confectioner's caramel, or beer caramel may contain both ammonium and sulfite compounds; used in acid environments such as soft drinks. Despite widespread claims that caramel is toxic or carcinogenic, the IPCS (see) has found no evidence of carcinogenicity or mutagenicity in its extensive studies. Sulfite ammonia caramels tested on humans produced soft to liquid stools and increased bowel movements. Permanently listed as a coloring in 1963, but the FDA has given caramel priority for testing its mutagenic, teratogenic subacute, and reproductive effects as a food additive. Certification not required. See Plain Caramel. GRAS. ASP. E

CARAMEL COLOR III • Used as a color additive in beers and a variety of foods. Beer is the most important single source of this additive in the diet, although consumption of dark beers has been decreasing in recent years. May contain ammonium compounds; used in beer, synthetic soy sauce, and confectionery, sulfite ammonia caramel, acid-proof caramel, or soft-drink caramel. The JECFA (see) has established an ADI (see) of 200 per kilogram of body weight per day. The safety of caramel color III has been questioned during recent years following feeding studies in rats that were associated with reduced white cells and lymphocyte counts. In studies at Hazelton Laboratories America, Madison, Wisconsin, rats given caramel color III had soft feces and lower food and fluid consumption. No other toxicity was noted.

CARAWAY SEED and OIL • The dried ripe seeds of a plant common to Europe and Asia and cultivated in England, Russia, and the United States. It is used in liquor flavorings for beverages, ice cream, baked goods, and condiments; also used as a spice in baking. The oil is used in grape, licorice, anisette, kümmel, liver, sausage, mint, caraway, and rye flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, meats, condiments, and liquors. Can cause contact dermatitis. A mild carminative, from 1 to 2 grams breaks up intestinal gas. Moderately toxic by ingestion and skin contact. A skin irritant. May be mutagenic. GRAS. E. ASP

CARAZOLOL • A beta-blocker that lowers blood pressure, chest pain, and irregular heartbeat. It is used for the treatment of stress in pigs.

CARBADOX • Mecadox. Fortigro. An antibacterial used in animal feed for swine. The Joint Expert Committee on Food Additives (JECFA) would not set an ADI or NOEL (see both) for this drug since it is a cancer-causing additive. FDA tolerance for carbadox residues in swine is zero. On January 4, 1994, the FDA was notified by a Quincy, Illinois, company that twenty-five dairy cows at a small Wisconsin farm had been accidentally fed for several months with swine feed containing carbadox. The agency was also notified that milk from these cows had been shipped to Wisconsin dairies for processing into mozzarella cheese, butter, and whey. The whey, in turn, had been further processed into lactose, which was used in infant formula and other products. Carbadox is approved for use in pig feed to treat swine dysentery. Studies have indicated that the drug can cause liver tumors in rodents when fed at high levels over their entire lifetime. Research reportedly had “found no significant adverse effects associated with short-term carbadox exposure in animals.” Analyses by FDA, state, and other experts indicated that any carbadox residue in any of the suspect products would have been so “minuscule that it would not pose a risk to public health.” A study of milk from a cow fed with carbadox-treated feed showed the amount of carbadox in the milk was less than 1 percent of the amount that was fed to the animals. Metabolism studies of carbadox in animal species show the drug can be converted to less toxic compounds. The FDA said it is likely that much of the carbadox fed to the cows was converted to less toxic compounds. In addition, any milk used that contained carbadox would have been mixed with milk from many other sources, and therefore diluted. Canada in 2001 moved to ban the use of carbadox in food animals.

CARBAMATE • A compound based on carbamic acid that is used only in the form of its numerous derivatives and salts. Carbamates are used in pesticides. Among the car-bamate pesticides are aldicarb, 4-benzothienyl-Nmethyl carbamate, bufencarb (BUX), carbaryl, carbofuran, isolan, 2-isopropyl phenyl-N-methyl carbamate, 3-isopropyl phenylmethyl carbamate, maneb, propoxur, thiram, Zectran, zineb, and ziram. Carbamic acid, which is colorless and odorless, causes depression of bone marrow and degeneration of the brain, nausea, and vomiting. It is moderately toxic by many routes.

CARBAMIDE • The chief solid component of mammalian urine; synthesized from ammonia and carbon dioxide and used as fertilizer and in animal feed and in plastics. Increasingly popular in tooth whiteners. See Urea. E

N-CARBAMOYL ARSANILIC ACID • White, nearly odorless powder added to animal feed as a growth stimulant. It is an arsenic (see) compound that is on the Community Right-to-Know List (see). Poison by ingestion. Has caused tumors in laboratory animals.

CARBARSONE • An antiamebic and antihistomonad used in turkey and chicken feed. FDA residue tolerance is 0.025 percent to 0.0375 percent in the feed, 2 ppm in residue in edible by-products of chicken and turkeys, and 0.5 ppm as residue in muscle meat of chickens and turkeys and in eggs.

CARBARYL • Sevin. Pesticide used on corn and other vegetables and fruits. FDA residue tolerances for pineapple bran for feed, 20 ppm; as residues in or on pineapples, 2 ppm; as residue in eggs, 0.25 ppm; as residue in fat, meat, meat by-products from layer chickens, 0.05 ppm; as residues in kidney and liver of cattle, goats, horses, sheep, and swine, 1 ppm; as residue in fat, meat, and meat by-products of cattle, swine, goats, horses, and shrimp, 0.1 ppm; as a residue in various raw agricultural conditions, 0.2-100 ppm. Causes nausea, vomiting, diarrhea, lung damage, blurred vision, excessive salivation, muscle twitching, cyanosis, convulsions, coma, and death. It is a poison via oral and skin absorption. It is an eye and skin irritant. Absorption through skin is slow. It does not accumulate in the tissues and is much less toxic than parathion (see).

CARBETHOXY MALATHION • Malathion. Vegru Malatox. Vetiol. Zithiol. Malacide. Carbophos. Used as an insecticide on animal feed, citrus pulp, grapes, nonmedicated cattle-feed concentrate blocks, packaging material, and safflower oil. The FDA permits a residue of up to 12 ppm in grapes, 0.6 ppm in safflower oil, 50 ppm in dehydrated citrus pulp, 10 ppm in nonmedicated cattle-feed concentrate blocks. A human poison by ingestion. May be mutagenic. Has caused allergic skin reactions. It can interfere with nerve transmission.

CARBOFURAN • A pesticide used in animal feed in combination with the antibiotic oxytetracycline. FDA residue tolerances are in various raw agricultural commodities, 2 ppm; on dried grape pomace, 6 ppm; soybean soap stock, 6 ppm; in raisin waste, 6 ppm; peanut soap stock, 24 ppm. Zero residue allowed in chickens.

CARBOHYDRASE ASPERGÍ LLUS • An enzyme from fermentation of Aspergillus oryzae, a fungi, used as a production aid and tenderizing additive in alcoholic beverages, ale, bakery products, beer, dairy products, meats, poultry, and starch syrups. Used in the production of dextrose. The FDA says that solutions of water and this enzyme applied or injected into raw meat cuts shall not result in a gain of more than 3 percent above the weight of the treated product. When heated to decomposition, it emits acrid smoke and irritating fumes. GRAS. ASP

CARBOHYDRASE and CELLULASE • Derived from Aspergillus niger, this enzyme permits easy shucking of clams and peeling of shrimp. The FDA permits use at a level not in excess of the amount reasonably required to accomplish the intended effect. When heated to decomposition, it emits acrid smoke and irritating fumes. NUL

CARBOHYDRASE and PROTEASE • An enzyme from the controlled fermentation of Bacillus licheniformus, it is a brown powder or liquid used in

CARBOHYDRASE and PROTEASE • An enzyme from the controlled fermentation of Bacillus licheniformis; it is a brown powder or liquid used in beer, alcoholic beverages, candy, dextrose, fish meal, nutritive sweeteners, protein hydrolysates, and starch syrups. When heated to decomposition, it emits acrid smoke and irritating fumes. There is reported use of the chemical, but it has not yet been assigned for toxicology literature. GRAS. EAF

CARBOHYDRASE from BACILLUS AMYLOLIQUEFACIENS and BACILLUS SUBTILIS • Bacillus amyloliquefaciens strain FZB24 is found naturally in soil and leaf litter, and can be easily grown in large quantities. It seems to work as a growth enhancer and disease suppressor through an enzyme that it produces. Bacillus sub-tilis, a gram-positive harmless bacterium, is capable of producing endospores resistant to adverse environmental conditions such as heat and desiccation and is widely used for the production of enzymes and specialty chemicals. ASP

CARBOHYDRASE RHIZOPUS • An enzyme derived from Rhizopus oryzae used in processing dextrose (see). When heated to decomposition, it emits acrid smoke and irritating fumes. GRAS. NUL

CARBOHYDRASE from SACCHAROMYCES • Enzyme from yeast used to break down protein in food processing and wine making. GRAS. NUL

CARBOHYDRATES • Starches and sugars contain a high proportion of carbohydrates. Carbohydrates are chemicals that contain carbon, hydrogen, and oxygen, and they are widely available in plants. In the body, however, carbohydrates in the blood supply are held at an almost constant level of about 0.05 to 0.1 percent. Carbohydrates are the fuel of life. Each gram of carbohydrate provides about 4 calories of energy—the same as protein but less than fat. Following digestion and absorption, available carbohydrates may be used to meet immediate energy needs of tissue cells, converted to glycogen, the storage form of glucose in liver and muscle for later energy needs, or converted to fat as a reserve for energy. It is possible that relatively pure carbohydrate solutions have different effects in young and elderly individuals. Carbohydrates can act as a supplemental fuel source during exercise. The ability of carbohydrate supplements to prolong endurance during exercising is related to preventing fatigue in a physiological sense in both body and mind. The effect of carbohydrates in increasing the tryptophan ratio in blood is considered to be a possible mechanism.

CARBOMYCIN • Deltamycin. An animal antibiotic used on chickens. It is also used in combination with oxytetracycline (see). The FDA allows no residue in cooked edible tissues of chicken. Poison by subcutaneous route. Moderately toxic by vein and injection into the muscle. When heated to decomposition, it emits toxic fumes.

CARBON BLACK • Several forms of artificially prepared carbon or charcoal, including animal charcoal, furnace black, channel (gas) black, lamp black, activated charcoal, and ferric sulfate. Animal charcoal is used as a black coloring in confectionery. Activated charcoal is used as an antidote for ingested poisons, and as an adsorbent in diarrhea. The others have industrial uses. Carbon black, which was not subject to being certified (see) by the FDA, was reevaluated and then banned in 1976. It was found in tests to contain a cancer-causing by-product that was released during dye manufacture. It can no longer be used in candies such as licorice and jelly beans or in drugs or cosmetics. Channel (gas) black has been banned.

CARBON DIOXIDE • Colorless, odorless, noncombustible gas with a faint acid taste. Used as a pressure-dispensing additive in gassed creams. Also used in the car-bonation of beverages and as dry ice for refrigeration in the frozen food industry. Under pressure of about fifty-nine atmospheres it may be condensed into a liquid, a portion of which forms a white solid (dry ice). May cause shortness of breath, vomiting, high blood pressure, and disorientation if inhaled in sufficient amounts. GRAS. ASP. E

CARBON DISULFIDE • A clear, colorless liquid used as a fumigant for cereal grains. Extremely hazardous. A human poison by ingestion. Mildly toxic to humans by inhalation. It is number 176 on the CERCLA Priority List of Hazardous Substances (see).

CARBON MONOXIDE • CO. Used as a gas in packaging for red meat products. Tyson, a major producer of poultry and meat products, notified the FDA of the company's view that CO is GRAS for use as a component of a modified atmosphere packaging (MAP) system for case-ready fresh beef and pork. The level of CO in this MAP system is 2.2 milligrams (mg) CO per pound (lb) of meat. Along with carbon dioxide and nitrogen (see both). Meat is placed on a tray within a chamber filled with the desired gas mixture. A barrier film is then affixed to the package and then labeled with a validated open date code at a central location. The package will not be further processed or manipulated in the retail store. The open date code for products packed in the MAP system will not exceed thirty-five days following the date of packaging for intact muscle cuts and twenty-eight days for ground beef. Tyson states that the CO is included in the package to help maintain the characteristic color of fresh meat, but will not affect microbial growth or extend shelf life. Tyson assumes the meat will absorb 30 percent of the CO in the package and 100 percent of the CO in the meat by the consumer. A dietary intake of 0.36 mg of CO per meal would occur when 8.8 ounces (250 grams) of meat is consumed. Tyson considers that this estimated intake of CO from its use in packaging meat is small compared to the amount that is presently accepted as a safe exposure limit by the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA). Based on the information submitted by Tyson, FSIS (see) has concluded that the MAP system as described in Tyson's notice, and used under the conditions stated in Tyson's notice, would be acceptable for packaging red meat cuts and ground meat. GRAS acceptance by the FDA is pending.

CARBON TETRACHLORIDE • Carbon Tet. Tetrachloromethane. Perchlor-methane. Obtained from carbon disulfide and chlorine (see both), it is used as a fumigant on cereal grains. Poisonous by inhalation, ingestion, or skin absorption. Acute poisoning causes nausea, diarrhea, headache, stupor, kidney damage, and can be fatal. Chronic poisoning involves liver damage, but can also cause kidney damage. It has caused cancer in animals. Because it is so toxic, the FDA banned its use in cleaning and other products for the home in 1970.

CARBONYL IRON • Iron that has been processed with carbon and oxygen. Used as a coloring. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now, and it should continue its GRAS status with limitations on the amounts that can be added to food.

CARBOPHENOTHION • A pesticide used on citrus meal fed to cattle. FDA tolerance is 10 ppm. See Organophosphates.

CARBOXINE • Vitavax. Carboxin. A fungicide used on barley, beans, corn, oats, peanut hulls, rice, sorghum, and wheat for animal feeds. Poison by ingestion. Moderately toxic by skin contact.

CARBOXYMETHYL CELLULOSE • Sodium. Stabilizer for cheeses, frozen desserts, dressings for foods and flavorings. See Cellulose Gums. GRAS. E

CARBOXYMETHYL HYDROXYETHYL CELLULOSE • A binder and emulsifier. See Cellulose and Ethylene Glycose. ASP

CARDAMOM OIL • Grains of Paradise. A natural flavoring and aromatic additive from the dried ripe seeds of trees common to India, Ceylon, and Guatemala. Used in butter, chocolate, liquor, spice, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods (1,700 ppm), meats, and condiments. The seed oil is used in chocolate, cocoa, coffee, cherry liquor, liver, sausage, root beer, sarsaparilla, cardamom, ginger ale, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, liquor, pickles, curry powder, and condiments. As a medicine, it breaks up intestinal gas. May be muta-genic. ASP. GRAS

CARDAMOM OLEORESIN • An emulsifier. See Cardamon Oil. GRAS.

CARDAMOM SEED • An emulsifier. See Cardamon Oil. GRAS

3-CARENE • Antifungal terpene (see). Can cause allergic reactions and has been found to be toxic to the lungs. See Terpene. EAF

CARMINE • Cochineal, Ponceau Red 4, Coccus catil. A crimson pigment derived from a Mexican and Central American species of a scaly female

insect that feeds on various cacti. Carmine and cochineal extracts are permanently listed, but cochineal alone is not authorized for use. The colorings are used in red applesauce, confections, baked goods, meats, and spices. Cochineal was involved in an outbreak of sal-monellosis (an intestinal infection) that killed one infant in a Boston hospital and made twenty-two patients seriously ill. Carmine used in the diagnostic solution to test the digestive organ was found to be the infecting additive. Also used in cosmetics. University of Michigan medical researchers said this color additive extracted from dried bugs and used in candy, yogurt, fruit drinks, and other foods can cause life-threatening allergic reactions. It is often just listed as a "natural" ingredient on the label. The British and European Parliament at this writing are seeking to ban this coloring because it reportedly affects hyperactivity in young children. See Cochineal. ASP. E

CARMINIC ACID • Natural Red No. 4. Used in mascaras, liquid rouge, paste rouge, and red eye shadows. It is the coloring matter from a scaly insect (see Carmine). Color is deep red in water and violet to yellow in acids. May cause allergic reactions. Not subject to certification by the FDA.

CARNAUBA WAX • Copernicia cerífera. The exudate from the leaves of the Brazilian wax palm tree used as a candy glaze and polish. The crude wax is yellow or dirty green, brittle, and very hard. It is used in many polishes and varnishes, and when mixed with other waxes makes them harder and gives them more luster. It rarely causes allergic reactions. GRAS. ASP. E

L-CARNITINE • Levocarnitine Carnitor. Vitacam. A B-vitamin factor found in muscle, liver, and meat extracts. Used for patients born with systemic carnitine deficiency. It is a thyroid inhibitor. Enables fatty acids to produce energy in persons carnitine deficient. Potential adverse reactions include nausea, vomiting, cramps, diarrhea, and body odor. ASP

CARNOBACTERIUM MALTAROMATICUM STRAIN CBI • Used to inhibit the growth of histeria monocytogenes by spraying on the surfaces of ready-to-eat (RTE) meat to inhibit the growth of L. monocytogenes. The applicant to the FDA for GRAS status, the producer, Griffith Co., indicates that C. maltaromaticum can grow on meat to a maximum concentration of 108 to 109 cfu/g (colony-forming bacteria per gram). Using a per capita consumption of meat of 141 g/d, Griffith calculates that consumption of C. maltaromaticum would not add significantly to bacterial flora in the body. Based on the information provided by Griffith, as well as other information available to FDA, the agency has no questions at this writing regarding Griffith's conclusion that C. maltaromaticum strain CB1 is GRAS as an inhibitor of L. monocytogenes in RTE meat products under conditions set by the USDA (see). The agency has not, however, made its own determination regarding the GRAS status of the subject use of C. maltaromaticum. As always, it is the continuing responsibility of Griffith to ensure that the food ingredients it markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

CAROB BEAN • Emulsifier. In Ancient Egypt, it was a common sweetener and was used in the hieroglyph for "sweet" (nedjem). Dried carob fruit is traditionally eaten on the Jewish holiday of Tu Bishvat. Carob juice drinks are traditionally drunk during the Islamic month of Ramadan. Carob pods were the most important source of sugar before sugarcane and sugar beets became widely available. Low-fat, low-sodium, high-fiber, calcium-rich carob is made from the pods of carob trees (Ceratonia siliqua). There are hundreds of varieties of these trees (the locust) growing all over the world, including the United States, but the evergreen leguminous type on the shores of the Mediterranean Sea produces the most flavorful product and provides the commercial carob—"fake cocoa." Carob powder and carob chips are used as an ingredient in cakes and cookies. Carob is sometimes used as a substitute for chocolate. However, there is a significant difference in flavor. Carob is better suited to accompany fruit cooking (e.g., apple and carob cake) as it is milder and isn't as bitter as chocolate. The seeds, also known as locust beans, are used as animal feed. They are also the source of locust bean gum (see), a thickening agent. In Egypt, carobs are consumed as a snack. Crushed pods are used to make a refreshing drink. Compotes and liqueurs are made from carob in Portugal, Spain, and Sicily. Carob has proven effective in relieving diarrhea in infants. GRAS

CAROB BEAN EXTRACT • Emulsifier. GRAS

CAROB BEAN GUM • Used as an essential oil and emulsifier. Long-term exposure to high doses may result in depletion of metal(s) from the body (iron). See Locust Bean Gum. GRAS. ASP

CAROPHYLLENE ALCOHOL • A flavoring that occurs in essential oils, especially in clove oil. Colorless, oily, with a clovelike odor. Used as a synthetic mushroom flavoring for baked goods and condiments.

b-CAROPHYLLENE OXIDE • See b-Caryophyllene and Oxidizer. ASP

CAROTENE • Provitamin A. Beta-carotene. Found in all plants and many animal tissues, it is the chief yellow coloring matter of carrots, butter, and egg yolks. Used as a vegetable dye in butter, margarine, shortening, skim milk, buttermilk, and cottage cheese, it is also employed to manufacture vitamin A and is a nutrient added to skim milk, vegetable shortening, and margarine at the rate of 5,000 to 13,000 I.U. per pound. Too much carotene in the blood (exceeding 200 micrograms per 100 mil-liliters of blood) can lead to carotinemia—a pale yellow-red pigmentation of the skin that may be mistaken for jaundice. It is a benign condition and withdrawal of carotene from the diet cures it. It is GRAS with no limitations other than good manufacturing practices. Beta-carotene has been permanently listed as a coloring since 1964. ASP. E

CAROTENOID • Any of several pigments that give fruits and vegetables yellow, orange, or red coloring.

CARRAGEENAN and AMMONIUM, CALCIUM, POTASSIUM, OR SODIUM SALTS • Stabilizers. See Carrageenan and Ammonia. ASP

CARRAGEENAN and SALTS • Chondrus Extract. Irish Moss. A stabilizer and emulsifier, seaweedlike in odor, derived from Irish moss, used in oils in cosmetics and foods. It is used as an emulsifier in chocolate products, chocolate-flavored drinks, chocolate milk, gassed cream (pressure-dispensed whipped cream), syrups for frozen products, confections, evaporated milk, cheese spreads and cheese foods, ice cream, frozen custard, sherbets, ices, French dressing, artificially sweetened jellies and jams. Salts of carrageenan, such as calcium, ammonium, potassium, or sodium, are used as a demulcent to soothe mucous membrane irritation. It is used for producing gels. Carrageenan stimulated the formation of fibrous tissue when injected under the skin of guinea pigs. When a single dose of it dissolved in saline was injected under the skin of the rat, it caused sarcomas after approximately two years. Its cancer-causing ability may be that of a foreign body irritant, because upon administration to rats and mice at high levels in their diet, it did not appear to induce tumors, although survival of the animals for this period was not good. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that although no evidence in the available information demonstrates it is a hazard to the public at current use levels, uncertainties exist, requiring that additional studies be conducted. Carrageenan is at this writing on the FDA list for cancer study since it is a carcinogen in animals. The JECFA (see) requested in 2003 that, based on laboratory results, carrageenan should be restricted in infant formulas but that it is acceptable for use as a food additive for adults. ASP. E

CARRAGEENAN CALCIUM SALT WITH POLYSORBATE 80 • Used to produce foods in gel form. See Carrageenan and Polysorbate. ASP

CARRAGEENAN, POTASSIUM SALT OF • See Carrageenan and Potassium. ASP

CARRIER • Used to dissolve, dilute, disperse, or otherwise physically modify a food additive or nutrient without altering its function in order to facilitate its handling, application, or use.

CARROT FIBER • Used in baked goods as a texturizer at a maximum level of 5 percent by weight of flour, for use in meat substitutes (e.g., meatless sausages and meatless patties) at a maximum level of 5 percent, and for use in meat and poultry products as a binder/extender and to reduce water purging/gelling at a maximum level of 5 percent. GRAS

CARROT JUICE POWDER • See Carrot Oil.

CARROT OIL• Daucus carota. Either of two oils from the seeds of carrots. A light yellow essential oil that has a spicy odor and is used in liqueurs, flavorings. It is used as a violet, fruit, rum, and spice flavoring for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, condiments, and soups. Rich in vitamin A, it is also used as a coloring and has been permanently listed since 1964. A skin irritant. When heated to decomposition, it emits acrid smoke and irritating fumes. GRAS. ASP

CARROT SEED EXTRACT • Extract of the seeds of Daucus carota sativa. See Carrot Oil.

CARVACROL • A colorless to pale yellow liquid with a pungent, spicy odor related to thymol but more toxic. It is found naturally in oil of origanum, dittany of Crete oil, oregano, lavage oil, marjoram, and savory. It is a synthetic flavoring used in citrus, fruit, mint, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and condiments. It is used as a disinfectant and is corrosive; 1 gram by mouth can cause respiratory and circulatory depression and cardiac failure leading to death. ASP

CARVACRYL ETHYL ETHER • A synthetic spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. Found naturally in caraway and grapefruit. ASP

CARVEOL • A synthetic mint, spearmint, spice, and caraway flavoring additive for beverages, ice cream, ices, candy, and baked goods. Found naturally in caraway and grapes, baked fruit. ASP

4-CARVOMENTHENOL • A synthetic citrus and spice flavoring for beverages, ice cream, ices, candy, and baked goods. Occurs naturally in cardamom oil, juniper berries.

CARVOMENTHOL • Flavoring. See Menthol. ASP

CARVONE (d-or /-) • Oil of Caraway. It is colorless to light yellow with an odor of caraway oil. Carvone occurs in several essential oils. d-Carvone is usually prepared by distillation from caraway seed and dill seed. l-carvone is usually isolated from spearmint oil or synthesized commercially from limonene. Carvol (d-carvone) is a synthetic liquor, mint, and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. It breaks up intestinal gas and is used as a stimulant. GRAS. ASP

CARVONE OXIDE • See Carvone. NIL

CARVYL ACETATE • A synthetic mint flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

CARVYL PROPIONATE • A synthetic mint flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

CARVYLOPHYLLENE ACETATE • A general fixative that occurs in many essential oils, especially in clove oil. Colorless, oily, with a clovelike odor. Used for beverages, ice cream, ices, candy, baked goods, and chewing gum. NIL

6-CARYOPHYLLENE • A synthetic spice flavoring. Occurs naturally in cloves, black currant buds, yarrow herb, grapefruit, allspice, and black pepper. The liquid smells like oil of cloves and turpentine. Used in beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. A skin irritant. ASP

CASCARA, BITTERLESS EXTRACT • Rhamnus purshiana. A natural flavoring derived from the dried bark of a plant grown from northern Idaho to northern California. Cathartic. Used in butter, maple, caramel, and vanilla flavorings for beverages, ice cream, ices, and baked goods. Also used as a laxative. The freshly dried bark causes vomiting, so it must be dried for a year before use, by which time the side effect has disappeared. It has a bitter taste and its laxative effect is due to its ability to irritate the mucosa of the large intestine. ASP

CASCARILLA BARK • A natural flavoring additive obtained from the bark of a tree grown in Haiti, the Bahamas, and Cuba. The dried extract is added to smoking tobacco for flavoring and is used in bitters and spice flavorings for beverages. The oil, obtained by distillation, is light yellow to amber, with a spicy odor. It is used in cola, fruit, root beer, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and condiments. It is also used as an emulsifier. GRAS. EAF

CASCARILLA BARK OIL • Croton. See Cascarilla Bark. EAF

CASEIN • Ammonium Caseinate. Calcium Caseinate. Potassium Caseinate. Sodium Caseinate. The principal protein of cow's milk. It is a white, water-absorbing powder without noticeable odor. Used as a texturizer for ice cream, frozen custard, ice milk, fruit sherbets, and in special diet preparations. Nontoxic. GRAS. ASP

CASHOO EXTRACT • See Catechu Extract.

CASSIA ABSOLUTE • Acacia farnesiana. A natural flavoring extract from cultivated trees. Used in cola, root beer, and spice flavorings for beverages, ice cream, candy, and baked goods. The bark oil is used in berry, chocolate, lemon, coffee, cola, cherry, peach, rum, peppermint, pecan, root beer, cassia, ginger ale, and cinnamon flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, meats, and condiments. The buds are used in spice flavorings for beverages. Cassia bark can cause inflammation and erosion of the gastrointestinal tract. GRAS. EAF

CASSIA BUDS • Cinnamomum cassia. A natural flavoring from the flowers of the acacia plant. Used in blackberry, violet, vermouth, and fruit flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. See Cassia Absolute. GRAS. EAF

CASSIA GUM • At this writing, an application has been made to use it as a stabilizer in frozen dairy desserts. See Cassia Absolute.

CASSIA OIL• Cloves. Chinese Oil of Cinnamon. Darker, less agreeable, and heavier than true cinnamon. Obtained from a tropical Asian tree, it is used in bitters, fruit, liquor, meat, root beer, sarsaparilla, and spice flavorings for beverages, ice cream, candy, and baked goods (3,000 ppm). It is also used in perfumes, poultices, and as a laxative. It can cause irritation and allergy, such as a stuffy nose. EAF

CASSIE FLOWERS • Flavoring. Cassie perfume is distilled from the flowers. Cassie absolute is employed in preparation of violet bouquets, extensively used in European perfumery. Trees used as ingredient in Ivory Coast for arrow poison. The seeds, containing an unnamed alkaloid, are used to kill rabid dogs in Brazil. Bark is astringent and demulcent, and along with leaves and roots is used for medicinal purposes. Woody branches used in India as toothbrushes. The gummy roots also chewed for sore throat. Said to be used for alterative, antispasmodic, aphrodisiac, astringent, demulcent, diarrhea, febrifuge, rheumatism, and stimulant. It is also used for dyspepsia and neuroses. Mexicans sprinkle powdered dried leaves onto wounds. The flowers are added to ointment, rubbed on the forehead for headache. Costa Ricans decoct the gum from the trunk for treating diarrhea, vaginal discharge, and uterine bleeding. Panamanians and Cubans used the pod to treat conjunctivitis. Cubans use the pod decoction for sore throat. For rheumatic pains, West Indians bind bark strips to the afflicted joint. The root decoction has been suggested as a folk remedy for tuberculosis and cancer.

CASSIS • See Currant Buds, Absolute.

CASTOR OIL • Palm Christi Oil. Tang Tang Oil. Ricinus Oil. Palm Cristi Oil. The seed of the castor oil plant. After the oil is expressed from the beans, a residual castor pomace remains, which contains a potent allergen. A flavoring, it has a slightly acrid, sometimes nauseating taste. Used in butter and nut flavorings for beverages, ice cream, ices, candy, and baked goods. Also an antisticking additive in hard-candy products and a component of protective coatings, drying oil, and releasing additive (see). Castor oil has a long history of use as a laxative and aside from these effects it has been employed apparently without harm. At laxative levels, castor oil might be expected to inhibit the absorption of fat-soluble

nutrients, notably vitamins A and D. Therefore, food-additive use of castor oil should be kept well below levels where absorption would be inhibited. At doses of 4 g in adults, absorption appears to be complete and may be considered as a no-effect level (NOEL). However, in light of the lack of adequate long-term studies of immediate relevance, the JEFCA applied a more conservative margin of safety. ASP

CASTOREUM EXTRACT and LIQUID • A creamy, orange-brown substance with strong penetrating odor and bitter taste that consists of the dried perineal glands of the beaver and their secretions. The glands and secretions are taken from the area between the vulva and anus in the female beaver and from the scrotum and anus in the male beaver. Used as a fixative. GRAS. EAF

CATALASE • An enzyme from bovine liver used in milk, for making cheese, and for the elimination of peroxide. It is used also in combination with glucose oxidase for treatment of food wrappers to prevent oxidative deterioration of food. GRAS. EAF

CATALASE FROM ASPERGILLUS NIGER • The basis for determination that car-bohydrase, pectinase, protease, glucose oxidase, and catalase enzyme preparations from fungus A. niger are GRAS for their intended use is through experience based on common use in food before 1958. The fungal carbohdrase is used in brewing and baking and in starch conversion, syrup production, and production of other food products such as cereals and fruit juices and specifically identifies the source fungus as A. niger. See Catalase and Aspergillus. ASP

CATALASE FROM BOVINE LIVER • Brown crystalline solid, catalase is utilized in cell culture applications by functioning as a natural antioxidant, protecting cells against oxidative damage to proteins, lipids, and nucleic acids. Used as an enzyme in the manufacture of certain cheeses. Catalase has also been used to study the role reactive oxygen species play in gene expression and apoptosis. Not for drug, household, or other uses. Do not breathe dust. Treat as a possible biological hazard. ASP

CATALASE FROM PENICILLIUM NOTATUM • Enzyme used as a mold inhibitor. Enzyme from this fungi is probably best known for being the source of penicillin. It destroys the bacterial cell wall, making the bacterium very susceptible to damage. ASP

CATALYST • A substance that causes or speeds up a chemical reaction but does not itself change.

CATECHINS FROM GREEN TEA EXTRACT • Ingredient in beverages, including bottled teas, sport drinks, carbonated soft drinks and juice, at levels according to current good manufacturing practices. At notifier's request, the FDA ceased to evaluate it for GRAS.

CATECHU, BLACK POWDER • Acacia Catechu, Wild. See Catechu Extract. ASP

CATECHU EXTRACT • Black Cutch Extract. Cachou Extract. Cashoo Extract. Pegu Catechu Extract. A preparation from the heartwood of the Acacia catechu (see Acacia) grown in India, Sri Lanka, and Jamaica. Used in bitters, fruit, and rum flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. The powder is used in fruit, rum, and spice flavorings for beverages, ice cream, candy, baked goods, and chewing gum. Incompatible with iron compounds, gelatin, lime-water, and zinc. Used as an astringent in diarrhea. May cause allergic reactions. EAF

CAUSTIC SULFITE CARAMEL • Manufactured by heating sugars with a sulfite. See Caramel. E

CAYENNE PEPPER • Red Pepper. A condiment made from the pungent fruit of the plant. Used in sausage and pepper flavorings for beverages, ice cream, ices, candy, meats (910 ppm), soups, and condiments. Reported to retard growth of Mexicans, South Americans, and Spaniards who eat a great deal of these peppers. GRAS

CEDAR • Cedar Wood Oil. The oil from white, red, or various cedars obtained by distillation from fresh leaves and branches. A colorless to yellow liquid with a fresh woody scent, it is used in fruit and spice flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and liquors. Used frequently as a substitute for oil of lavender. There is usually a strong camphor odor that repels insects. Cedar oil can be a photosensitizer, causing skin reactions when the skin is exposed to light. Similar toxicity to camphor oil (see). Finished food should be thujone free. Thujone is a toxic substance found in oils such as cedar, tansy, thuja, wormwood, and sage. EAF

CEDAR WOOD OIL, ALCOHOLS, and TERPENES • See Cedar and Terpenes. ASP

CEDRO OIL • See Lemon Oil.

CEDRYL ACETATE • Colorless liquid having a light cedar odor. Used in fragrances. ASP

CEFTIOFUR • A cephalosporin antibiotic used in beef. The FDA limits residues to 3 ppm in muscle, 9 ppm in kidney, 6 ppm in liver, and 12 ppm in fat of cattle. See Fluroquinones.

CELERY • Apium graveolens. Native to Mediterranean areas and the Middle East, it is a member of the carrot family and has been cultivated for thousands of years. Historically, celery has been used as a flavoring agent and for medicinal purposes, and it was even used as an award for sporting events in ancient Greece. It wasn't until the 1600s that celery was actually used alone for food. Scientists have discovered a natural ingredient that may also protect us against cancer, high blood pressure, and high cholesterol. See 3-N-butylphthalide.

CELERY SEED • A yellowish to greenish brown liquid, having a pleasant aromatic odor, distilled from the dried ripe fruit of the plant grown in southern Europe. Celery seed is used in sausage and celery flavorings for beverages (1,000 ppm), baked goods, condiments (2,500 ppm), soups, meats, and pickles. Celery seed solid extract is used in celery, meat, and spice flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and maple syrup. Celery seed oil is used in fruit, honey, maple, sausage, nut, root beer, spice, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, meats, soup, pickles, and condiments. Celery seed may cause a sensitivity to light. GRAS. ASP

CELIAC DISEASE • An autoimmune disorder that occurs in genetically predisposed people of all ages from middle infancy. The condition involves an immune reaction to gluten, a protein found in wheat and related grains and present in many foods. Celiac disease causes impaired absorption and digestion of nutrients through the small intestine. Symptoms include frequent diarrhea and weight loss. Dermatitis herpetiformis, an intensely itchy skin eruption, can be associated with celiac disease. The most accurate test for celiac disease is a biopsy of the involved small bowel. Treatment is to avoid gluten in the diet. See Gluten.

CELLULASE ENZYME • Derived from the fungi Aspergillus nigeror Trichoderma longibrachiatum. An enzyme for removal of visceral mass in clam processing and shells from shrimp. GRAS. EAF

CELLULOSE • Chief constituent of the fiber of plants. Cotton contains about 90 percent. It is the basic material for cellulose gums (see). EAF. E

CELLULOSE ACETATE • Obtained by treating cellulose with a food starch modifier, it was first prepared in 1865. The acetate ester of cellulose is used as a component in some adhesives, films, and as a synthetic fiber. When exposed to heat, moisture or acids in the film base begin to deteriorate to an unusable state, releasing acetic acid with a characteristic vinegary smell, causing the process to be known as “vinegar syndrome.” It has been shown to cause cancer in animals when ingested. GRAS for packaging only with no limitations other than good manufacturing. ASP

CELLULOSE DIETHYLAMINOETHYL • DEAE-cellulose. Used for chromatogra-phy. See Cellulose. ASP

CELLULOSE GUMS • Sodium Carboxymethylcellulose. CMC. Modified Cellulose. They absorb water. Fibrous substances consisting of the chief part of the cell walls of plants and made from cotton by-products. A synthetic gum, cellulose gums are used as stabilizers in ice cream, beverages, and other foods. Some are ASP and some are EAF.

CELLULOSE, METHYL • See Methyl Cellulose. ASP

CELLULOSE MICROCRYSTALLINE • Partially hydrolyzed microcrystalline cellulose (see) is used as a filler in slimming and other foods. ASP. See Cellulose.

CELLULOSE TRIACETATE • Used to reduce the lactose (see) content of milk. EAF

CENTAURY (CENTAURIUM) HERB • Flavoring in alcoholic beverages only. EAF

CEPHALOSPORIN • Antibacterial agents in use today for both humans and animals. Four generations of cephalosporins have evolved, all of which contain the beta-lactam substructure first found in penicillin. The range of cephalosporins is available for use in food-producing animals. The problem is that bacteria may become resistant in the antibiotic in both humans and animals. See Antibiotics.

CEPHARPIRIN • An animal drug used in beef and milk. The FDA limits residue to 0.02 ppm in milk and 0.1 ppm in uncooked edible tissues of dairy cattle. Moderately toxic by injection into the vein. When heated to decomposition, it emits toxic fumes. ASP

CERCLA • The Comprehensive Environmental Response, Compensation, and Liability Act. CERCLA, as amended by the Superfund Amendments and Reautho-rization Act (SARA), requires the U.S. ATSDR (Agency for Toxic Substances and Disease Registery) (see) and the Environmental Protection Agency (EPA) to prepare a list, in order of priority, of substances that are most commonly found at facilities on the National Priority List (NPL) and which are determined to pose the most significant potential threat to human health due to their known or suspected toxic-ity and potential for human exposure at these NPL sites. CERCLA also requires this list to be revised periodically to reflect additional information on hazardous substances. It should be noted that this priority list is not a list of “most toxic” substances, but rather a prioritization of substances based on a combination of their frequency, toxicity, and potential for human exposure at National Priority List sites.

CEREAL SOLIDS, HYDROLYZED • From grains such as rice or wheat, dried and then hydrolyzed (see) used as an anticaking agent. ASP

CERESIN • Ceresine. Earth Wax. Used in protective creams. It is a white or yellow, hard, brittle wax made by purifying ozokerite (see), found in Ukraine, Utah, and Texas. It is used as a substitute for beeswax and paraffin wax (see both); also used to wax paper and cloth, as a polish, and in dentistry for taking wax impressions. May cause allergic reactions.

CERTIFIED • All color additives permitted for use in foods are classified as “certifiable” or “exempt from certification.” Certifiable color additives are man-made, with each batch being tested by the manufacturer and the FDA. This “approval” process, known as color additive certification, is aimed at assuring the safety, quality, consistency, and strength of the color additive prior to its use in foods. The manufacturer must submit samples of every batch for testing, and the lot test number accompanies the colors through all subsequent packaging.

CESIUM • A white metal, cesium comes in many forms. Cesium 133 is found in a variety of minerals. Cesium is a liquid at room temperature. Radioactive cesium forms in nuclear reactors and explosions. Two radioactive forms are cesium 134 and cesium 137. You could be exposed to cesium through breathing, drinking water, eating food, or having skin contact with cesium. If food is grown in contaminated areas, you can be exposed to radioactive cesium. Cesium irritates the eyes and burns the skin. Pure cesium is highly reactive with water so any contact on or in the body can cause burns. Today's irradiators, using radioactive cesium or cobalt or electron beam linear accelerators, expose food to the equivalent of between 30 million and 150 million chest X-rays. Some of the foods now approved for irradiation are beef, pork, poultry, nuts, potatoes, wheat, wheat flour, fruits and vegetables, tea, and sixty dried herbs and spices. There are no human studies that specifically associate exposure to radioactive cesium with increased cancer risk. The Third U.S. National Report on Human Exposure to Environmental Chemicals said that whether cesium levels found in urine is a cause for health concern is unknown; more research is needed.

CETONE D • See Methyl 6-Naphthyl Ketone.

CETONE V • See Allyl a-Ionone.

CETYL • Means derived from cetyl alcohol (see).

CETYL ALCOHOL • An emollient and emulsion stabilizer used in many foods and cosmetics. Cetyl alcohol is waxy, crystalline, and solid and found in spermaceti (see). It has a low toxicity for both skin and ingestion and is sometimes used as a laxative. Can cause hives. See Fatty Alcohols. ASP

CETYL ARACHIDATE • An ester produced by the reaction of cetyl alcohol and arachidic acid. The acid is found in fish oils and vegetables, particularly peanut oil. A fatty compound used as an emulsifier. Nontoxic.

CETYL ESTERS • Synthetic spermaceti (see).

CETYLIC ACID • See Palmitic Acid.

CETYLPYRIDINIUM CHLORIDE • CPC. Cecure. An antimicrobial quaternary ammonium compound (see) used in commercial raw poultry processing. Multiple poultry plants are using it as a pre-chill application immediately following the inside/outside bird washer and before the chiller. It is an antiseptic compound that kills bacteria and other microorganisms. It has been shown to be effective in preventing dental plaque and reducing gingivitis in some types of mouthwashes, toothpastes, lozenges, throat sprays, anti-sore-throat sprays, breath sprays, and nasal sprays. It has also been used as an ingredient in certain pesticides.

CEYLON CINNAMON • See Cinnamon.

CEYLON CINNAMON LEAF OIL • See Cinnamon Leaf Oil.

CF-3 • Preempt. A blend of twenty-nine beneficial microbes found in the gastrointestinal tracts of mature, healthy chickens that can reduce salmonella (see) colonization. CF-3 products are made up of live bacteria that can be given to animals to establish normal gut microflora, thereby helping to reduce or prevent the colonization of undesirable bacteria. By populating the gut with normal microflora, thereby excluding undesirable bacteria, CF-3 products may help reduce carcass contamination and the incidence of food-borne illness in humans. Reduction of salmonella colonization in chickens is an important step in reducing salmonella contamination in processed poultry products. A single spray of bacterial suspension is administered to newly hatched chicks at a dose of approximately 0.25 milliliter per chick. The bacteria on the chick's feathers are subsequently ingested through normal grooming (preening) behavior. It is essentially replacing the mother hen. Before the advent of large modern poultry farms, hens would pass on the good microbes—and disease resistance—to their chicks. Although salmonella colonization is generally not a problem for the chickens, it is a problem for humans who may develop salmonellosis through the ingestion of improperly cooked or handled salmonella-contaminated chickens. The use of Preempt will help reduce one type of contamination, but poultry must be properly handled and cooked to be safe. This culture product was originally developed and tested by a USDA-Agricultural Research Service team at College Station, Texas. During clinical studies, no adverse effects were observed in the chicks following Preempt administration. In addition, since CF-3 is a suspension of bacteria, there are no concerns regarding chemical residues in edible tissue from treated chickens. Because its use in chickens produces no residues in edible tissues or products, the agency has waived the residue chemistry testing requirements. The FDA said that it has no objection to Engelhard, the producer, declaring CF-3 safe but, as always, it is the continuing responsibility of Engelhard to ensure that the food ingredients it markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements. ASP

CFR • FDA Code of Federal Regulations for drug and biologic manufacturers (revised through April 1, 2008).

CFSAN • The abbreviation for the FDA's Center for Food Safety and Applied Nutrition.

CHACONINE • An alkaloid occurring in plants of the Solanaceae family such as potatoes and tomatoes. In laboratory animals, it causes birth defects, but the WHO said that the amount in potatoes is not significant. The JECFA says the committee considered that, despite the long history of human consumption of plants containing alkaloids, the available epidemiological and experimental data from human and laboratory animal studies did not permit the determination of a safe level of intake. The committee recognized that the development of empirical data to support such a level would require considerable effort. Nevertheless, it felt that the large body of experience with the consumption of potatoes, frequently on a daily basis, indicated that normal alkaloid levels found in properly grown and handled tubers were not of concern. To support the continued safe use of potato tubers, those developing new methods of cultivation, and others growing, harvesting, storing, processing, and consuming potatoes, should be aware of the possibility of inadvertently increasing the content of alkaloids to potentially toxic levels.

CHAMOMILE • Roman, English, and Hungarian Chamomile. The daisylike white and yellow heads of these flowers provide a coloring additive known as apigenin. The essential oil distilled from the flower heads is pale blue. Roman chamomile is used in berry, fruit, vermouth, maple, spice, and vanilla flavorings. English chamomile is used as a flavoring in chocolate, fruit, and liquor flavorings for beverages, ice cream, ices, candy, and baked goods. Roman chamomile oil is used in chocolate, fruit, vermouth, and spice flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and liquors. Hungarian chamomile oil is used in chocolate, fruit, and liquor flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and liquors. Chamomile contains sesquiterpene lactones that may cause allergic contact dermatitis and stomach upsets. GRAS. The Hungarian and Roman flowers are ASP. Anthemis nobils is EAF while Matricaria chamomilla is NIL.

CHARCOAL • Formerly widely used as a black coloring. The FDA no longer authorizes its use.

CHAR SMOKE FLAVOR • A flavoring. ASP

CHECKERBERRY EXTRACT • See Wintergreen Oil.

CHECKERBERRY OIL • See Wintergreen Oil.

CHELATING ADDITIVE • Any compound, usually one that binds and precipitates metals, such as ethylenediamine tetraacetic acid (EDTA), which removes trace metals. See Sequestering Additive.

CHEMICALS USED IN WASHING FRUITS AND VEGETABLES • Polyacryl-amide, potassium bromide, sodium dodecylbenzenesulfonate, sodium hypochlorite, sodium 2-ethyl-/-hexylsulfate, sodium ra-alkylbenzene sulfonate, sodium mono- and dimethyl-naphthalene sulfonates; alkylene oxide adducts of alkyl alcohols, and phosphate esters of alkylene oxides. Adducts of alkyl alcohols mixtures. Uses of such chemicals are followed by rinsing to remove residues. Some individual chemicals remain in limited amounts in wash water, according to the FDA.

CHERRY BARK • See Cherry Wild Bark. ASP

CHERRY LAUREL LEAVES • Prunus laurocerasus. A flavoring. NUL

CHERRY LAUREL WATER • Flavoring. ASP

CHERRY PIT OIL • A natural flavoring and fragrance extracted from the pits of sweet and sour cherries. Also a cherry flavoring for beverages, ice cream, and condiments. ASP

CHERRY PLUM • Source of purplish red color. See Anthocyanins.

CHERRY WILD BARK • Virginian prune, black cherry, black choke, chokecherry, rum cherry dried bark. Used in cherry flavorings for food. Collected from young plants in the autumn when it has its highest prussic acid (see) content. Also contains cyanogenic glycosides including prunasin; volatile oil, benzaldehyde, coumarins, benzoic acid, gallitannins, resin, an enzyme (prunase). Prunus is an important cough remedy. Due to its powerful sedative action, it is used primarily in the treatment of irritating and persistent coughs. Prunus may be used as a bitter where digestion is sluggish. The cold infusion of the bark may be used as a wash in eye inflammation and as an astringent in diarrhea. Prunus causes drowsiness. Cyanogenic glycosides are moderately toxic, producing cyanic acid on hydrolysis, and should not be taken to excess. The leaves have poisoned cattle. GRAS. ASP

CHERVIL • Anthriscus cereifolium. A natural flavoring extracted from an aromatic Eurasian plant and used in spice flavorings for beverages, ice cream, ices, candy, baked goods, and condiments. A chewing-gum base. GRAS. ASP

CHERVIL EXTRACT • An essential oil. GRAS. See Chervil. NUL

CHESTNUT • Castanea dentata. Nuts from a European tree used as a remedy for piles, backaches, and for coughs. The bark of Spanish chestnut contains tannins (see). NUL

CHESTNUT LEAVES EXTRACT • Contains natural herbicides that the tree uses to inhibit the growth of neighboring plants. Horse chestnut leaves have been used by herbalists as a cough remedy and to reduce fevers. The leaves were also believed to reduce pain and inflammation of arthritis and rheumatism. Extract contains minerals, tannins, free amino acids, and vitamins B1, B2, and PP. It reportedly has antimicrobial, antiinflammatory, and healing properties. EAF

CHEWING-GUM BASES • Chicle, chiquibal, crown gum, guttahang kang, mas-saranduba balata, massaranduba chocolate, nispero lechi caspi, pendare, perillo, rosidinha, Venezuelan chicle, liche devaca, Niger gutta, tuno, chilte, natural rubber, glycerol ester of tall oil resin.

CHICLE • The gummy, milky resin obtained from trees grown in Mexico and Central America. Rubberlike and soft at moderate temperatures. Used in the manufacture of chewing gum. ASP

CHICORY EXTRACT • Coffee. Cichorium intybus. Wild Succory. A natural flavor extract from a plant, usually with blue flowers and leaves. Related to dandelion, in ancient times it was used as a narcotic, sometimes administered before operations. Used in butter, caramel, chocolate, coffee, maple, nut, root beer, sarsaparilla, vanilla, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, and baked goods. The root of the plant is dried, roasted, and ground for mixing. On the Continent, chicory is much cultivated, not only as a salad and vegetable, but also for fodder and more especially for the sake of its root, which though woody in the wild state, under cultivation becomes large and fleshy, with a thick rind, and is employed extensively when roasted and ground, for blending with coffee. An infusion of the herb is useful for skin eruptions connected with gout. Herbalists considered that the leaves when bruised make a good poultice for swellings, inflammations, and inflamed eyes. GRAS. ASP

CHILI • Capsicum fastigatum. Chili is the dried pod of a species of capsicum (see) or red pepper. The small pods have been used for heartburn and dilated blood vessels arising from drunkenness.

CHILQUIBUL • A composition of chewing-gum base.

CHILTE • Cnidoscolus. Jatropha. A chewing-gum base component of vegetable origin. ASP

CHINA BARK EXTRACT • See Quillaja Extract.

CHINESE CINNAMON • See Cinnamon.

CHINESE CINNAMON LEAF OIL • See Cinnamon Leaf Oil.

CHINESE RESTAURANT SYNDROME • Manifested by anxiety, flushed face, and pressure in the chest, has been shown to be caused by eating large amounts of the flavor enhancer MSG. Sulfite preservatives are also now known to have the potential to cause a serious attack of asthma and even death.

CHIQUIBUL • Manilkara zapota. A composition in chewing-gum bases. ASP

CHIRATA HERB EXTRACT • Chiretta. East Indian Bolonong Flavoring used in alcoholic beverages only. There is reported use of the chemical; it has not yet been assigned for toxicology literature search. EAF

CHIVES • Allium schoenoprasum. Flavoring. A member of the amaryllis family, it's closely related to the onion. Some research has found it may have anticancer potential. GRAS. ASP

CHLORAMPHENICOL • Drug in any form may no longer be used in food-producing animals (meat, milk, and egg). Once widely used in animals. In the EPA Genetic Toxicology Program (see). Poison by intraperitoneal, intravenous, and subcutaneous routes. Moderately toxic by ingestion. A human carcinogen that causes leukemia, aplastic anemia, and other bone marrow changes by ingestion.

CHLORDANE • An organochlorine pesticide introduced in 1945 that was among the first to be developed for insect control. Because of its persistence in the environment, most of its uses were suspended by order of the EPA in 1975. Several specified uses are still permitted, including pest control on pineapple, strawberries, and Florida citrus crops. It also can be used to remedy a number of other pest-control problems that plague certain areas of the United States. Chlordane causes cancer of the liver in mice. It is less toxic than other similar pesticides, but acute exposure has the effect of stimulating the central nervous system. It has also been implicated in acute blood abnormalities such as aplastic anemia. Can be absorbed through the skin. It is number twenty on the CERCLA Priority List of Hazardous Substances (see).

CHLORDIMEFORM • Crystals derived from ethyl formate and ammonia; it is a fumigant, insecticide, and miticide. It also kills insect eggs. It is sold for use on cotton and vegetable crops. It is less toxic than organophosphates and is biodegradable. It is used in dried apple pomace, cottonseed hulls, and in dried prunes as a residue resulting from application to growing plums. In animal feed the tolerance is up to 25 ppm. In prunes it is 15 ppm.

CHLORETHEPHON • Water-absorbing needles from benzene used as a plant-growth regulator, in animal feed, barley, raisin waste, sugarcane molasses, and wheat-milling fractions (except flour). The FDA permits a residue of 5 ppm in barley and wheat-milling fractions (except flour), 1.5 ppm in sugarcane molasses, and 65 ppm in raisin waste when used for animal feed. Moderately toxic by ingestion. May be irritating to exposed skin and eyes or if inhaled.

CHLORFENVINPHOS • Insecticide and paracitide and worm killer. It inhibits the signals between nerves. Identified as a priority hazardous substance by the EU. On the EPA's Extremely Hazardous Substances List.

CHLORHEXIDINE DIHYDROCHLORIDE • A veterinary drug used for cattle. The FDA tolerance residue in edible tissue of calves is zero.

CHLORIMURON • A pesticide and herbicide used in soybeans, peanuts, peanut hulls. The FDA tolerance residues are from 0.02 to 0.05 ppm.

CHLORINE • A nonmetallic element, a gas that is found in the earth's crust and has a pungent suffocating odor. Toxic and irritating to the skin and lungs, it has a tolerance level of 1 ppm in air. It is used in the manufacture of carbon tetrachloride (see) and in flame-retardant compounds; and in processing fish, vegetables, and fruit. The chlorine used to kill bacteria in drinking water may contain carcinogenic compounds such toluene, xylene, and the suspected carcinogen styrene. They have been observed in both the drinking water and wastewater plants in the Midwest. Bromide is naturally present in groundwater and chlorine is used to kill bacteria, but sunlight is the final ingredient in the potentially harmful mix. Fresh-cut fruits and vegetables are a rapidly growing segment of the market, and chlorine solutions are widely used by the industry to sanitize and prolong shelf life. But concerns about the potential formation of carcinogens from chlorine usage have prompted some to investigate alternative sources, including essential oils and irradiation. Chlorine is a powerful irritant and can be fatal upon inhalation. In fact, it is in military arsenals as a poison gas. A National Cancer Institute study published in 1987 linked bladder cancer to people who had been drinking chlorinated surface water for more than forty years. ASP

CHLORINE DIOXIDE • A yellow to reddish yellow gas, with an unpleasant odor. Used for bleaching of flour and for the disinfection of municipal drinking water. It is also employed as an antimicrobial additive in poultry processing water and to wash fruits and vegetables at a level not to exceed 3 ppm residual chlorine dioxide. It is also employed as a rinse for food-processing equipment in packaging for fresh fruits and vegetables. The use of chlorine dioxide in water treatment leads to the formation of the by-product chlorite (see), which is currently limited to a maximum of 1 ppm in drinking water in the United States. Engelhard Industries made an effort to have chlorine dioxide declared GRAS. In its notice to the FDA, Engelhard stated it is anticipated that no residual chlorine dioxide or chlorite will remain on the treated food since chlorine dioxide is rapidly converted into chlorite upon contact with organic matter and chlorite is quickly degraded into chloride. Engelhard sponsored a study that investigated the interaction of raspberry extract with chlorite (see Sodium Chlorite) and interpreted that the concentration of any chlorite formed in fruits treated with chlorine dioxide would be substantially reduced. Any residual chlorite will then be removed during washing of treated fruits and vegetables. Therefore, Engelhard purports dietary exposure to either chlorine dioxide or the chlorite ion generated in food packaging would be negligible. The FDA says Engelhard's description, the use of this ingredient in packaging, appears to represent use as a preservative, with the packaging intended as a preservative. The Federal Food, Drug, and Cosmetic Act provides that a food shall be deemed to be misbranded if it bears or contains any chemical preservative, unless it bears labeling stating that fact. Furthermore, food that is subjected to any form of preservation, with a few exceptions, may not be labeled as “fresh.” Inhalation, ingestion (liquid), skin and/or eye contact may cause irritation of the eyes, nose, throat and cough, wheezing, bronchitis, pulmonary edema, and chronic bronchitis. Chlorine dioxide is suspected of being a developmental toxicant. This is a high-volume chemical with production exceeding 1 million pounds annually in the United States. It is ranked as one of the most hazardous compounds (worst 10%) to ecosystems. It lacks at least some of the data required for safety assessment, according to the U.S. EPA (see). The EU (see) has approved the use of chlorine dioxide to clean chicken carcasses. For many decades, food regulators were hesitant to endorse the use of antimicrobial substances by poultry processors. They were worried that such use of antimicrobials would mask unhygienic practices and would induce resistance of the microflora present on the surface of treated products. But the existence of outbreaks of salmonella (see) and other infectious agents make the use wise and the antimicrobials would post no risk.

CHLORINE GAS • Flour-bleaching and aging and oxidizing additive. Also used in water purification. Found in the earth's crust, it is a greenish yellow gas with a suffocating odor. A powerful irritant, dangerous to inhale, and lethal. Thirty ppm will cause coughing. The chlorine used in drinking water often contains carcinogenic carbon tetrachloride, a contaminant formed during the production process. Chlorination has also been found to sometimes form undesirable “ring” compounds in water, such as toluene, xylene, and the suspected carcinogen styrene—they have been observed in both the drinking water and waste water plants in the Midwest.

CHLORITE • See Sodium Chlorite.

CHLORINE SOLUTION, AQUEOUS • See Chlorine. ASP

CHLORO- • Signifies a substance contains chlorine (see).

CHLOROACETIC ACID • Used in packaging adhesives and as a preservative. Not permitted in alcoholic beverages or foods. In the EPA Genetic Toxicology Program (see) and considered an extremely hazardous substance.

C10-13-CHLOROALKANES • Used in sealing compounds, as flame retardants, in paints and lacquers, in rubber and textiles, and as secondary plasticizers in PVC (see). Is toxic to fish and shrimp and enters the human body when we eat or drink contaminated water or fish. Identified as priority hazardous substance by the EU. See Paraffin Wax.

CHLOROBUTANOL • Tetramethylene Chlorohydrin. An animal drug used to treat mastitis in cows. The FDA does not permit any residue in milk. Moderately toxic by ingestion and may be mutagenic.

CHLOROFLUOROCARBONS • CFC. Any of several compounds composed of carbon, fluorine, chlorine, and hydrogen, the best known of which are trichloro-methane and dichlorodifluoromethane. Chlorofluorocarbons trap heat at the earth's surface, decreasing the amount radiated back into space and affecting the ozone layer. The ozone layer blocks ultraviolet radiation from the sun that can cause skin cancer and harm ecosystems. It has deteriorated for decades, especially in Antarctica, under an assault from synthetic chemicals. Phasing out CFCs began in 1989 with enactment of the Montreal Protocol, an international treaty. But the destructive substances take decades to decay, resulting in the long lag before beneficial effects could be measured. The use was prohibited in 1979 except for a few specialized items because of their depleting effect on stratospheric ozone. It is banned in foods, but the FDA permits it for use in cooling or freezing chickens.

CHLOROFORM • Used as a solvent for fats, oils, waxes, resins, and as a cleaning ingredient. It has many serious side effects and is considered a carcinogen. Exposure to it may also cause respiratory and skin allergies. The National Cancer Institute made public in June 1976 the finding that chloroform was found to cause liver and kidney cancers in test animals. It is no longer permitted in cosmetics. It is number eleven on the CERCLA Priority List of Hazardous Substances (see). NUL

CHLORMETHYLATED 2002 LAMINATED STYRENE DIVINYLBENZENE RESIN • Used to clarify (see) sugar liquor up to 500 ppm. See Divinylbenzene.

CHLOROMETHYL METHYL • Used in the synthesis of chloromethylated compounds and as an alkylating agent and solvent used in the manufacture of water repellents, ion-exchange resins, and industrial polymers. Highly irritating to the skin and lungs. NUL

2-CHLORO-4-NITROENZMIDE • A feed additive. See Aklomide.

CHLOROPENTAFLUOROETHANE • Colorless gas with a slight, ethereal odor. Used as a propellant and aerating agent in food except where food standards preclude its use. ASP

CHLOROPHENAMIDINE • Acaron. Fundex. A pesticide used in animal feed, apple pomace (dried) cottonseed hulls, prunes (dried). FDA residue tolerance of 15 ppm in dried prunes, 25 ppm in dried apple pomace, 10 ppm in cottonseed hulls when used for animal feed. Poison by ingestion, skin contact, and injection. Possible cancer-causing additive and mutagen. Eye and skin irritant.

1-(4-CHLOROPHENOXY)-3,3-DIMETHYL-1-(1,2,3-TRIAZOL-1-YL)2-BUTAN-2-ONE • Amiral. MEB 6447. Triadimefon. A fungicide used on barley (except flour) and wheat (except flour). FDA residue tolerance is 4 ppm in barley and wheat, milled fractions (except flour). Poisonous by ingestion.

1-(4-CHLOROPHENOXY)-3-3-DIMETHYL-1-(IH-1,2,4-TRIAZOL-1YL)-2-BUTANONE • A fungicide used in animal feed. FDA residue tolerances on grape pomace, 3 ppm; on apple pomace, 4 ppm; on raisin waste, 7 ppm.

2(m-CHLOROPHENOXY) PROPIONIC ACID • A growth regulator used in pineapple bran. FDA residue tolerance is 3 ppm.

1-(4-CHLOROPHENYL)-3-(2,6-DIFLUOROBENZOYL) UREA • Difluon. Dimilin. An insecticide used in animal feed, soybean hulls, and soybean soap stock when used for animal feed. In the EPA Genetic Toxicology Program (see). Moderately toxic by skin contact. Mildly toxic by ingestion. May be mutagenic. p-CHLOROPHENYL-2,4,5-TRICHLOROPHENYL SULFONE • Tetradifon. Akaritox. A pesticide used on dried figs, dried hops, and dried tea. FDA residue tolerance is 120 ppm in dried hops, 10 ppm in dried figs, and 8 ppm in dried tea. Moderately toxic by ingestion. Mildly toxic by skin contact. May cause birth defects.

CHLOROPHYLL • The green coloring matter of plants, which plays an essential part in plants' photosynthesis process. It imparts a greenish color to certain fats and oils, notably olive oil and soybean. Can cause a sensitivity to light. Chlorophylls are obtained by solvent extraction of grass or lucerne. The color requested refers to chlorophylls and chlorophyllins obtained from natural sources. In 1975 the SCF noted that no biological data were available for natural chlorophylls and did not establish an ADI (see) but agreed that their use in food generally was acceptable. The JECFA notes that in 1975 only chlorophylls obtained by physical processes from natural food sources (e.g., grass) are allowed. ASP. E

CHLOROPHYLLINS • Reaction products of alcoholic potassium or sodium hydroxid and alcoholic leaf extracts. Used in food coloring, dyes, deodorants, and medicine. See Chlorophyll.

CHLOROPRENE • Chloroprene is the common name for the organic compound 2-chloro-1,3-butadiene, used to make a type of synthetic rubber. Chloroprene may be an indirect food additive from the use of gloves and packaging. Symptoms reported from acute (short-term) human exposure to high concentrations of chloroprene include giddiness, headache, irritability, dizziness, insomnia, fatigue, respiratory irritation, cardiac palpitations, chest pains, nausea, gastrointestinal disorders, dermatitis, temporary hair loss, conjunctivitis, and corneal necrosis. Acute exposure may damage the liver, kidneys, and lungs; affect the circulatory system and immune system; depress the central nervous system (CNS); irritate the skin and mucous membranes; and cause dermatitis and respiratory difficulties in humans. The RfC (see) for chloroprene is under review by the EPA, and the agency has not established an RfD (see) for chloroprene. A study reported functional disturbances in sper-matogenesis in workers exposed to chloroprene and increased spontaneous abortions in the wives of exposed workers. However, insufficient details are available in the reports to adequately evaluate the results. Epidemiological studies of rubber workers in the Soviet Union have indicated a possible association between exposure to chloroprene and skin and lung cancer. Levels of exposure causing symptoms have not yet been well defined and these studies have major methodological deficiencies. The National Toxicology Program (NTP) is testing chloroprene with inhalation bioassays in both rats and mice. The EPA has classified chloroprene as not classifiable as to human carcinogenicity, because of the inadequate data. It has stated that, due to the structural similarity of the compound to 1,3-butadiene and positive muta-genicity tests, unnecessary exposure should be avoided. Newer human and animal studies are now available at this writing and are being assessed.

CHLOROPROPANOLS • Certain chlorinated propanols used as insecticides and herbicides contaminate hydrolyzed vegetable proteins (see). The two substances considered by the JECFA (see) were 3-chloro-1,2-propanediol and 1,30 dichloro-2-propanol, neither of which had been previously evaluated. During traditional processing of vegetable proteins with hydrochloric acid, “significant amounts” of these two contaminants have been found. With newer methods, the level of propanediol compound has been reduced to less than 2 mg per kg and the propanol compound to less than 0.02 mg per kg in hydrolyzed vegetable protein. In monkeys, the propanediol compound induced anemia, increased white blood cell count, and other blood changes following ingestion of 30 mg per kg of body weight a day for six weeks. It also reduced fertility in male rats and caused malignant and gene-damaging effects in cells in laboratory dishes. The propanediol also did the same in mouse cells in laboratory dishes. In more recent experiments in which rats were fed 1.1 to 28 mg per kg of body weight per day of either one of the compounds, the animals developed cancers of the testes, breast, and tongue among others. The JECFA concluded that these substances are “undesirable contaminants in food” and expressed the opinion that then levels in hydrolyzed vegetable proteins should be reduced as far as “technically possible.”

CHLORPENTAFLUOROETHANE • Alone or with carbon dioxide. Used as pro-pellant and aerating additive in foods. See Chlorofluorocarbons.

CHLORPROMAZINE • Ormazine. Thorazine. Thor-Pram. An antipsychotic and antinausea medication introduced in the 1950s, it is also used for intractable hiccups and mild alcohol withdrawal. It is used to tranquilize pigs on their way to market. Potential adverse reactions to the medication in humans include a drop in white blood cells, sedation, uncontrolled movements, Parkinsonism-like symptoms, dizziness, a drop in blood pressure when rising from a seated or prone position, vision changes, dry mouth, constipation, urine retention, male breast enlargement, inhibited ejaculation, liver dysfunction, weight gain, increased appetite, fever, photosen-sitivity, irregular heartbeat, sweating. Uncontrollable shaking may occur after prolonged use. Alcohol and other central nervous system depressants may increase central nervous system depression. Drugs used to treat Parkinsonism and antide-pressants may increase chlorpromazine's nerve-suppressing activity. Blood pressure medications that act on the brain may be less effective. Oral blood thinners may be less effective and propranolol can increase the levels of both propranolol and chlorpromazine. Contraindicated in central nervous system depression, bone marrow suppression, brain damage, Reye's syndrome, and coma. Also should not be used in cardiovascular disease, or respiratory disorders, glaucoma, and enlarged prostate, and in acutely ill or dehydrated children. The ingested drug may take effect in thirty to sixty minutes and may last up to three weeks after stopping the drug.

CHLORPYRIFOS • O,O-Dimethyl-0-(3,5,6-Trichloro-2-Pyridyl) Phosphorothioate. Dursban. Lorsban. Used as an insecticide and acaricide on corn and other vegetables. Poison by ingestion. A skin irritant. FDA residue tolerance is 90 ppm in barley milling fractions (except flour), 130 ppm in oat milling fractions (except flour), 90 ppm in sorghum milling fractions (except flour), 30 ppm in rice milling fractions (except flour), 30 ppm in wheat milling fractions (except flour). The FDA tolerance as residues in milk fat is 1.25 ppm and 0.5 ppm as residues in fat, meat, and meat byproducts of cattle, goats, hogs, poultry, and sheep. As a residue in barley, oat, rice, and wheat grain, the tolerance is 6 ppm. Identified as a priority hazardous substance by the EU.

CHLORSULON • Curatrem. An animal drug used to treat worms. The FDA tolerance is 1 ppm in uncooked edible muscle tissue of cattle; 2 ppm as residue in uncooked liver; 3 ppm as residue in kidney; 4 ppm as residue in uncooked cattle fat.

CHLORTETRACYCLINE • Aureomycin. Biomycin. Biomitsin. PfiClor. A preservative, an antibiotic, used in dip and feed to improve feed efficiency and increase weight gain. The FDA permits 4 ppm residue in uncooked kidneys of chickens and turkeys; 1 ppm in uncooked muscle, liver, fat, and skin of chickens and turkeys, and zero residue in eggs. The residues permitted in uncooked swine liver is 2 ppm, 0.2 ppm in uncooked fat of calves, 4 ppm in uncooked liver and kidneys of calves, 0.1 ppm in uncooked muscle and fat of calves, uncooked liver, and kidneys of beef cattle and nonlactating dairy cows. Residue in milk is supposed to be zero. One of the reasons for increased resistance to antibiotics in patients is believed to be the widespread use of antibiotics in food animals. In 1969, the British restricted the veterinary use of antibiotics. In 1972, the FDA-appointed committee to study the use of antibiotics in animals recommended curbs on use. Many strains of bacteria are known to be resistant to tetracycline. Use of this antibiotic has caused discoloration of permanent teeth in children given the drug prior to the eruption of the second teeth. It can also cause skin rash, gastrointestinal upsets, and inflammations in the anogenital area.

CHOLECALCIFEROL • Vitamin D3. Used as a dietary supplement and nutrient in breakfast cereals, grain products, margarine, milk, milk products, and pasta. GRAS

CHOLEST • Listing on labels for cholesterol (see).

CHOLESTEROL (DIETARY) • Cholesterol is not fat, but rather a fatlike substance classified as a lipid. Cholesterol is vital to life and is found in all cell membranes. It is necessary for the production of bile acids and steroid hormones. Dietary cholesterol is found only in animal foods. Abundant in organ meats and egg yolks, cholesterol is also contained in meats, chicken, and shellfish. Vegetable oils and shortenings are cholesterol free.

CHOLESTEROL (SERUM or BLOOD) • High blood cholesterol is a risk factor in the development of coronary heart disease. Most of the cholesterol that is found in the blood is manufactured by the body at a rate of about 800 to 1,500 milligrams a day. By comparison, the average American consumes 300 to 450 milligrams daily in foods. Cholesterol travels through the blood via particles called lipoproteins—combinations of lipids and proteins. Too much cholesterol can build up in the blood and accumulate in the walls of the blood vessels, a condition known as atherosclerosis. This can ultimately reduce the flow of blood in major arteries, leading to heart attack. Blood cholesterol reflects the amount of three major classes of lipoproteins: very low-density lipoprotein (VLDL); low-density lipoprotein (LDL), which contains most of the cholesterol found in the blood; and high-density lipoprotein (HDL). LDL seems to be the culprit in coronary heart disease and is popularly known as the “bad cholesterol.” By contrast, HDL is increasingly considered desirable and known as the “good cholesterol.” Diet is just one factor influencing blood cholesterol levels.

For some people at risk, heredity is a stronger predictor of cholesterol levels than diet. Age, race, and gender are other risk factors for high cholesterol levels.

CHOLIC ACID • Occurs in the bile of most vertebrates and is used as an emulsifying additive in dried egg whites and as a choleretic to regulate the secretion of bile. Bitter taste; sweetish aftertaste. GRAS. NUL

CHOLINE • Found in most animal tissues, either free or in combinations such as lecithin or acetylcholine. Choline is being actively studied for its effects on brain neurotransmission and memory.

CHOLINE BITARTRATE • A dietary supplement included in the B complex and found in the form of a thick syrupy liquid in most animal tissue. It is necessary to nerve function and fat metabolism and can be manufactured in the body but not at a sufficient rate to meet health requirements. Dietary choline protects against poor growth, fatty liver, and renal damage in many animals. Choline deficiency has not been demonstrated in humans, but the National Academy of Sciences lists 500 to 900 milligrams per day as sufficient for the average human. GRAS status with no limitations other than good manufacturing practices. ASP

CHOLINE CHLORIDE • Ferric Choline Citrate. A dietary supplement with the same function as choline bitartrate (see). GRAS. ASP

CHOLINE HYDROCHLORIDE • Colorless to white, water-absorbing crystals used as a fungicide on various feeds. It is listed in the Community Right-to-Know List (see). Moderately toxic to humans by ingestion. May be mutagenic.

CHOLINE XANTHATE • A feed additive for poultry, swine, and ruminants.

CHONDRUS EXTRACT • Stabilizer. See Carrageenan. GRAS

CHROMIUM • Occurs in the earth's crust and plays a vital role in the activities of some human enzymes. It is involved in the breakdown of sugar for conversion into energy and in the manufacture of certain fats. It works together with insulin and is essential to the body's ability to use sugar. Traces of chromium are widely available in food. However, chromium deficiency may frequently occur because the soil in the United States contains low levels. Those who are deficient may show symptoms similar to diabetes such as tiredness, mental confusion, and numbness or tingling of the hands and feet. Deficiency may worsen preexisting diabetes, depress growth in children, or contribute to the development of narrowing of the arteries. Chromium-rich diet, conversely, may prevent type 2 diabetes, the non-insulin-dependent form of the disease that starts in adulthood. Richard A. Anderson, a biochemist at the USDA Human Nutrition Research Center in Beltsville, Maryland, has shown that diets high in simple sugars such as glucose and fructose rob the body of chromium, whereas those high in complex carbohydrates such as pasta preserve it. Foods that contain chromium include fruit, beer, oysters, liver, egg yolk, potatoes with skin, mushrooms, brewer's yeast, and wines. Not always absorbed—for example, much of the chromium in potatoes never gets incorporated into body cells. Simple sugars, furthermore, cause the body to excrete large amounts of the mineral. An attempt was made to permit chromium to be listed on a food label as reducing the risk of high blood sugar in adults. The FDA denied the claim because it said the statements submitted as the basis for it were not “authoritative.” Chromium is poisonous in large amounts. Ingestion can result in violent gastrointestinal irritation. Chromium can be carcinogenic according to the Environmental Defense Fund. It is number eighteen on the CERCLA Priority List of Hazardous Substances (see).

CHROMOSOME • One or more small rod-shaped elements in a cell that contains genetic information.

CHYMOSIN • Enzyme prepared from calf stomach. Used as a stabilizer and thickener. GRAS. EAF

CHYMOSIN ENZYME PREPARED FROM TRICHODERMA REESEI EXPRESSING THE BOVINE CHYMOSIN B GENE • As an enzyme for milk coagulation during cheese making. GRAS pending.

CINCHONA EXTRACT • The extract of the bark of various species of cinchona cultivated in Java, India, and South America. A natural flavoring, red cinchona bark is used in bitters, fruit, rum, vermouth, and spice flavorings for beverages, ice cream, ices, candy, liquors, and bitters (1,000 ppm). Yellow cinchona bark is a natural flavoring from the bark of a species of South American tree used in bitters, fruit, and vermouth flavorings for liquors. The yellow extract is used as a bitters flavoring for beverages. Quinine is derived from it. Cinchona stimulates digestion. May rarely cause allergies and stomach upsets. ASP

CINENE • See Limonene.

CINEOLE • See Eucalyptol. ASP

CINNAMAL • See Cinnamaldehyde.

CINNAMALDEHYDE • Cinnamic Aldehyde. A synthetic yellowish oily liquid with a strong odor of cinnamon isolated from a wood-rotting fungus. Occurs naturally in cassia bark extract, cinnamon bark, and root oils. Used in cola, apple, cherry, liquor, rum, nut, pecan, spice, cinnamon, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy (700 ppm), baked goods, chewing gum (4,900 ppm), condiments, and meats. It is estimated that eaters' only exposure is 0.099 mg/kg per person per day. Also used in perfume industry, to flavor mouthwash and toothpaste, and to scent powder and hair tonic. It is irritating to the skin and mucous membranes, especially if undiluted. University of Illinois researchers reported in 2004 that chewing gum containing it reduced bacteria in the mouth and bad breath. Can cause inflammation and erosion of the gastrointestinal tract. One of the most common allergens. It cross-reacts with balsam Peru and benzoin. May cause depigmentation and hives. GRAS. ASP

CINNAMALDEHYDE ETHYLENE GLYCOL ACETAL • Cinncloval. Spice, cassia, cinnamon, and clove flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. See Cinnamaldehyde for toxicity. ASP

CINNAMEIN • See Benzyl Cinnamate.

CINNAMIC ACID • A cherry, honey, spice, cassia, and cinnamon flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. Also used in suntan lotions and perfumes. Occurs in storax, balsam Peru, cinnamon leaves, and coca leaves. Usually isolated from wood-rotting fungus. Used mainly in the perfume industry. It may cause allergic skin rashes. ASP

CINNAMIC ALCOHOL • Fragrance ingredient. One of the most common allergens in fragrances and flavorings. See Cinnamaldehyde.

CINNAMIC ALDEHYDE • Found in cinnamon oil, cassia oil, cinnamon, and patchouli oil. Used as a flavoring. See Cinnamaldehyde.

CINNAMON (CEYLON, CHINESE, SAIGON) • Obtained from the dried bark of cultivated trees. Used in bitters, cola, apple, plum, vermouth, sausage, eggnog, cinnamon, and vanilla flavorings for beverages, ice cream, ices, candy (4,000 ppm), baked goods (1,900 ppm), condiments, meats, and apple butter. Extracts have been used to break up intestinal gas and to treat diarrhea, but can be irritating to the gastrointestinal system. Studies by the U.S. Department of Agriculture have shown that cinnamon promotes glucose metabolism and supports healthy cholesterol levels in individuals with type 2 diabetes but not all investigators agree. However, researchers note that when consumed consistently or in high doses, whole cinnamon and fat-soluble extracts may be toxic. GRAS. ASP.

CINNAMON BARK • Extract and Oil. From the dried bark of cultivated trees, the extract is used in cola, eggnog, root beer, cinnamon, and ginger ale flavorings for beverages, ice cream, baked goods, condiments, and meats. The oil is used in berry, cola, cherry, rum, root beer, cinnamon, and ginger ale flavorings for beverages, condiments, arid meats. Can be a skin sensitizer in humans and cause mild sensitivity to light. GRAS. ASP

CINNAMON LEAF OIL • Oil of Cassia. Chinese Cinnamon. Volatile oil from the leaves and twigs of cultivated trees that is about 80 to 90 percent cinnamal. It has the characteristic odor and taste of cassia cinnamon and darkens and thickens upon aging or exposure to air. Used in cola, apricot, rum, root beer, cinnamon, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, condiments, pickles, and sliced fruits. Can cause contact dermatitis. EAF

CINNAMYL ACETATE • A synthetic flavoring, colorless to yellow liquid with a sweet floral odor. Occurs naturally in cassia bark. Used in apricot, cherry, grape, peach, pineapple, cinnamon, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. Can cause allergic reactions. ASP

CINNAMYL ALCOHOL • A synthetic flavoring, white to slightly yellow liquid with a balsamic odor. Occurs in storax, balsam Peru, cinnamon leaves, and hyacinth oil. Used in raspberry, strawberry, apricot, peach, plum, prune, grape, liquor, brandy, nut, black walnut, spice, and cinnamon flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and brandy. Can cause allergic reactions. ASP

CINNAMYL ANTHRANILATE • A synthetic flavoring additive that has been banned by the FDA. The National Cancer Institute reported on December 20, 1980, that it caused liver cancer in male and female mice and caused both kidney and pancreatic cancers in male rats in feeding studies. Earlier studies showed it increased lung tumors in mice. The FDA banned the use of it in food in 1982. Most companies voluntarily stopped using it in cosmetics after publication of the NCI information. BAN

CINNAMYL BENZOATE • A synthetic butter, caramel, and fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, condiments, and chewing gum. ASP

CINNAMYL BUTYRATE • A synthetic citrus orange and fruit flavoring for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP.

CINNAMYL CINNAMATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

CINNAMYL FORMATE • Formic Acid. A synthetic flavoring, colorless to yellow liquid with a faint cinnamon odor. Used in banana, cherry, pear, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. See Formic Acid for toxicity. ASP

CINNAMYL ISOBUTYRATE • A synthetic strawberry, citrus, apple, banana, grape, peach, pear, and pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and toppings. ASP

CINNAMYL ISOVALERATE • A synthetic flavoring, colorless to yellow liquid with a spicy, fruity, floral odor. Used in strawberry, chocolate, apple, apricot, cherry, grape, maple nut, nut, spice, peach, pineapple, and plum flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

CINNAMYL PHENYLACETATE • A synthetic flavoring with a fruity floral odor. Used in berry, apple, chocolate, currant, grape, peach, pear, and pineapple flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

CINNAMYL PROPIONATE • A synthetic flavoring, colorless to yellow liquid with a fruity floral odor. Used in berry, apple, chocolate, currant, grape, peach, pear, and pineapple flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

CINNCLOVAL • See Cinnamaldehyde Ethylene Glycol Acetal.

CINOXATE • See Cinnamic Acid.

CIRE D'ABEILLE ABSOLUTE • Flavoring. See Beeswax, Bleached.

CIS- • Latin for “on this side” and used as a prefix for a double bond between two carbon atoms.

CITRAL • A light, oily liquid that occurs naturally in grapefruit, orange, peach, ginger, grapefruit oil, oil of lemon, and oil of lime. Either isolated from citral oils or made synthetically. Used in strawberry, lemon, lime, orange, apple, cherry, grape, spice, ginger, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. Also used in the synthesis of vitamin A. The compound has been reported to inhibit wound healing and tumor rejection in animals. Vitamin A counteracts its toxicity, but in commercial products to which pure citral has been added vitamin A may not be present. GRAS. ASP

CITRAL DIETHYL ACETAL • Flavoring. See Citral and Acetic Acid. ASP

CITRAL DIMETHYL ACETAL • A synthetic citrus, lemon, and fruit flavoring for beverages, ices, candy, and condiments. ASP

CITRATE, CALCIUM • See Calcium Citrate.

CITRATE, ISOPROPYL • See Isopropyl Citrate.

CITRATE, MONOGLYCERIDE • See Monoglyceride Citrate.

CITRATE, SODIUM • See Sodium Citrate.

CITRATE, STEARYL • See Stearyl Citrate.

CITRATE SALTS • Softening additive for cheese spreads; emulsifier salts to blend pasteurized processed cheeses and cheese foods. Citrates may interfere with the results of laboratory tests including tests for pancreatic function, abnormal liver function, and blood alkalinity-acidity.

CITRAURIN, b- • Raw material for the extraction of carotinoids (see Carotene), or orange coloring. Found in tangerine and orange peels. Soluble in alcohol.

CITRIC ACID • One of the most widely used acids in the cosmetics and flavoring industries, it is derived from citrus fruit by fermentation of crude sugars. It is also extracted from citrus fruits and occurs naturally in coffee and peaches. It is a flavoring for beverages (2,500 ppm), ice cream, ices, candy (4,300 ppm), baked goods, and chewing gum (3,600 ppm). Citric acid is used to neutralize lye employed in peeling vegetables, as an adjuster of acidity-alkalinity in fruit juices, wines, jams, jellies, jelly candies, canned fruit, carbonated beverages, frozen fruit, canned vegetables, frozen dairy products, cheese spreads, sherbet, confections, canned figs, dried egg whites, mayonnaise, salad dressing, fruit butter, preserves, and fresh beef blood. Employed in curing meats, for firming peppers, potatoes, tomatoes, and lima beans and to prevent off-flavors in fried potatoes. Removes trace metals and brightens color in various commercial products. It has been used to dissolve urinary bladder stones. GRAS. ASP. E

CITRIC ACID ESTERS OF MONO- AND DIGLYCERICDES • As an emulsifier in combination with lauramide ethyl ester in food in general, including meat and poultry. FDA has no question about the notifier's request for GRAS status.

CITRIDIC ACID • See Aconitic Acid.

CITROFLEX A-4 • See Tributyl Acetylcitrate.

CITRONELLA OIL • A natural food flavoring extract from fresh grass grown in Asia. It consists of about 60 percent geraniol (see), 15 percent citronellol (see), and 10 to 15 percent camphene (see). Used in citrus, fruit, and ginger ale flavorings for beverages, ice cream, ices, candy, and baked goods. Used as an insect repellent. May cause allergic reactions such as stuffy nose, hay fever, asthma, and skin rash when used in cosmetics. Can cause vomiting when ingested, cyanosis, convulsions, damage to intestinal mucosa, and when taken in sufficient amounts, death. GRAS. ASP

CITRONELLAL • A flavoring additive that is the chief constituent of citronella oil (see). Also found in lemon and lemongrass oils. Colorless liquid

with an intense lemon-rose odor. Used in citrus, lemon, cherry, and spice flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. A skin irritant. See Citronella Oil for toxicity. ASP

CITRONELLOL • A flavoring used in berry, citrus, cola, fruit, rose, and floral flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Also used in perfumes and insect repellents, and as a mite attractant. Obtained from citronellal or geraniol, geranium rose oil, or citronella oil (see all). Colorless liquid with a roselike odor. The d form is oilier and is the major ingredient of rhodinol (see). A mild irritant. See Citronella Oil. ASP

CITRONELLOXY ACETALDEHYDE • A synthetic floral, rose, and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Citronella Oil for toxicity. ASP

CITRONELLYL ACETATE • A synthetic flavoring additive, colorless liquid with a fruity odor. Used in lemon, rose, apricot, banana, grape, pear, and raisin flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. A major ingredient of rhodinyl acetate (see). ASP

CITRONELLYL ANTHRANILATE • Synthetic flavoring additive. No safety concern (conditional) at current levels of intake when used as a flavoring agent, according to the WHO/FAO. The evaluation is conditional because the estimated daily intake is based on the anticipated annual volume of production. The conclusion of the safety evaluation of this substance was to be revoked if use levels or poundage data were not provided before the end of 2007. At the June 2008 JECFA meeting, it was still on the list of additives to be evaluated. At this writing, no action has been taken. EAF

CITRONELLYL BUTYRATE • A synthetic flavoring additive, colorless liquid, with a strong rose-fruit odor. Used in cola, floral, rose, apple, pineapple, plum, prune, and honey flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. A major ingredient of rhodinyl acetate (see). ASP

CITRONELLYL FORMATE • Formic Acid. A synthetic flavoring additive, colorless liquid, with a strong fruity odor. Used in orange, apple, apricot, peach, plum, and honey flavorings for beverages, ice cream, ices, candy, baked goods. A major ingredient of rhodinyl acetate (see). See Formic Acid for toxicity. ASP

CITRONELLYL ISOBUTYRATE • A synthetic flavoring additive, colorless liquid, with a fruit-rose odor. Used in raspberry, strawberry, floral, rose, and grape flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. A major ingredient of rhodinyl acetate (see). ASP

CITRONELLYL PHENYLACETATE • A synthetic butter, caramel, rose, fruit, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. A major ingredient of rhodinyl acetate (see). ASP

CITRONELLYL PROPIONATE • A synthetic flavoring additive, colorless liquid, with a rose-fruit odor. Used in lemon and fruit flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. A major ingredient of rhodinyl acetate (see). ASP

CITRONELLYL TIGLATE • A leafy, rose, geranium note. Green fruit flavors like banana and apple, and it is opined that they would benefit from the addition of this product. It is used as a modifier for tomato flavors. Said to be GRAS by FEMA (see).

CITRONELLYL VALERATE • A synthetic flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

CITRUS BIOFLAVONOIDS • Vitamin P complex nutrient supplement up to 1 gram per day. Occurs naturally in plant coloring and in the tonka bean; also in lemon juice. High concentrates can be obtained from all citrus fruits, rose hips, and black currants. Commercial methods extract rinds of oranges, tangerines, lemons, limes, kumquats, and grapefruit. P vitamin is related to healthy blood vessels and skin. Any claim for bioflavonoids renders the product illegal, according to FDA rules.

CITRUS OILS • Eugenol. Eucalyptol. Anethole, a-irone, orris, and menthol (see all). Used in flavoring food products and cosmetics and as odorants in special soaps.

CITRUS PEEL EXTRACT • A natural flavor extract from the peel or rind of grapefruit, lemon, lime, orange, and tangerine. Color, odor, and taste characteristic of source. Used as flavoring additives in bitters, lemon, lime, orange, vermouth, beer, and ginger ale flavorings for beverages, ice cream, ices, candy, and baked goods. Also, antibacterial and antifungal ingredients. The preservative power of citrus peel could solve the shelf-life headaches facing natural and organic manufacturers. The current lack of alternatives to traditional preservatives has persuaded many to opt for “nature-identical” substances instead, but some suppliers are working toward plant-based solutions. Citramed is among them. GRAS. ASP

CITRUS RED NO. 2 • Monoazo. Used only for coloring orange skins that are not intended for processing and that meet minimum maturity standards established by or under laws of the states in which the oranges are grown. Used to color Florida but not California oranges. Oranges colored with Citrus Red No. 2 are not supposed to bear more than 2 ppm of the color additive calculated on the weight of the whole fruit. Citrus Red No. 2 toxicity is far from determined even though, theoretically, consumers would not ingest the dye because they peel the orange before eating. The 2-naphthol constituent of the dye if ingested in quantity can cause eye lens clouding, kidney damage, vomiting, and circulatory collapse. May cause allergic reactions and cross-react with clothing, hair dyes, and with sulfanilimides. Application to the skin can cause peeling and deaths have been reported after application to the skin. Also may cause cancer. See FD and C Colors. ASP

CIVET, ABSOLUTE • Zibeth. Zibet. Zibetum. Essential oil used as a flavoring. Derived from the unctuous secretions from the receptacles between the anus and genitalia of both the male and female civet cat. Semisolid, yellowish to brown mass, with an unpleasant odor. Used in raspberry, butter, caramel, grape, and rum flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. A fixative in perfumery. GRAS. There is reported use of the chemical; it has not yet been assigned for toxicology literature. EAF

CLARIFICATION • Removal from liquid of small amounts of suspended matter; for example, the removal of particles and traces of copper and iron from vinegar and certain beverages.

CLARIFYING ADDITIVE • A substance that removes from liquids small amounts of suspended matter. Butyl alcohol, for instance, is a clarifying additive for clear shampoos.

CLARY • Clary Sage. Salvia Sclarea. A well-known spice in food and beverages. A fixative (see) for perfumes. A natural extract of an aromatic herb grown in southern Europe and cultivated widely in England. The herb is a vermouth and spice flavoring additive in vermouth (500 ppm). Clary oil is used in butter, black cherry, grape, licorice, vermouth, wine, root beer, birch beer, spice, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and vermouth. GRAS. EAF

CLARY OIL • Salvia Sclarea. See Clary. ASP

CLAY, ATTAPULGITE • Kaopectate. Magnesium-aluminum silicate mineral that is used to treat diarrhea. It works by adsorbing (binding) large numbers of bacteria and toxins and reducing the loss of water. Attapulgite reduces the number of bowel movements, improves the consistency of loose or watery stools, and relieves the gastrointestinal cramping that often is associated with diarrhea. ASP

CLAYS • Kaolin. China Clay. Used to clarify liquids (see Clarification) and as a filler for paper. GRAS

CLOPIDOL • Additive used in chicken and turkey feeds to combat parasites. The FDA tolerance for residues in milk is 0.02 ppm; for cereal, grains,

vegetables, fruits, meat of cattle, sheep, and goats, and in edible tissue of swine, it is 0.2 ppm. The tolerance is 1.5 ppm in liver of cattle, sheep, and goats; 5 ppm in muscle of chicken and turkeys; 5 ppm in liver and kidneys of chickens and turkeys.

CLOPROSTENOL • Estrumate. An animal drug used to treat infertility in sows and to synchronize estrus in cows.

CLOPYRALID • An herbicide used in animal feed, barley (milled, except flour), oats (except flour), and wheat (milled, except flour). FDA residue limits are 12 ppm in barley, oats, and wheat (except in their flours) when used for animal feed. The tolerance for residues in fat, meat, by-products of sheep is 2 ppm and 0.2 ppm for the fat, kidneys, and meat of hogs and poultry.

CLOVE AND ITS DERIVATIVES • Syzygium aromaticum, syn. Eugenia aro-maticum or Eugenia caryophyllata. Aromatic dried flower buds of a tree in the family Myrtaceae native to Indonesia and used as a spice in cuisine all over the world. The name derives from French clou, a nail, as the buds vaguely resemble small irregular nails in shape. See Clove Bud Extract, Clove Bud Oil, Clove Bud Oleoresins, and Clove Leaf Oil. GRAS

CLOVE BUD EXTRACT • Eugenia spp. A natural flavor extract from the pungent, fragrant, reddish brown dried flower buds of a tropical tree. Used in berry, fruit, meat, root beer, and spice flavorings for beverages, ice cream, candy, baked goods, condiments, and meats. Cloves are used also as a dental analgesic and germicide. They may cause intestinal upsets. Rats poisoned with clove oil have shown paralysis of hind legs and jaws, with prostration and eventually death. The FDA gave tox-icity studies of clove additives top priority in 1980. GRAS. ASP

CLOVE BUD OIL • The volatile, colorless or pale yellow oil obtained by steam distillation from the dried flower buds of a tropical tree. A characteristic clove odor and taste. Used in raspberry, coffee, cola, banana, cherry, peach, plum, rum, sausage, eggnog, pecan, root beer flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (1,800 ppm), gelatin desserts, meats, liquors, spiced fruit (830 ppm), jelly, condiments. Used as an antiseptic and flavoring in tooth powders and as a scent in hair tonics and to flavor postage stamp glue, as a toothache treatment, as a condiment, and as a flavoring in chewing gum. It is 82 to 87 percent eugenol (see) and has the characteristic clove oil odor and taste. It is strongly irritating to the skin and can cause allergic skin rashes. Its use in perfumes and cosmetics is frowned upon, although in very diluted forms it is innocuous. GRAS. ASP

CLOVE BUD OLEORESIN • A natural resinous, viscous flavoring extract from the tree that produces clove buds. Used in fruit, meat, and spice flavorings for meat.

CLOVE LEAF OIL • The volatile pale yellow oil obtained by steam distillation of the leaves of the tropical tree that produces clove buds. Used in loganberry, cherry, root beer, sarsaparilla, and cinnamon flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, meats, pickles, apple butter, and condiments. See Clove Bud Extract for toxicity. GRAS. ASP

CLOVE STEM OIL • The volatile, yellow to light brown oil obtained by steam distillation from the dried stems of the tropical tree that produces clove buds. Characteristic odor and taste of cloves. Used in berry, cherry, root beer, ginger ale, and ginger beer flavorings for beverages, ice cream, ices, candy, baked goods, and condiments. See Clove Bud Extract for toxicity. GRAS

CLOVER • Trifolium spp. An herb, a natural flavoring extract from a plant characterized by three leaves and flowers in dense heads. Used in fruit flavorings for beverages, ice cream, ices, candy, and baked goods. May cause sensitivity to light. GRAS. ASP

CLOVER BLOSSOM EXTRACT • Trifolium Extract. The extract of the flowers of Trifolium pratense. Used in fruit flavorings. May cause sensitivity to light. NUL

CLOVER LEAF OIL • Eugenia Caryophyllus Leaf Oil. The volatile oil obtained by steam distillation of the leaves of Eugenia caryophyllata. It consists mostly of eugenol (see). ASP

CLOVES • Eugenia caryophyllata. An evergreen tree, the clove is native to the Spice Islands and the Philippines and is cultivated in India, South America, the West Indies, and other tropical areas. The oldest medical use was in China, where it was taken for various ailments as early as 240 B.C. Medicinally, herbalists use cloves to treat flatulence, diarrhea, and for liver, stomach, and bowel ailments. It is also used as a stimulant for nerves. Clove oil is still sold in modern drugstores as a treatment for toothaches. Clove tea with mace is used for nausea. In 1992, the FDA proposed a ban on clove oil in astringent (see) drug products because it has not been shown to be safe and effective for its stated claims. Cloves, however, are listed as GRAS. ASP

CLOXACILLIN • Alcloxa. Apo-Cloxi. Austrastaph. Bactopen. Cloxapen. Novo-cloxin. Orbenin. Orbenin Injection. Tegopen. A penicillin antibiotic introduced in 1962 for systemic infections caused by penicillinase-producing staphylococci (see Staphybiotic). It is used in cattle. The FDA says residues in cattle meat should not exceed 0.1 ppm. In humans, it may cause lung problems (eosinophilia), nausea, vomiting, gastric distress, diarrhea, hypersensitivity including potentially fatal allergic reaction, liver problems, and overgrowth of nonsusceptible organisms.

CMC • See Cellulose Gums

CND • FDA abbreviation for canned.

COAGULATED POTATO PROTEIN, HYDROLYZED POTATO PROTEIN, CLARIFIED HYDROLYZED POTATO PROTEIN. • See Potato Protein.

COAL TAR • Used in adhesives, creosotes, insecticides, phenols, woodworking, preservation of food, synthetic flavors, and dyes to make colors used in cosmetics, including hair dyes. Thick liquid or semisolid tar obtained from bituminous coal, it contains many constituents including benzene, xylenes, naphthalene, pyridine, quinolineoline, phenol, and cresol. The main concern about coal-tar derivatives is that they cause cancer in animals, but they are also frequent sources of allergic reactions, particularly skin rashes and hives. It is number twenty-three on the CERCLA Priority List of Hazardous Substances (see).

COBALT SALTS • Acetate, Chloride, and Sulfate. Illegal for use. In 1960, it was discovered that cobalt salts added to beer to maintain the head caused serious heart problems in beer drinkers. Cobalt sulfate has been banned.

COBALT SOURCES • Acetate, Carbonate, Chloride, Oxide, and Sulfate. Cobalt is a metal occurring in the earth's crust; gray, hard, and magnetic. All here are used as a mineral supplement at the rate of 1 milligram per day. Used as a nutrient in animal feed. Excess administration can result in an overproduction of red blood cells and gastrointestinal upset.

COBALTOUS CHLORIDE AND COBALT SULFATE • Banned as a food additive.

COCA LEAF EXTRACT (DECOCAINIZED) • Flavoring from the dried leaves of cocaine-containing plants grown in Bolivia, Brazil, Peru, and Java. Used in bitters and cola flavoring for beverages, ice cream, ices, and candy. Once a central nervous system stimulant. GRAS. EAF

COCCIDIOSIS • Diseases due to coccidia, one-celled animals that cause serious infections in many species of animals. It is rare in humans except in persons suffering from AIDS.

COCCIDIOSTAT • A drug generally added to animal feed to partially inhibit or delay the development of coccidiosis (see).

COCHINEAL • Ponceau Red 4R. A deep crimson dye is extracted from the female cochineal insects. Cochineal is used to produce scarlet, orange, and other red tints. The coloring comes from carminic acid. Cochineal extract's natural carminic-acid content is usually 19–22 percent. The insects are killed by immersion in hot water (after which they are dried) or by exposure to sunlight, steam, or the heat of an oven. Each method produces

a different color, which results in the varied appearance of commercial cochineal. Because it is an azo dye, it may elicit intolerance in people allergic to salicylates (aspirin). Additionally, it is a his-tamine liberator and may intensify symptoms of asthma. Ponceau 4R is considered carcinogenic in some countries, including the USA, Norway, and Finland, and it is currently listed as a banned substance by the U.S. Food and Drug Administration (FDA). Since 2000 the FDA has seized Chinese-produced haw flakes (a fruit candy) on numerous occasions for containing Ponceau 4R. Possible cause of hyperactivity. On September 6, 2007, the British Food Standards Agency revised advice on certain artificial food additives, including this. University of Michigan medical researchers said this color additive extracted from dried bugs and used in candy, yogurt, fruit drinks, and other foods can cause life-threatening allergic reactions. It is often just listed as a "natural" ingredient on the label. A paper on the subject was published in 1997 in the November issue of Annals of Allergy, Asthma & Immunology. The British and European Parliament at this writing are seeking to ban this coloring because it reportedly affects hyperactivity in young children. See Carmine. ASP. E

COCOA • A powder prepared from the roasted and cured kernels of ripe seeds of Theobroma cacao and other species of Theobroma. A brownish powder with a chocolate odor, it is used as a flavoring. May cause wheezing, rash, and other symptoms of allergy, particularly in children. EAF

COCOA BUTTER SUBSTITUTE FROM COCONUT OIL • GRAS. EAF

COCOA BUTTER SUBSTITUTE FROM HIGH OLEIC SAFFLOWER • Good substitute for olive oil and shea butter (see both). EAF

COCOA BUTTER SUBSTITUTE FROM PALM KERNEL OIL • Coating material for vitamins, citric acid, succinic acid, and spices. In lieu of cocoa butter in sweets. It is also used to cover vitamins. There is reported use of the chemical; it has not yet been assigned for toxicology literature. GRAS. EAF

COCOAMPHODIPRIOPIONATE • See Coconut Oil.

COCOA WITH DIOCTYL SODIUM SULFOSUCCINATE • Adjuvant, emulsi-fier, humectant, stabilizer, and thickener. Dioctyl sodium sulfosuccinate is derived from maleic anhydride, a tissue irritant. Used in dairy-based drinks, flavored and/or fermented, for example, chocolate milk, drinking yogurt, whey-based drinks, condensed milk (plain) unripened cheese (5,000 mg/kg), processed cheese (5,000 mg/kg), fruit-based desserts, including fruit-flavored water-based desserts (15 mg/kg), cocoa mixes (powders and syrups; 4,000 mg/kg), edible casings (e.g., sausage casings; 200 mg/kg; white and semiwhite sugar (sucrose or saccharose), fructose, glucose (dextrose), xylose; sugar solutions and syrups, also (partially) inverted sugars, including molasses, treacle, and sugar toppings (25 mg/kg); emulsified sauces (e.g., mayonnaise, salad dressing; 5,000 mg/kg); water-based flavored drinks, including "sport" or "electrolyte" drinks and particulated drinks; alcoholic beverages, including alcohol-free and low-alcoholic counterparts (10 mg/kg). NIL

COCOCIN • Coconut water. GRAS.

COCONUT • The fruit of the coconut palm. The coconut consists of an outer fibrous husk enclosing a large nut that contains a white edible layer. Coconut is often dried and grated and used extensively in cooking and confectionery. The coconut also produces a valuable oil, which has been used for thousands of years. Sap from the coconut tree can be fermented and used to produce a palm wine, which is similar to the Turkish Arrack or Arak spirit. Coconut aroma and flavor is often found in red wines and is a quality that is attributed to the use of certain oak barrels.

COCONUT ACIDS • See Coconut and Coconut Oil.

COCONUT ALCOHOLS • See Coconut Oil.

COCONUT OIL • The white, semisolid, highly saturated fat expressed from the meat of the coconut. Used in chocolate, candies, in baking, instead of lard, and in self-basting turkeys. A saturated fat that is not recommended for those worried about fat-clogged arteries. May cause allergic skin rashes. GRAS. ASP

CODEX ALIMENTARIUS COMMISSION • CAC. The Codex Alimentarius Commission was created in 1963 by FAO and WHO to develop food standards, guidelines, and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme. The main purposes of this program are protecting health of the consumers, ensuring fair trade practices in the food trade, and promoting coordination of all food standards work undertaken by international governmental and non-governmental organizations. See CAC.

COENZYME-Q10 • See Co-Q10.

COFFEE • Coffee Beans. Dry, unroasted seeds of Coffea arabica. Contains caffeine (see). An essential oil used as a flavoring. GRAS. ASP

COGNAC OIL • Wine Yeast Oil. The volatile oil obtained from distillation of wine, with the characteristic aroma of cognac. Green cognac oil is used as a flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, liquors, and condiments and is ASP. White cognac oil, which has the same constituents as green oil, is used in berry, cherry, grape, brandy, and rum flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. GRAS.

COLA NUT • Essential oil used for flavoring. GRAS

COLISTIMETHATE SODIUM • First Guard Sterile Powder. Used on one- to three-day-old chickens for control of early mortality due to Escherichia coli organisms. It is injected into the necks of the chicks.

COLLAGEN • Protein substance found in connective tissue. It is usually derived from animal tissue. Collagen from hides and skins is used as an emulsifier in meat products because it can bind large quantities of fat. This makes it a useful additive or filler for meat products. Collagen can also be extracted from cattle hides to make the collagen sausage used in the meat industry. Collagen casing products were developed in Germany in the 1920s, but only gained popularity in the United States in the 1960s. The processing does not convert the collagen into a soluble product, as in the case of gelatin. Instead, it results in a product that retains a relatively high degree of the native collagen fiber and is strong enough to be used as a casing for sausages and other products. The extracted collagen is mixed with water and converted into a dough, which is extruded by either a wet or a dry process. The tube of extruded collagen is then passed through a concentrated salt solution and a chamber of ammonia to precipitate the collagen. The swollen gel contracts to produce a film of reasonable strength. It can be improved by the addition of glycerin (see), to make it more flexible. Allergic reactions to collagen are not infrequent. ASP

COLLOIDAL SILICON DIOXIDE SOL • Silica Sol. Practically insoluble in water. A free-flowing additive in salt, seasoned salt, and sodium bicarbonate. Also included in vitamin products, dietary products, spices, meat-curing compounds, flavoring powders, dehydrated honey, dehydrated molasses, and dehydrated nondi-astatic malt. Chemically and biologically inert when ingested. See Silicon Dioxide.

COLORING • More than 90 percent of the food colorings now in use are manufactured, frequently from coal-tar colors. The coal-tar derivatives need to be certified, which means that batches of the dyes are chemically tested and approved by the FDA. As more and more food colors are banned, interest has grown in colors derived from natural sources such as carotene (see) from carrots, which is used to color margarine, and beet juice, which provides a red color for some foods. For information on the synthetics now in use, see FD and C Colors.

COLORS • See FD and C Colors and Colors, Natural

COLORS, NATURAL • Lycopene, caramel, annatto, red beet juice, tumeric, paprika, chlorophlly green, anthocyan (see all). There is controversy over whether cochineal (see) is a natural color.

COMBUSTION PRODUCT GAS • The controlled combustion of air of butane, propane, or natural gas. A process for the air drying of a food such as a protein-containing material. It is used by agricultural producers, food manufacturers, and pesticide manufacturers to disperse chemicals. The FDA says it may be used with no restrictions other than good manufacturing practices. The EPA in 2003 states it was aiming to revoke some tolerances of substances remaining after exposure to combustion product gas. It is now listed as not safe to treat fresh meat. ASP

COMMUNITY RIGHT-TO-KNOW LIST • Manufacturers that employ toxic chemicals while making products must respond, under the law, to inquiries from employees and citizens in the area. Cyanide, which is used in the manufacture of pesticides and some food additives is an example of a chemical on this list compiled by the U.S. Environmental Protection Agency.

COMPETITIVE MICROBIAL INHIBITION • Relies on the fact that many harmless bacteria, notably lactic acid bacteria, can inhibit the growth of both spoilage bacteria and pathogens. Inhibitory strains of lactic acid bacteria can be selected for use in dairy cultures or added to refrigerated foods to extend shelf life and enhance safety.

CONCENTRATED HYDROLYZED MILK PROTEIN • Manufactured either through milk fermentation (FM) or an enzymatic hydrolysis of casein (see). Based on the information provided by the manufacturer, Calpis, as well as other information available to the FDA, the agency has no questions at this time regarding Calpis's conclusion that its concentrated hydrolyzed milk protein is GRAS under the intended conditions of use, as an ingredient in orange juice, yogurt (including yogurt drinks), nutrition bars, and margarine spread. The agency has not, however, made its own determination regarding the GRAS status of concentrated hydrolyzed milk protein. As always, it is the continuing responsibility of Calpis to ensure that the food ingredients the firm markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

CONCENTRATED TOMATO LYCOPENE EXTRACT • Principal carotenoid of the concentrated tomato lycopene extract. Ingredient in nonalcoholic beverages up to a maximum level of 20 ppm. The FDA notes that the manufacturer San-Ei's concentrated tomato lycopene extract has the potential to impart color in food products that contain it. As such, its use in food products may constitute the use of a color additive. Based on the information provided by San-Ei, as well as other information available to the FDA, the agency has no questions at this writing regarding San-Ei's conclusion that its concentrated tomato lycopene extract is GRAS under the intended conditions of use, as an ingredient in nonalcoholic beverages, including carbonated beverages. The agency has not, however, made its own determination regarding the GRAS status of the subject use of concentrated tomato lycopene extract. As always, it is the continuing responsibility of San-Ei to ensure that the food ingredients it markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

CONCRETE • A semisolid mixture of essential oil and fatty, waxy material that is obtained by the solvent extraction of flowers or plants followed by solvent removal.

CONDENSED ANIMAL PROTEIN HYDROLYSATE • A feed used for poultry and cattle. The rules are less than 5 percent for poultry feed and less than 10 percent for cattle feed.

CONJUGATED LINOLEIC ACID • Ingredient in certain specified foods within the general categories of soy milk, meal replacement beverages and bars, milk products, and fruit juices at levels not to exceed 1.5 grams per serving. GRAS pending.

CONTACT DERMATITIS • See Allergic Contact Dermatitis.

COPAIBA OIL • Jesuit's Balsam. From steam distillation of South American balsam, Copaifera officinalis. It is a yellow liquid with an aromatic odor and slightly bitter taste. It is used as a flavoring additive in various foods. EAF

COPALS, MANILA • A resin obtained as a fossil or as an exudate from various species of tropical plants. Must be heated in alcohol or other solvents. Dilutes in color additive mixtures. May cause allergic reactions, particularly skin rashes. NUL

COPOLYMER • Result of polymerization (see Polymer), which includes at least two different molecules, each of which is capable of polymerizing alone. Together they form a new, distinct molecule. They are used in the manufacture of nail enamels and face masks.

COPOLYMER CONDENSATES OF ETHYLENE OXIDE and PROPYLENE OXIDE • Stabilizers in flavor concentrates, processing and wetting additives in yeast-leavened bakery products, dough conditioners, surfactants, defoaming additives, and nutrient supplements in animal feed. Ethylene oxide has been found to cause cancer in animals.

COPPER • CU. One of the earliest known metals. An essential trace element and is a constituent of plants and of animal and human tissues. The tissues containing the largest concentrations are the liver and the brain. The whole human body contains 100–150 mg. At the subcellular level, a number of enzymes, such as tyrosi-nase, contain Cu as part of their structure or require it for proper functioning. About 3.2 mg Cu is consumed daily in food—mainly in meat, eggs, oils with oysters having the highest concentration. Naturally occurring or experimentally produced copper deficiency in animals leads to a variety of abnormalities including anemia, skeletal defects, and muscle degeneration. Copper deficiency is extremely rare in man. Copper compounds are used as pesticides. Water also may contain a significant amount of copper. Somewhat controversial evidence suggests that the metal is an essential cofactor in red blood cell production and is involved in iron metabolism. Some animal diseases, especially severe anaemias, are suspected to arise from nutritional copper deficiency. In humans, the average daily requirement for adults is estimated at 2 mg, and for infants and children at 0.05 mg/kg bw. The average daily dietary intake for adults is estimated at 2 to 5 mg. Normal human serum levels range from 68 to 90 mg/ml.

COPPER COMPLEXES OF CHLOROPHYLLS AND CHLOROPHYLLINS • See Copper and Chlorophyllins. E

COPPER DISODIUM EDTA • Used as an injection for cattle. See Copper and Copper Salts.

COPPER GLUCONATE • An essential nutrient. Used as a feed additive, dietary supplement, and mouth deodorant. GRAS. ASP

COPPER SALTS • Used as nutrient supplements in animal feed. Copper itself is nontoxic, but soluble copper salts, notably copper sulfate, are highly irritating to the skin and mucous membranes, and when ingested cause serious vomiting. Copper salts include copper carbonate, chloride, gluconate, hydroxide, orthophosphate oxide, pyrophosphate, and sulfate. GRAS

COPPER SULFATE • Nutrient. See Copper Salts. GRAS. ASP

COPRA OIL• Coconut oil. From the kernel of the fruit of the coconut palm Cocos nucifera. Fatty solid or liquid with a sweet, nutty taste. Used as a coating additive, flavoring, emulsifying additive, and as a texturizer in baked goods, candy, desserts, and margarine. High in fat and calories, it is similar to human milk. Nontoxic. GRAS

CO-Q10 • Coenzyme-Q10. May boost physical performance and reduce feelings of tiredness associated with exercise, Japanese researchers have reported. Asahi Kasei Pharma Corporation will start supplying its Co-Q10 as an ingredient for use in foods and beverages in the U.S. market, following its certification as GRAS (see).

The Japanese company has been producing Co-Q10 for around twenty-five years and is already supplying it to the food and beverage industries in Japan. The firm now hopes to expand its reach into the U.S. market, where the antioxidant is still primarily used in dietary supplements, although it has already started to be added into foods and drinks. Asahi Kasei has self-affirmed the GRAS status of its ingredient, following an analysis of safety and quality data by an independent panel of scientists. The firm said its Co-Q10 is manufactured under pharmaceutical GMP (good

manufacturing practice) conditions, is free of animal materials, and is also certified as kosher. New research from Japan suggests that supplements of Co-Q10 may reduce the occurrence of muscular injuries in athletes. Levels of markers associated with increased wear and tear in the muscle, like creatine kinase and lipid peroxide, were significantly lower in elite Japanese kendo athletes after consuming Co-Q10 for twenty days compared with those taking a placebo. Researchers from University of Tsukuba, University of Tokyo, and Kobe Gakuin University reported their findings in the British Journal of Nutrition in 2007.

CORIANDER LEAF OIL • Coriandrum sativum. Coriander leaf oil is also available. It smells similar to the seed oil but is stronger, greener, and not as sweet. Coriander oil is a natural deodorant and is frequently used in perfumery and as a flavoring. EAF

CORIANDER OIL • The volatile oil from the dried ripe fruit of a plant grown in Asia and Europe. Used as a flavoring additive in raspberry, bitters, fruit, meat, spice, ginger ale, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods (880 ppm), chewing gum, meats (1,300 ppm), liquors (1,000 ppm), and condiments. Used to flavor dentrifices. The oil is used in blackberry, raspberry, chocolate, coffee, cola, fruit, liquor, sausage, root beer, spice, ginger ale, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, condiments, meats, and liquors. Can cause allergic reactions, particularly of the skin. Coriander is used as a weak medication (up to 1 gram) to break up intestinal gas. GRAS. ASP

CORK, OAK • Flavoring in alcoholic beverages only. ASP

CORN • Corn Sugar. Dextrose. Zea mays. The genus name Zea means “cause of life,” and the species name mays means “mother.” Used in maple, nut, and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. The oil is used in emollient creams and toothpastes. The syrup is used as a texturizer and carrying additive in cosmetics. It is also used for envelopes, paper, stamps, sticker tapes, ale, aspirin, bacon, baking mixes, powders, beers, bourbon, breads, cheeses, cereals, chop suey, chow mein, confectioners' sugar, cream puffs, fish products, ginger ale, hams, jellies, processed meats, peanut butters, canned peas, plastic food wrappers, sherbets, whiskeys, and American wines. It may also be found in capsule vitamins, fritters, Fritos, frostings, canned or frozen fruit, graham crackers, gravies, grits, gum, monosodium glutamate, Nescafé, oleomargarine, bologna, pablum, tortillas, vinegar, yeasts, frying fats, fruit juices, laxatives. May cause allergic reactions including skin rashes and asthma. ASP

CORN ACID • See Corn Oil.

CORN COB MEAL • The milled powder prepared from the cobs of Zea mays.

CORN DEXTRIN • Dextri-Maltose. A white or yellow powder obtained by enzymatic action of barley malt on corn flours and used as a modifier or thickening additive in milk and milk products. Nontoxic. GRAS

CORN ENDOSPERM OIL • For use in chicken feed to enhance the yellow color of chicken skin and eggs. Permanently listed since 1967. NIL

CORN FLOUR • A finely ground powder. Used in face and bath powder. See Corn Oil.

CORN GERM EXTRACT • The extract of the germ of Zea mays.

CORN GLUTEN • A nutrient supplement for various foods. GRAS. ASP

CORN MINT OIL • M. arvensis, European mint. Used as a flavoring in sweets and beverages. The oil is actually an antiseptic. Seed is poisonous if ingested. Parts of the plant are poisonous if ingested. Handling plant may cause skin irritation or allergic reaction. Plant has spines or sharp edges; use extreme caution when handling. May be a noxious weed or invasive. This plant is attractive to bees, butterflies, and/or birds. ASP

CORN OIL • Light yellow, clear, oily liquid used as a coating additive, emulsifying additive, and texturizer in bakery products, margarine, mayonnaise, and salad oil. Obtained as a by-product by wet-milling the grain for use in the manufacture of cornstarch, dextrins, and yellow oil. It has a faint characteristic odor and taste and thickens upon exposure to air. Human skin irritant and allergen. Has caused birth defects in experimental animals. GRAS. ASP

CORN POPPY EXTRACT • The extract obtained from the petals of the Papaver rhoeas.

CORN SILK • Essential oil used as a natural flavoring extract in baked goods, baking mixes, beverages, soft candies, and frozen dairy desserts. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there were insufficient relevant biological and other studies upon which to base an evaluation of it when it is used as a food ingredient. It remains GRAS. NUL

CORN SILK EXTRACT • Zea mays. The stigmas from the female flowers of maize are fine soft threads 10–20 cm long. When fresh, they are like silk threads of a light green or yellow-brown color; when dry, they resemble fine, dark, crinkled hairs. Corn silk is a soothing, relaxing diuretic and a remedy for acute inflammation and irritations of the genitourinary system, such as cystitis, urethritis, and prostatitis. Corn silk is particularly useful for calming bladder irritation and infection in children. Corn silk clears toxins, catarrh, and deposits and irritants out of the kidneys and bladder, and it has a gentle antiseptic and healing action. Corn silk has been used as a remedy for frequency of urination and bed-wetting due to irritation or weakness of the urinary system, as well as for urinary stones and gravel. By reducing fluid retention in the body, corn silk may help reduce blood pressure, and by aiding elimination of toxins and wastes from the body, corn silk may relieve gout and arthritis and act as a gentle detoxifying remedy. Corn silk's healing and soothing properties are touted as helpful for relieving skin irritation and inflammation and for healing wounds and ulcers. May inhibit tumors. GRAS. ASP

CORN SILK OIL • Zea mays. Flavoring used in baked goods, gels, puddings, soft candies, frozen desserts, and nonalcoholic beverages. See Corn Silk Extract. NUL

CORN STEEP LIQUOR • Well-defined and consistent amino acid profile and a high level of complex sugars that produce an attractive smell and taste. Used in animal feed and as a growth and fermentation medium for the production of some food additives. ASP

CORN SUGAR • Nutrient. See Corn Syrup. GRAS

CORN SYRUP • Corn Sugar. Dextrose. A sweet syrup prepared from cornstarch. Used in maple, nut, and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. Also used for envelopes, stamps, sticking tapes, aspirin, and many food products including bacon, baking mixes, powders, beer, bourbon, breads, breakfast cereals, pastries, candy, carbonated beverages, ketchup, cheeses, cereals, chop suey, chow mein, confectioners' sugar, cream puffs, fish products, ginger ale, hams, jellies, processed meats, peanut butter, canned peas, plastic food wraps, sherbet, whiskey, and American wines. May cause allergic reactions. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now, and it should continue in GRAS status with no limitations on amounts that can be added to food. ASP

CORN SYRUP, HIGH FRUCTOSE • Nutrative. See High Fructose Corn Syrup.

CORNSTARCH • Many containers are powdered with cornstarch to prevent sticking. The dietetic grade is marketed as Maizena and Mondamin. It is a demulcent for irritated colons. May cause allergic reactions, including skin rashes and asthma. GRAS. ASP

CORPS PRALINE • See Maltol.

COSTMARY • Virgin Mary. A natural flavoring derived from an herb native to Asia. Its yellow aromatic flowers are shaped like buttons. Infrequently used today as a flavoring in beer and ale. Regarded as sacred to the Virgin Mary. NUL

COSTUS ROOT OIL • The volatile oil is obtained by steam distillation from dried roots of an herb. Light yellow to brown viscous liquid, with a persistent violetlike odor. A natural fruit and vanilla flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. EAF

COTTONSEED FLOUR • Cooked, partly defatted, and toasted flour used for pale yellow coloring. Sometimes used to make gin. It is permanently listed as a coloring. It is known to cause allergies, and because it is used in a wide variety of products without notice, it may be hard to avoid. More often, exposures to the allergens arise from the use of cottonseed meal, which may be found in fertilizers and as a constituent of feed for cattle, hogs, poultry, and dogs. Symptoms usually result from inhalation but allergic reactions also can occur from ingesting cottonseed meal used in pan-greasing compounds and in foods such as some fried cakes, fig bars, and cookies. ASP

COTTONSEED KERNELS GLANDLESS, RAW • Very low in saturated fat, cholesterol, and sodium. It is also a good source of vitamin B6, folate, calcium, potassium, and copper, and a very good source of protein, thiamin, iron, magnesium, phosphorus, zinc, and manganese. Glandless cottonseed kernels are roasted to attain a temperature of not less than 250° F in the kernel for not less than 5 minutes for use as a snack food, in baked goods, or in soft candy; or in hard candy, where the kernel temperature during cooking will exceed 250°F, for not less than 5 minutes. Because of the possibility of contamination of cottonseed with aflatoxin (see) due to exposure to excessive moisture levels before harvesting and in storage, the raw material used for food processing should be selected following careful sampling for freedom from this fungal toxin. Ideally, the product should contain less than 30–50 micrograms (mcg) per kilogram (30–50 ppb) of total aflatoxin. The Indian Standards Institution suggests a maximum aflatoxin level of 60 mcg/kg for edible products produced in that country. ASP

COTTONSEED OIL • The fixed oil from the seeds of the cultivated varieties of the plant. Pale yellow, oily, odorless liquid used in the manufacture of soaps, creams, baby creams, nail polish removers, and lubricants. The oil is used in most salad oils, oleomargarines, mayonnaises, and salad dressings. Lard compounds and lard substitutes are made with cottonseed oil. Sardines may be packed in it. Most commercial fried products such as potato chips and doughnuts are fried in cottonseed oil, and restaurants use it for cooking. Candies, particularly chocolates, often contain this oil and it is used to polish fruits at stands. Known to cause many allergic reactions, but because of its wide use in cosmetics, foods, and other products, it is hard to avoid.

COTTONSEED and SOYBEAN FATTY ACIDS • Used as a lubricant, binder, defoaming additive, and component in manufacture of other food-grade additives.

COUCHGRASS • See Dog Grass Extract.

COUMAPHOS • Agridip. Asunthol. Baymix 50. Used in cattle and chicken feed as an insecticide and to counteract worms. Poison by ingestion, skin contact, inhalation, and injection. May be a mutagen. The FDA tolerance in meat and meat byproducts of cattle, goats, hogs, horses, poultry, and sheep is 1 ppm. In eggs and milk it is zero.

COUMARIN • Tonka Bean. Cumarin. A fragrant ingredient of tonka beans, sweet woodruff, cramp bark, and many other plants. It is made synthetically as well. Coumarin is prohibited in foods because it is toxic by ingestion and carcinogenic. Coumarin in Mexican vanilla has been a recurring problem for quite some time according to the FDA. Coumarin has been prohibited in food in the United States since 1940. Food containing any added coumarin as such or as a constituent of tonka beans or tonka extract is deemed to be adulterated. BAN

COUMARONE-IDENE RESIN • Coating for fruit. The FDA limits it to 200 ppm on fresh-weight basis. ASP

CRAMBE MEAL, HEAT TOASTED • Crambe has been evaluated as a potential oilseed crop since about 1932. Interest first surfaced in the United States in 1957 when the USDA began a program of systematically screening a large number of plant species as potential new crops. There are more than 8,000 species. Crambe has emerged as a promising oilseed crop due to its high content of erucic acid (see). This long-chain fatty acid has many potential industrial uses, including use as lubricants, coatings, slip-agents, plasticizers, polymers, and nylon precursors. As a member of the mustard family of plants, crambe seeds and meal contain several glucosinolates recognized as sources of potentially antinutritional compounds. Similar compounds are responsible for the sharp flavors of certain condiments and vegetables, such as radish, horseradish, cabbage, brussels sprouts, broccoli, and mustard. Of the glucosinolates in crambe, the major one, epiprogoitrin, accounts for 95 percent of the total. These plant compounds and their metabolites may interfere with iodine metabolism by reducing the ability of the thyroid to take up iodine. Most reports conclude that oilseed meals containing glucosinolates reduce feed intake and animal performance when fed to nonruminant animals, but ruminants tolerate glucosinolates at much higher levels without negative effects.

CRANBERRY JUICE CONCENTRATE • Bright red coloring from the juice of the red acid berry, produced by any of several plants of the genus Vaccinium, grown in the United States and Europe. Food manufacturers may substitute this natural coloring for the synthetic reds that were banned.

CRANBERRY JUICE OIL • Antioxidant and stabilizer that contains omega-3, −6, and −9. GRAS.

CRANBERRY POMACE • Source of natural red coloring. See Anthocyanins.

CREAM OF TARTAR • A white crystalline salt in tartars from wine making, prepared especially from argols and also synthetically from tartaric acid (see). Has a pleasant acid taste. Used as a thickening additive.

CREOSOL • See 2-Methoxy-4-Methylphenol. ASP

p-CRESOL • A synthetic nut and vanilla flavoring additive. Obtained from coal tar. It occurs naturally in tea and is used for beverages, ice cream, ices, candy, and baked goods. It is more powerful than phenol and less toxic. Phenol is an extremely toxic acid obtained from coal tar that has many industrial uses, including as a disinfectant for toilets and as an anesthetic. ASP

O- and p-CRESYL ACETATE • See o-Tolyl Acetate.

CRETAN DITTANY • See Dittany of Crete.

CROCETIN • Yellow coloring from saffron (see).

CROCUS EXTRACT • See Saffron.

CROSSLINED SODIUM CAROXYMETHYL CELLULOSE • See Carboxymethyl cellulose. E

CROSS-REACTIVITY • When the body mistakes one compound for another of similar chemical composition.

CROWN GUM • Catalyst. EAF

CRUCIFEROUS VEGETABLES • A family of plants characterized by flowers and fruits that bear a cross in the center. The genus being studied intensively for health properties are the Brassica, which include brussels sprouts, cauliflower, and broccoli. These vegetables contain large quantities of some substances that have been shown to inhibit chemically induced cancers in animals.

CRUFOMATE • An antiworm insecticide from petroleum used on cattle, goats, and sheep. FDA residue tolerance is 1 ppm in meat, fat, and by-products.

CRYOLITE SODIUM ALUMINUM FLUORIDE • Fluorine compound. A mineral used as an insecticide. FDA tolerance on fruits and vegetables is 0.7 ppm.

CRYPTOXANTHIN • A natural yellow coloring from corn and marigolds. See Xanthophyll.

CRYSTALLINE FRUCTOSE • Used in baked goods, frozen foods, beverages, and tabletop sweeteners. It has about one to two times the sweetness of sugar and has calories. See Fructose.

CTG • The abbreviation for the component or coating for fruits and vegetables.

CUBEBS • Piper cubeba. Tailed Pepper. Java Pepper. The mature, unripe, sun-dried fruit of a perennial vine grown in South Asia, Java, Sumatra, the Indies, and Sri Lanka. It has a strong, spicy odor and is used in fruit flavoring for beverages (800 ppm). The volatile oil is obtained by steam distillation from the fruit and is colorless to light green with a characteristic spicy odor and a slightly acrid taste. It is used in berry, fruit, and ginger flavorings for beverages, ice cream, ices, candy, baked goods, meats, and condiments. Java pepper was formerly used to stimulate healing of mucous membranes. The fruit has been used as a stimulant and diuretic and sometimes is smoked in cigarettes. EAF

CUCUMBER JUICE • From the succulent fruit of the vine. It has a pleasant aroma and imparts a cool feeling to the skin.

CUMALDEHYDE • See Cuminaldehyde.

CUMENEALDEHYDE • Colorless liquid with a floral odor used as a flavoring additive in various foods. Moderately toxic by ingestion. Narcotic in high doses. ASP

CUMIN • Cummin. A natural flavoring obtained from the seeds of an Old World plant. Used in spice and sausage flavorings for baked goods (2,500 ppm), condiments (3,900 ppm), and meats. Volatile oil, light yellow to brown, with a strong, disagreeable odor, is distilled from the plant. Used in berry, fruit, sausage, and spice flavorings for beverages, ice cream, ices, candy, chewing gum, baked goods, meats, pickles, and condiments. Moderately toxic by ingestion and skin contact. May be mutagenic. GRAS. ASP

CUMINAL • See Cuminaldehyde.

CUMINALDEHYDE • A constituent of eucalyptus, myrrh, cassia, cumin, and other essential oils, but often made synthetically. Colorless to yellowish, oily, with a strong, lasting odor. It is used as a synthetic flavoring in berry, fruit, and spice flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. Used in perfumery. ASP

CUMINIC ALDEHYDE • See Cuminaldehyde.

CUMIN OIL • Spice. See Cumin. GRAS. ASP

CUPRIC ACETATE • The copper salts of acetic acid and copper (see both).

CUPRIC CHLORIDE • Copper Chloride. A copper salt used in hair dye. A yellow to brown water-absorbing powder that is soluble in diluted acids. Irritating to the skin and mucous membranes. Irritating when ingested. See Copper.

CUPRIC OXIDE • See Copper.

CUPRIC SULFATE • Copper sulfate occurs in nature as hydrocyanite. Grayish white to greenish white crystals. Used as agricultural fungicide, herbicide, and in the preparation of azo dyes (see). Very irritating if ingested. Nontoxic on the skin and is used medicinally as a skin fungicide. See Copper.

CUPROUS IODIDE • A source of dietary iodide. See Iodine Sources. GRAS. NIL

CURACAO PEEL EXTRACT • A natural flavoring extracted from a plant native to the Caribbean islands. Used in orange and liquor flavorings for beverages (1,700 ppm). GRAS

CURACAO PEEL OIL • A natural flavoring extracted from a plant native to the Caribbean islands. Used in berry, lime, and liquor flavorings for beverages, ice cream, ices, candy, and baked goods.

CURCUMIN • Orange-yellow colorant from turmeric (see) used as a natural food coloring. It does not require certification because it is a natural product, but the Expert Committee on Food Additives of the FDA recommended that the acceptable daily intake of curcumin (and turmeric) be limited to 0 to 0.5 milligrams per kbw (see). A skin irritant. The JECFA (see), however, concluded in June 1998 that reproductive toxicity studies and more information concerning the solvents used in the manufacturing processes of this additive are needed. Eating curcumin, a natural ingredient in the spice turmeric, may reduce the chance of developing heart failure, researchers at the Peter Munk Cardiac Centre of the Toronto General Hospital Canada reported in 2008. E

CURDLAN • Pureglucan. Received approval from the FDA. It is the first direct food additive completely developed and petitioned by a Japanese company. An emulsifier and stabilizer. EAF

CURING ADDITIVES • In food preparation, curing refers to various preservation and flavoring processes, especially of meat or fish, by the addition of a combination of salt, sugar, and either nitrate or nitrite. Many curing processes also involve smoking. Curing with salt and sugar may be called salting, salt-curing, sugar-curing or honey-curing. Curing in brine is called wet-curing or pickling or brining. The curing of fish is sometimes called kippering. Salt inhibits the growth of spoilage-causing microorganisms by drawing water out of microbial cells through osmosis. As the unwanted bacterial population decreases, some good bacteria, primarily of the Lactobacillus genus (think yogurt), come to the fore and generate an acidic environment (around 4.5 pH). The sugar included in the cure is used as food by the lac-tobacilli. This process is a form of fermentation, and, in addition to reducing further the ability of the spoilage bacteria to grow, accounts for the tangy flavor of some cured products. Concentrations of salt up to 20 percent are required to kill most species of unwanted bacteria. Smoking adds chemicals to the surface of an item, which affects the ability of bacteria to grow, inhibits oxidation (and thus rancidity), and improves flavor. Nitrate and nitrite compounds help kill bacteria and also produce a characteristic flavor, and they give meat a pink or red color. According to American Cancer Society studies, increased consumption of pickled foods or foods preserved with salt is linked with cancer of the stomach, nose, and throat. As with processed meats, it's suspected that the link is caused by large amounts of nitrites in pickled foods. They are suspected carcinogens. See Nitrate and Nitrite and Pickling.

CURRANT BUDS, ABSOLUTE • A natural flavoring from a variety of small raisins grown principally in Greece. Used in fruit, berry, and raspberry flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

CUSPARIA BARK • Essential oil from the bark of angostura used as a flavoring. See Angostura Extract. GRAS

CYANAMIDE • Water-absorbing crystals used as fumigant for uncooked bacon, cereal flours, cereals that are cooked before being eaten, cocoa, uncooked ham, and uncooked sausage. FDA residue tolerances are 125 ppm in cereal flours, 90 ppm in cereals that are cooked before being eaten, 50 ppm in uncooked bacon, ham, and sausage, and 200 ppm in cocoa. Cyanide and its compounds are on the Community Right-to-Know List (see). Poison by ingestion, inhalation, and intraperitoneal route. Moderately toxic by skin contact. Listed as a cancer-causing agent. A severe eye irritant.

CYANIDE • Prussic Acid. Hydrocyanic Acid. An inorganic salt, it is one of the most rapid poisons known. Poisoning may occur when any compound releases cyanide. Cyanide is used as a fungistat, insecticide, and rodenticide. It has been reported to reduce oxygen availability in the blood even in low doses.

CYANIDIN • Usually isolated from bananas or cherries, it is used as a coloring in foods. It has also been used to treat night blindness.

CYANO-, CYAN- • From the Greek kaynos, meaning a dark blue. The prefix is commonly used to signify compounds containing the cyanide group. If the cyanide is not released from the compound, its presence is presumed not harmful.

CYANO(4-FLURO-3-PHENOXYPHENYL)METHYL-3-(2,2-DICHLOROETHENYL)-2,2-DIMETHYL-PROPANECARBOXYLATE • An insecticide used in animal feed. See Cyanamide.

CYANO(3-PHENOXYPHENYL)-METHYL-4-CHLORO-ALPHA(1-METHYL ETHYL)BENZENEACETATE • A pesticide used in apple pomace to be used in animal feeds up to 20 ppm. The tolerance is 10 ppm in tomato pomace in animal feed and 1 ppm in peanut hulls to be used in animal feeds.

CYANOCOBALAMIN • See Vitamin B12.

CYANODITHIOIMIDOCARBONATE, DISODIUM • Bacteria-killing component in the processing of sugarcane. Many organic cyano compounds are decomposed in the body to yield highly toxic cyanide.

CYANOGENS • Substances in almonds, and in peach and apricot pits, that can cause headache and heart palpitations.

CYCLAMATES • Sodium and Calcium. Artificial sweetening additives about thirty times as sweet as refined sugar, removed from the food market on September 1, 1969, because they were found to cause bladder cancer in rats. At that time 175 million Americans were swallowing cyclamates in significant doses in many products ranging from chewing gum to soft drinks. There has been a concerted effort to bring cyclamates back to the market, but as of this writing, they have not been approved. The FDA's Cancer Assessment Committee's review of all the evidence reportedly indicates that neither cyclamate nor its major metabolic end product, cyclohexy-lamine, cause cancer. However, in 2003, the FDA put in abeyance (see) a petition by Abbott Laboratories to allow cyclamates on the market. BAN. In 2008, these sweeteners had been evaluated by the JECFA and ADIs had been established; therefore, the Committee endorsed levels for these sweeteners as proposed, noting the reservations of above delegations that they were still banned by Norway and the United States.

CYCLAMEN ALDEHYDE • Colorless liquid with a strong floral odor used as a flavoring additive in various food products. Moderately toxic by ingestion. A human skin irritant. GRAS.

CYCLAMIC ACID • Fairly strong acid with a sweet taste. It is the acid from which cyclamates (see) were derived. E

CYCLOBUTANONES • Substances formed in fatty foods after irradiation including beef, chicken, eggs, cheese, and certain fruits such as avocado, mango, and pawpaw. The JECFA has called for more studies of these compounds to determine their effect on health, if any.

CYCLODEXTRINS (BCD) a- and b- • Sweet tasting, enzymatically modified starches shaped like doughnuts. The cavity of the molecule repels water and organic compounds can fill the cavity. As a result, caffeine can be removed from tea and coffee, bitter components can be removed from citrus fruits, flavor oils can be extracted from onion, garlic, and other plants, and cyclodextrins can be recovered and reused. The Joint Expert Committee on Food Additives (see) evaluated the data on cyclodextrin. The members found that it is poorly absorbed in the upper gastrointestinal tract in humans and is largely utilized following breakdown by the microflora in the lower gut. A small proportion may be absorbed intact. A few studies in human volunteers indicate that flatulence, bloating, nausea, and soft stools may occur in some individuals who ingest 20 grams or higher doses of a-cyclodextrin at one sitting. A number of acute and short-term toxicity studies were reviewed that indicated low toxicity by the oral route. Despite its low toxicity, the committee was concerned about its possible effect on fat-absorbed nutrients and drugs. The previously established ADI (see) was “not specified” by the committee for use with flavors, colors, and sweeteners, as a solubilizer for fatty acids, certain vitamins, as a flavor modifier in soya milk, and as an absorbent in confectioneries. Experts set a temporary ADI (see) of 0 to 6 mg per kg of body weight and recommended further study of its effects on fat-absorbed nutrients. They also asked for more information on production methods. The JECFA requested in June 1998 that a study of human tolerance be revived in 1999 “in order to confirm the absence of adverse gastrointestinal symptoms at normal levels of intake of gamma-cyclodextrin.” In 2003, a flavoring, beta-cyclodextrin, was determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association (FEMA). In 2008, Mexican researchers were evaluating cyclodextrins as carriers (see) for antimicrobial ingredients in fresh-cut products, as the industry seeks alternatives to chlorine solutions for preserving fresh-cut vegetables. Fresh-cut fruits and vegetables are a rapidly growing segment of the market, and chlorine solutions are widely used by the industry to sanitize and prolong shelf life. But concerns about the potential formation of carcinogens from chlorine usage have prompted some to investigate alternative sources including essential oils and irradiation. The committee concluded there were no safety concerns at the proposed used levels and resulting predicted consumption.

a-CYCLODEXTRIN • Cyclohexa-Amylose, Cyclomalto-Hexose, or Alpha-Dextrin. Liquefied starch is treated with the enzyme cyclodextringlycosyltrans-ferase. Use in selected foods, except meat and poultry, for fiber supplementation; as a carrier or stabilizer for flavors (flavor adjuvant); as a carrier or stabilizer for colors, vitamins, and fatty acids; and to improve mouthfeel in beverages, breads, rolls, cakes, baking mixes, refrigerated dough, diet soft drinks, beverage mixes, fruit juices, instant coffees and teas, coffee whiteners (dry), formula diets, meal replacements, and nutritional supplements, vegetable juices, soy milk and non-soy (imitation) milk, ready-to-eat breakfast cereals, instant rice, pasta, and noodles (prepared), condiments, reduced fat spreads, dressings, and mayonnaise; also, yogurt, milk beverage mixes, and frozen dairy desserts, canned and dry soups (prepared), hard candy, chewing gum, pudding mixes (dry) and snack foods. Based on the information provided by Wacker, the producer, as well as other information available to the FDA, the agency has no questions at this writing regarding Wacker's conclusion that its alpha-cyclodextrin is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status. As always, it is the continuing responsibility of the notifier to ensure that the food ingredients the firm markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

b-CYCLODEXTRIN • It may serve as a carrier and stabilizer of food flavors, food colors, and some vitamins. Intake of β-cyclodextrin from use as a food additive has been estimated at 1-1.4 g/day. Other applications include decaffeination of coffee/tea and reduction in the cholesterol content of eggs. Such uses add little to intakes. Cyclodextrins can also be used as capsules to deliver drugs and as catalysts for chemical reactions. Nontoxic. In the carcinogenicity study in mice, however, β-cyclodextrin caused inflammatory changes in the lower gastrointestinal tract, which were considered to be the cause of death of some animals. EAF. See a-Cyclodextrin.

CYCLOHEPTADECA-9-EN-1-ONE • Flavoring. ASP

CYCLOHEXANE • Hexamethylene. A hydrocarbon (see) solvent widely used in industry in the manufacture of nylon, cellulose fats, oils, waxes, resins, paint and varnish removers, glass substitutes, and fungicides. Colorless liquid with a pungent odor. It is also used to dilute colors in food. Poison by intravenous route. Moderately toxic by ingestion. A systemic irritant by inhalation and ingestion. A skin irritant. May cause mutations. Suspected by the U.S. National Toxic Program of being a neuro-toxin. ASP

CYCLOHEXANE ETHYL ACETATE • A synthetic fruit and honey flavoring for beverages, ice cream, ices, candy, and baked goods. See

Cyclohexaneacetic Acid for toxicity. ASP

CYCLOHEXANEACETIC ACID • A synthetic butter and fruit flavoring for beverages, ice cream, ices, candy, and baked goods. Cyclohexane in high concentrations may act as a narcotic and skin irritant. ASP

CYCLOHEXANONE • It is a colorless, oily liquid with an odor reminiscent of oil of peppermint. It is used in organic synthesis, particularly in the production of adipic acid, caprolactam, polyvinyl chloride, and methacrylate ester polymers. Also used in wood stains, paint, varnish removers, spot remover, degreasing of metals, polishes, lubricating oil additives, solvent for herbicides, cellulosics, natural and synthetic resins, waxes, and fats. The JECFA says that consumer exposure may occur when it is used as a solvent. Eye, skin, and respiratory irritant. May cause dermatitis. Irritating to skin and eyes. Derived from phenol (see), it is used in many chemical products including fragrances and pharmaceuticals. It is being tested as a stimulant for nerve cells. It is also used in toxic herbicides. EAF

CYCLOHEXENE • Solvent widely used in food additives and pharmaceuticals. Oily liquid with an odor reminiscent of peppermint. Occurs in coal tar. Prepared from dehydration of cyclohexanol at high temperatures. Overexposure may cause irritation of the eyes, respiratory system, and skin and cause drowsiness. Used in the manufacture of many food additives including adipic and maleic acids and aldehyde (see all). Moderately toxic by ingestion.

CYCLOHEXYL ANTHRANILATE • A synthetic apple, banana, and grape flavoring for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Some cyclohexyl compounds are irritating to the skin. ASP

CYCLOHEXYL CINNAMATE • A synthetic apple, apricot, peach, and prune flavoring for beverages, ice cream, ices, candy, and baked goods. Some cyclohexyl compounds are irritating to the skin. ASP

CYCLOHEXYL FORMATE • Formic Acid. A synthetic cherry flavoring for beverages, ice cream, ices, candy, and baked goods. Some cyclohexyl compounds are irritating to the skin. ASP

CYCLOHEXYL ISOVALERATE • A synthetic strawberry and apple flavoring for beverages, ice cream, ices, candy, and baked goods. Some cyclohexyl compounds are irritating to the skin. ASP

CYCLOHEXYL PROPIONATE • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. Some cyclohexyl compounds are irritating to the skin. ASP

CYCLOIONONE • Flavoring. See Ionone. EAF

CYCLOPENADECANOLIDE • See Pentadecalactone.

CYCLOPENTANETHIOL • Flavoring additive. The JECFA says there is no safety concern. ASP

CYCLOPENTANONE • Colorless liquid with a peppermint odor. Used as a flavoring. EAF

N-CYCLOPROPYL-TRANS-2-CIS-6-NONADIENAMIDE • Provides a salivation cocktail that comprises a food acid and a tingling sensate. The combination of a food acid and a tingling sensate has been found to synergistically increase salivation. EAF

CYCLOTETRAGLUCOSE and CYCLOTETRAOSE • Produced separately from starch by enzymes. They are used as carriers for food additives. The JECFA issued a temporary ADI (see) until they identify the bacterial strains used to produce the substances and present evidence of that is not pathogenic or toxic.

CYFLUTHRIN • Synthetic pyrethroid insecticide that has both contact and stomach poison action. An insecticide used on cattle, goats, hogs, and sheep. FDA residues in meat are 0.05 ppm. Residue in milk 0.1 ppm. It is the active ingredient in many insecticide products including Baythroid, Baythroid H, Attatox, Contur, Laser, Responsar, Solfac, Tempo, and Tempo H. Combination products include Baythroid TM and Aztec. There is little information available about the breakdown of cyfluthrin in vegetation. One study determined that very small amounts of cyfluthrin residue remained on strawberries seven days after the last of three weekly applications. Another researcher identified a protein in tomatoes that is capable of breaking down cyfluthrin. Researchers in Australia demonstrated that cyfluthrin is stable and resistant to breakdown when used on wheat in storage for up to fifty-two weeks, according to research by a Pesticide Information Project of Cooperative Extension Offices of Cornell University, Oregon State University, the University of Idaho, and the University of California at Davis and the Institute for Environmental Toxicology of Michigan State University. Major support and funding was provided by the USDA/Extension Service/National Agricultural Pesticide Impact Assessment Program.

CYHALOTHRIN • Pyrethroid insecticide and acaracide. It is used predominantly on cattle and sheep, and to a lesser extent on pigs and goats, for the control of a broad range of parasites, including flies, lice, and ticks. Cyhalothrin is applied topically. The ADI was made temporary because cyhalothrin belongs to a class of substances that are characterized by their toxicity to the central nervous system. Neurobehavioral effects may be the most sensitive indicator of the toxicity of this compound. In a long-term study of toxicity and carcinogenicity in mice, cyhalothrin was given in the diet at a concentration of 0, 20, 100, or 500 mg/kg of feed for 104 weeks. An increased incidence of mammary and adrenal cancers were seen in female mice at high doses. The JECFA could not exclude the possibility that the adenocarcinomas seen in the groups given 100 or 500 mg/kg of feed were caused by cyhalothrin. Residues in food arising from the use of cyhalothrin on crops and in animal health are low, usually less than 0.2 mg/kg. No results are available on the total dietary intake in humans, but it can be assumed that the dietary exposure of the general population will not exceed the ADI (0.02 mg/kg body weight). In fish, the main residue in tissues consists of unchanged cyhalothrin. Under laboratory conditions, cyhalothrin and lambda-cyhalothrin are highly toxic to fish, aquatic arthropods, and honeybees. However, in field conditions, lasting adverse effects are not likely to occur under recommended conditions of use, the JECFA said. Although cyhalothrin and lambda-cyhalothrin have been used for several years and any effects from occupational exposure have been only transient, observations of human exposure should be maintained. No specific data on water levels are available. Cyhalothrin and lambda-cyhalothrin are very toxic to fish in clean water under laboratory conditions. Dogs that received 30 mg/kg per day for ten days showed severe clinical signs typical of pyrethroid toxicity (muscular trembling, unsteadiness, vomiting, and body weight loss). The animals were rested and then received 20 mg/kg per day for four weeks. Similar clinical signs were seen, with the exception of body weight loss, in all animals receiving 10 mg/kg per day or more. The severity seems dose related. There is no information on effects from short- or long-term exposure and no epidemiological information is available. The experts said, “Interestingly, the action of these pyrethroids closely resembles that of the insecticide DDT in the peripheral nervous system of the frog. Because of its universal effect on nerve excitability, the action of pyrethroids should not be considered restricted to particular animal species, or to a certain region of the nervous system.” Although it has been established that sense organs and nerve endings are the most vulnerable to the action of pyrethroids, the ultimate lesion that causes death will depend on the animal species, environmental conditions, and on the chemical structure and physical characteristics of the pyrethroid molecule.

CYHEXATIN • An insecticide used in animal feed. FDA residue in apple pomace and citrus pulp is 8 ppm. o-CYMEN-3-OL • See p-Cymene.

p-CYMENE • A synthetic flavoring, a volatile hydrocarbon solvent that occurs naturally in star anise, coriander, cumin, mace oil, oil of mandarin, and origanum oil. Used in fragrances, also in citrus and spice flavorings for beverages, ice cream, candies, and baked goods. Its ingestion pure may cause a burning sensation in the mouth, nausea, salivation, headache, giddiness, vertigo, confusion, and coma. Contact with the pure liquid may

cause a burning sensation in the mouth, nausea, salivation, headache, giddiness, vertigo, confusion, and coma. Contact with the pure liquid may cause blisters of the skin and inflammation of mucous membranes. ASP

CYMOL • See p-Cymene.

CYMOPHENOL • See Carvacrol.

CYNARON • See Acimeton.

CYROMAZINE • A pesticide used in poultry feed. The FDA tolerance residue in fat, meat, and meat by-products of poultry are 0.05 ppm; as residue in eggs, 0.25 ppm.

CYSTEINE • L-Form. An essential amino acid (see), it is derived from hair and used in hair products and creams. Soluble in water, it is used in bakery products as a nutrient. It has been used to promote wound healing. GRAS. ASP E

L-CYSTEINE MONOHYDROCHLORIDE • The ingredient is used to supply up to 0.009 part of total L-cysteine per 100 parts of flour in dough as a dough strength-ener in yeast-leavened baked goods and baking mixes. GRAS

DL CYSTINE • A nonessential amino acid (see) found in urine and in horsehair.

Colorless, practically odorless white crystals, it is used as a nutrient supplement. May have reproductive effects. GRAS. ASP

2,4-D • 2,4-Dichlorophenoxy Acetic Acid. Prepared from phenol and chloroacetic acid, it is an herbicide that belongs to the same class as dioxin (see) and is widely used by home gardeners and farmers. The FDA permits it in milled fractions (except flour) derived from barley, oats, rye, and wheat to be ingested as food or converted into food or feed as a residue. FDA tolerances for residues are 2 ppm in milled fractions, 1 ppm in potable water in the western United States, and 5 ppm in processed feeds using sugarcane bagasse or molasses. 2,4-D does not cause acute toxicity, but its long-term effects are a matter of controversy and it has been linked to cancer. An excess of non-Hodgkin's lymphoma among farmers has been strongly associated with its use. It does cause eye irritation and gastrointestinal upsets.

DAIDAI PEEL OIL • Japanese Bitter Orange Oil. The essential oil derived from the dried peel of immature fruit. The normal types of sour orange are usually too sour to be enjoyed out-of-hand. In Mexico, however, sour oranges are cut in half, salted, coated with a paste of hot chili peppers, and eaten. Sour oranges are used to make marmalade. The juice is used for ade and as a flavoring on fish and, in Spain, on meat during cooking. In Yucatán, it is employed like vinegar. In Egypt and elsewhere, it has been fermented to make wine. EAF

DAILY VALUE • DV. Substituted for the percentage of U.S. Recommended Dietary Allowances (see). It is a guideline based on the daily needs of the general population. The percentages are supposed to help you compare the nutrients in a particular food with dietary recommendations that help reduce risk for some chronic diseases.

DAIRY-LO • A fat replacer containing whey protein concentrate (see). It can be used in other foods including reduced-fat versions of butter, sour cream, cheese, yogurt, salad dressing, margarine, mayonnaise, baked goods, coffee creamers, soups, and sauces. GRAS

DALAPON • 2,2-Dichloropropanoic Acid. Used as an herbicide in citrus pulp for cattle feed. FDA tolerance is 20 ppm.

DAMAR • Dammar. Shorea dipterocarpaceae. Production is mainly by tapping living sal trees in India, although some is still collected from the ground in fossilized form. It has a bitter taste. A little is used in foods as a clouding or glazing additive. May cause allergic contact dermatitis. ASP

a-DAMASCONE and d-DAMASCONE • Fragrance ingredients. EAF

DAMIANA LEAVES • The dried leaves of a California and Texas plant used as a flavoring. Formerly used as a tonic and aphrodisiac. Now used as a flavoring. There is reported use of the chemical; it has not yet been assigned for toxicology literature. GRAS. EAF

DAMINOZIDE • Alar. Butanedioic Acid Mono (2,2-dimethyl hydrazide). An apple growth regulator was a particular focus of alarm in 1988–89 when its residues were reported to be hazardous to children. FDA residue tolerances were 10 ppm in dried tomato pomace; 90 ppm as residues in peanut meal (both for animal feed); 0.2 ppm in fat, meat, or meat by-products of cattle, goats, hogs, poultry, and sheep; 0.02 ppm as residues in milk; 0.2 ppm as residues in eggs; 20 ppm as residues in apples; and 30 ppm as residues in cherries, nectarines, and peaches. Probable human carcinogen. Causes multiple tumors in animals. Daminozide was removed from the market in 1989 and is now permitted for use only on flowerbeds. EAF

DAMMAR • See Damar.

DANDELION LEAF and ROOT • Lion's Tooth. Essential oil obtained from Taraxacum plants that grow abundantly in the United States. The Indians used the common dandelion weed, eaten as a salad green, for heartburn. Rich in vitamins A and C, it is also used as a flavoring. Health practitioners today maintain it is a gentle diuretic that does not deplete the body of potassium. Dandelion coffee is made from the dried roots of the plant. The root extract is used in bitters, butter, caramel, floral, fruit, root beer, and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. The fluid extract is used in butter, caramel, fruit, maple, and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. GRAS. ASP

DAUCUS CAROTA • See Carrot Oil.

DAVANA OIL• Artemesia pallens. A plant extract used in fruit flavoring for beverages, ice cream, ices, candy, baked goods, and chewing gum. There is reported use of the chemical; it has not yet been assigned for toxicology literature. ASP

DBP • The abbreviation for dibutyl phthalate (see). See also Phthalates.

DDD • See DDE.

DDE • Dichlorodiphenyldichlorethylene. It is a degradation product of DDT found as an impurity in DDT residues. It is believed to be an estrogen (see) disrupter and is being studied by an EPA expert committee. DDE (dichlorodiphenyldichloroeth-ylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. These chemicals are long-lasting and occur in food grown in long-ago contaminated soil or in imported foods from countries that still allow the use of DDT to control pests and still expose you to low levels of these pesticides. It is number twenty-one on the CERCLA Priority List of Hazardous Substances (see). DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

DDM • Dialkyl Dihexadecyl Malonate. A fat-based substance that is not absorbed into the body and can be used for frying and baking. It is not yet on the market as of this writing.

DDT • Dichloro-Diphenyl-Trichloroethane. A synthetic pesticide with a long and controversial history. In the early years of World War II, DDT was used with great effect to control mosquitoes spreading malaria, typhus, and other insect-borne diseases among both military and civilian populations. After the war, DDT was made available for use as an agricultural insecticide. In 1962, Silent Spring by American biologist Rachel Carson was published. The book described the effect on the environment of the indiscriminate spraying of DDT in the United States and questioned the logic of releasing large amounts of chemicals into the environment without fully understanding their effects on human health. The book suggested that DDT and other pesticides may cause cancer and that their agricultural use was a threat to wildlife, particularly to birds. DDT was subsequently banned for agricultural use worldwide under the Stockholm Convention, but its limited use in insect-borne disease control continues today in certain parts of the world and remains controversial.

Some of the food imported to the United States has residues of DDT. DDT and its breakdown product DDE (see), like other organochlorines, have been shown to be chemically similar enough to estrogens to trigger hormonal responses in animals and presumably humans. The effect seems to occur on both men and women effecting fertility and producing other signs of hormone-affected tissue. The insecticide is still one of the first and most commonly used for residual spraying, because of its low cost, high effectiveness, persistence, and relative safety to humans. One producer of DDT says that the company has supplied DDT to Madagascar, Ethiopia, Eritrea, Sudan, South Africa, Namibia, Solomon Islands, Papua New Guinea, Algeria, Thailand, and Myanmar for the Malaria Control Project. The argument is that people can die rapidly from malaria or slowly from cancer by the use of DDT.

DDVF • VPON. 2,2-Dichlorovinyl. An organophosphate (see) insecticide with contact and vapor action. It has been widely used for control of

DDVP • Used in feed. See Dichlorvos.

2–4 DECADIENAL • Flavoring. An aldehyde (see) chicken fat. Deep fat flavor, characteristic chicken aroma at 10 ppm and a citrus/orange/grapefruit character at lower dilution. Additive used to impart a deep fat flavor in beef, lamb, chicken, potato chips, and french fries. GRAS by FEMA (see).

(E,E)-2,4-DECADIEN-1-OL • See 2–4 Decadienal. EAF

δ-DECALACTONE • A synthetic flavoring additive. Occurs naturally in butter, cream, and milk. Colorless with a coconut odor. Used in coconut and fruit flavorings for beverages, ice cream, ices, candy, baked goods, oleomargarine (10 ppm), and toppings. ASP

γ-DECALACTONE • A synthetic flavoring additive, colorless, with a fruity odor, used in citrus, orange, coconut, and fruit flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

DECANAL • A synthetic flavoring additive. Occurs naturally in sweet orange peel, sweet mandarin oil, grapefruit oil, orris, and coriander. Colorless to light yellow, with a definite fatlike odor that becomes florallike when diluted. Used in berry, citrus, lemon, orange, fruit, and honey flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Moderately toxic by ingestion. A severe skin irritant. GRAS. ASP

DECANAL DIMETHYL ACETAL • A synthetic flavoring additive. Occurs naturally in anise, butter acid, oil of lemon, and oil of lime. Used in butter, coconut, fruit, liquor, whiskey, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. GRAS. ASP

DECANOIC ACID • Capric Acid. A synthetic flavoring additive that occurs naturally in anise, butter acids, oil of lemon, and oil of lime and is used to flavor butter, coconut, fruit, liquor, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, puddings, and shortenings. Also used for coating fruits and vegetables and in defoaming additives and fatty acids. Salts and esters of decanoic acid are called decanoates. A skin irritant. May be mutagenic. ASP

1-DECANOL • A synthetic fatty alcoh flavoring additive. Occurs naturally in orange and ambrette seed. Used in butter, lemon, orange, coconut, and fruit flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

3-DECANONE • Ethyl Heptyl Ketone. Waxy liquid with a citrius odor. Used as a flavoring agent. In 2002, the JECFA determined the ADI (see) posed no safety concern at current levels when used as a flavoring additive. EAF

DECANYL ACETATE • See Decyl Acetate. EAF

DECATRIENAL • Used as a perfuming or flavoring ingredient, in particular as a booster for mandarin- or tangerine-type flavors. EAF

2-DECENAL • A synthetic, fruit flavoring for beverages, ice cream, ices, candy, and baked goods. Moderately toxic by skin contact and mildly toxic by ingestion. A severe skin irritant. ASP

4-DECENAL • A synthetic, orangelike, fatty flavor. The JECFA (see) has no safety concern at current levels of intake when used as a flavoring agent. ASP

DECENOIC ACID • Used as a flavoring. 4 Decenoic Acid. 5-,6-, 9, (e)-2-, 4- are all EAF except 5- and 6-, which are NUL. 9-Decenoic Acid is a flavoring that tastes waxy, creamy, fatty with a cheesy and milky nuance. EAF.

DECOQUINATE • Decox. An animal antifungal drug used in beef, chicken, and goat feed. FDA residues are 2 ppm in uncooked edible tissues other than muscle and 1 ppm in skeletal muscle of chickens, cattle, and goats.

DECYL ACETATE • A synthetic berry, orange, apple, peach, plum, and honey flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, fish products, granulated sugar, and gravies. ASP

DECYL ALCOHOL • A synthetic fatty acid. An intermediate (see) for surface-active additives, an antifoam additive, and a fixative in perfumes. Occurs naturally in sweet orange and ambrette seed. Derived commercially from liquid paraffin wax (see). Used also for synthetic lubricants and as a synthetic fruit flavoring. Moderately toxic by skin contact. Mildly toxic by ingestion, inhalation, and possibly other routes. Has caused tumors in animals. A severe human skin and eye irritant.

DECYL BENZENE SODIUM SULEONATE • Defoaming additive and dispersing aid used on fresh citrus fruit. Poison by intravenous route. Moderately toxic by ingestion. A severe eye irritant.

DECYL BUTYRATE • A synthetic citrus and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

DECYL PROPIONATE • A synthetic citrus and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

DECYLIC ACID • See Decanoic Acid.

DECYLIC ALCOHOL • See 1-Decanol.

DEER'S TONGUE • Liatris wild vanilla. Vanilla plant. The extract of Trilisa odor-atissima found from Virginia to Florida and Louisiana. Contains the volatile oil coumarin (see). Used to make tobacco smell better. Removed from the GRAS list because of coumarin. There is no minimum percentage set by the FDA. ASP

DEFATTED • Meaning the fat has been partly or totally removed from a product. If partly removed, there is no minimum percentage set by the FDA.

DEFATTED COTTONSEED OIL • From cottonseed flour (see) with the fat removed.

DEFOAMING ADDITIVES • Antifoamer. Foam Inhibitor. Any number of surface-active additives (see), such as liquid glycerides (see), which are used to control the amount of foam produced in the processing of baked goods, coffee, whiteners, candies, milk products, jams, jellies, and fruit juices. They remove the head from processed drinks, such as orange and pineapple juice. Among the defoamers used are dimethylpolysiloxane, polyoxyethylene (40) monostearate, and propylene gly-col alginate (see all).

DEFOLIANT • Pesticide that kills unwanted plant leaves.

DEHA • The abbreviation for diethylhexyl adipate.

DEHP • The abbreviation for diethylhexyl phthalate (see). See also Phthalates.

DEHYDRATED • With the water removed.

DEHYDRATED BEETS • Used for coloring and flavoring. ASP

DEHYDROACETIC ACID • DHA. Sodium Dehydroacetate. A weak acid that forms a white, odorless powder with an acrid taste. Used as a preservative in cut or peeled squash. Used as an antienzyme additive in toothpaste to prevent tooth decay and as a preservative for shampoos. Also used as a fungi and bacteria-destroying additive in cosmetics. The presence of organic matter decreases its effectiveness. Not irritating or allergy

causing, but it is a kidney-blocking additive and can cause impaired kidney function. Large doses can cause vomiting, imbalance, and convulsions. ASP

DEHYDRODIHYDROIONONE • A flavoring from ionone. ASP

DEHYDROMENTHOFUROLACTONE • Flavoring used in chewing gum and cigarettes. GRAS. NUL

DEHYDRONOOTKATONE • Newer flavoring to be evaluated by the JECFA. See Nootkatone. EAF

DELANEY AMENDMENT • Written by Congressman James Delaney, the amendment was part of the 1958 law requested by the Food and Drug Administration. The law stated that food and chemical manufacturers had to test additives before they were put on the market and results had to be submitted to the FDA. Delaney's amendment specifically states that no additive may be permitted in any amount if tests show that it produces cancer when fed to man or animals or by other appropriate tests. Ever since it was enacted, the food and chemical industries have tried to get it repealed. Efforts have been made to substitute a negligible-risk standard to processed food. Until 1996, the EPA observed different safety standards for raw and processed foods. For the latter, it used the zero-risk standard established by the Delaney Amendment. That standard, however, had proved to be impractical and even counterproductive, according to the EPA and manufacturers. It prohibited foods from carrying minute traces of carcinogenic compounds, while exempting many toxic chemicals that were registered before the amendment was enacted. As a result, regulators were forced to allow the use of toxic chemicals while barring safer alternatives. Congress tweaked the Delaney Amendment in the Food Quality Protection Act of 1996 for pesticides, substituting the negligible-risk standard that had long been used to set tolerances for raw foods. This standard allows residues of potentially carcinogenic pesticides as long as there is a “reasonable certainty of no harm” to consumers. In practice, regulators will approve a pesticide application only if it will cause no more than one additional cancer case per million people who consume it over a lifetime. Congress has held hearings to examine the pros and cons of liberalizing the Delaney Amendment. At this writing, debates on the issue were in progress. Some coal-tar colors, nitrites, and nitrates that are considered cancer-causing additives are permitted in foods. See more about Delaney on pages 4–5.

DELAYED HYPERSENSITIVITY • An inflammatory response that develops twenty-four to seventy-two hours after exposure to an antigen that the immune system recognizes as foreign. This type of immune response involves mainly T (thy-mus) cells rather than antibodies (which are made by B [bone marrow] cells).

DELTAMETHRIN • A pesticide that contains cyanide used for tomato products. The FDA permits a residue of 1 ppm.

DELTA-TOCOPHEROL • See Tocopherol. E

DEMETON-S • An organophosphate (see) pesticide used in animal feed. FDA residue limits of 5 ppm in dehydrated sugar beet pulp when used for animal feed. Poison by ingestion and other routes.

DEMULCENT • A soothing, usually thick, oily or creamy substance used to relieve pain in inflamed or irritated mucous surfaces. The gum acacia, for instance, is used as a demulcent.

DENATONIUM • Denatonium benzoate. Usually available under trade names such as Bitrex or Aversion and as denatonium saccharide, it is the most bitter compound known to date. Dilutions of as little as 10 ppm are unbearably bitter to most humans. Used as aversive agents to prevent accidental ingestion. Denatonium is used in denatured alcohol, antifreeze, nail-biting preventions, animal repellents, liquid soaps, and shampoos. It is not known to pose any long-term health risks, although exposure may be irritating and unpleasant.

DENATURANT • A substance that changes another substance's natural qualities or characteristics. For example, denatonium benzoate is added to the alcoholic content in cosmetics to make it undrinkable.

DERMATITIS • Inflammation of the skin.

DESICCANT • Pesticide that kills unwanted plant tops.

DESOXYCHOLIC ACID • An emulsifying additive, white, crystalline, powdered, almost insoluble in water. Used in dried egg whites up to 0.1 percent. Moderately toxic by ingestion. Has caused tumors in animals. GRAS. NUL

DEXTRAN • A term applied to polysaccharides produced by bacteria growing on sugar. Used as a foam stabilizer for beer, in soft-center confections, and as a substitute for barley malt. Has caused cancer in rats. The FDA stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. ASP

DEXTRIN • British Gum. Starch Gum. White or yellow powder produced from starch and used as a foam stabilizer for beer, a diluting additive for dry extracts and pills, in polishing cereals, for preparing emulsions, and in matches, fireworks, and explosives. May cause an allergic reaction. GRAS. ASP

DEXTROSE • See Corn Syrup. GRAS. ASP

DHC • See Dihydrochalcones.

DIACETIN • A mixture of the diesters (see) of glycerin (see) and acetic acid (see), used as a plasticizer, softening additive, or as a solvent for cellulose derivatives, resins, and shellacs.

DIACETYL • Occurs naturally in cheese, cocoa, pears, coffee, raspberries, strawberries, and cooked chicken, but is usually prepared by a special fermentation of glucose. Used as a carrier of aroma of butter, vinegar, and coffee. Also used in blueberry, raspberry, strawberry, butter, buttermilk, butterscotch, caramel, chocolate, coffee, fruit, cheese, cherry, liquor, rum, wine, nut, almond, spice, ginger ale, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and shortening. Cleared by U.S. Department of Agriculture (Meat Inspection Division) to flavor oleomargarine in “amount sufficient for the purpose.” The butter flavor in microwave popcorn comes from diacetyl, which reportedly can cause serious lung and respiratory problems. Although most people who have gotten sick due to diacetyl exposure have worked in popcorn factories, one man developed a lung disease called bronchiolitis obliter-ans after eating two bags of microwave popcorn a day. After consumer groups and members of Congress exerted pressure, most companies that manufacture microwave popcorn have stopped using diacetyl in the butter flavoring. Diacetyl compounds have been associated with cancer when ingested by experimental animals. GRAS. ASP

DIACETYL TARTARIC ACID ESTERS OF MONOGLYCERIDES and Dl-GLYCERIDES • DATEM. An emulsifying additive used to improve volume and uniformity in bakery products up to 20 percent by weight of the combination. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. In 2002, however, the JECFA reported a two-year study in rats that seemed to show heart muscle fibrosis and adrenal overgrowth in animals at the low and intermediate doses of DATEM. The NOEL (see) could not be identified in the long-term study so the previous ADI of 0–50 mg/kg bw was made temporary pending submission of additional information. The JECFA could not determine whether reductions in the rats' body weights were secondary to decreased food consumption. It was suggested high concentrations of DATEM may decrease the bioavailability of nutrients, especially calcium.

DIALIFOR • Torak. An insecticide used in animal feed, apple pomace, dried citrus pulp, dried grape pomace, raisin waste, and raisins. FDA allows tolerances of up to 2 ppm in raisins, 40 ppm in dried apple pomace, 20 ppm in dried grape pomace, 115 ppm in dried citrus pulp, and 10 ppm in raisin waste when used for animal feed. Poison by ingestion and skin contact. Had adverse reproductive effects in experimental animals.

DIALKANOLAMIDE • A combination of methyl laurate and diethanolamine (see both) used to wash sugar beets prior to slicing operation. See Diethanolamine for potential cancer hazard.

DIALLYL POLYSULFIDES • Used in the manufacture of flavors. ASP

DIALLYL TRISULFIDES • Used in the manufacture of flavors. NIL

2,4-DIAMINO-5 (6-METHYLVERATRYL) PYRIMIDINE • A feed additive. See Ormetoprim.

DIAMMONIUM PHOSPHATE • Used in animal feed as a source of nonprotein nitrogen and phosphorous for ruminants.

DIAMYL KETONE • Solvent. Toxic. EAF

1,4-DIANILINOANTHRAQUINONE • See Coal Tar.

DIASMOL • See 1,3-Nonanediol Acetate (mixed esters).

DIASTASE FROM ASPERGILLUS ORYZAE • Used for milk clotting. See Aspergillus Oryzae and Diastase. ASP

DIASTASE • Separate. The name is more particularly applied to that ferment formed during the germination of grain, as in the malting of barley, but it is also occasionally used to designate the ferment contained in animal fluids, as in saliva and milk. During germination the barley secretes the enzyme diastase, which makes the starch in the barley soluble, thus preparing it for conversion into sugar. The enzyme in plants also converts starch to dextrin and maltose.

DIATASE • Maltase. A mixture of enzymes from malt. Used to convert starch into sugar and used for digestive and nutritional support. It is produced by cells using the small intestine. It converts at least fifty times its weight of potato starch into sugars in thirty minutes. In 1992, diatase and diatase malt aluminum hydroxide were not shown to be safe and effective as claimed in OTC digestive-aid products. EAF

DIATHIANON • A broad spectrum multisite protectant fungicide used outside the United States for control of apple and pear scab, black rot, rust, and leaf spot diseases in pome fruit, and Peronospora in hops. ASP

DIATOMACEOUS EARTH • Kieselguhr. A porous and relatively pure form of silica formed from fossil remains of diatoms—one-celled algae with shells. Inert when ingested. Used in dentrifices, as a clarifying additive, and as an absorbent for liquids because it can absorb about four times its weight in water. Used as a buffer for acid-proofing food packaging and as an insecticide. Used as an animal feed. The dust can cause lung damage after long exposure to high concentrations. Not recommended for use on teeth or skin because of its abrasiveness. GRAS. NIL

DIAZIDE • Alfa-Tox. Liquid with a faint esterlike odor widely used as an insecticide in animal feed. The FDA permits 1 percent to 2 percent in animal feed. Poison by ingestion, skin contact, and other routes, except for inhalation, during which it is mildly toxic. Human systemic effects by ingestion include changes in movement, muscle weakness, and sweating. Caused birth defects in animals. It is a severe skin and eye irritant in humans and emits toxic fumes when heated.

DIAZINON • A pesticide used in feed-handling establishments for crack and spot treatment in building floors and walls. It is a nonsystemic organophosphate insecticide formerly used to control cockroaches, silverfish, ants, and fleas in residential, nonfood buildings. In 1988, the Environmental Protection Agency prohibited the use of diazinon on golf courses and sod farms because of decimation of bird flocks. Residential uses of diazinon were canceled in 2004, but it is still approved for agricultural uses.

DIAZO • A compound containing two nitrogen atoms such as diazolidinyl urea (see), one of the newer preservatives, or diazepam, a popular muscle relaxant.

DIAZOLIDINYL UREA • Oxymethurea. 1,3-Bis(hydroxymethyl) Urea. Crystals from alcohol, soluble in water. May release formaldehyde (see).

DIBENZOFURAN • Highly toxic chemical compound used in chemical synthesis, synthetic resin, rubber adhesives, and as an insecticide. You can be exposed to dibenzofuran by breathing contaminated air, including tobacco smoke, or by eating or drinking contaminated food or water. In addition to the skin, eye, nose, and throat irritation caused by short-term exposure, long-term exposure can cause rashes and growths to appear on your skin. Your skin may also change color. The EPA (see) has determined there is a likelihood that the substance is a human carcinogen from both oral and inhalation exposure. It is on the EPA's top ten list of toxic chemicals for study. It is number fifteen on the CERCLA Priority List of Hazardous Substances (see).

DIBENZYL ETHER • A synthetic fruit and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. The Flavor and Extract Manufacturers Association evaluated the safety of this additive. High-dose female rats had increased liver weights. A no-effect level was achieved at 196 mg/kg/day. In a 60 kg human (about 132 pounds), this would be equivalent to approximately 11.8 grams a day. ASP

a-DIBROMO-a-CYANOACETAMIDE • DBNPA. An antimicrobial additive used in beets and sugarcane. FDA limits are up to 10 ppm and not less than 2 ppm based on weight of raw sugarcane or raw beets. A quick kill biocide which degrades rapidly to ammonia and bromide ion.

2,2-DIBROMO-3-NITRILOPROPIONAMIDE • Preservative used alone for control of microorganisms in raw sugarcane and beet sugar mills (2–10 ppm). ASP

DI(BUTAN-3-ONE-YL)SULFIDE • Flavoring. See Butanoic Acid and Sulfide. ASP

4,4-DIBUTYL-y-BUTYROLACTONE • A synthetic butter, coconut, and nut flavoring additive for ice cream, ices, candy, and baked goods. ASP

DlBUTYL PHTHALATE • DBP. Used in consumer products including pesticides, cosmetics, building materials, and furnishings that contribute to indoor air pollution. Linked to gene and hormone changes in rodents and genital abnormalities in human infants. This is a high-volume chemical with production exceeding 1 million pounds annually in the United States. Suspected by the EPA and the National Toxicology Program of being toxic to the hormonal, reproductive, developmental, and gastrointestinal systems, as well as to the kidney, liver, and skin. See Phthalates.

Dl BUTYL SEBACATE • Sebacic Acid. A synthetic fruit flavoring usually obtained from castor oil and used for beverages, ice cream, and baked goods. Also used for sealing food packages. Used in fruit-fragrance cosmetics. Mildly toxic by ingestion. Oral doses in rats cause reproductive effects. ASP

Dl BUTYL SULFIDE • See Butyl Sulfide.

DI-n-BUTYL PHTHALATE • An insect repellent. Used for the impregnation of clothing. May cause estrogenlike effects in humans. One of the chemicals being studied by the EPA's expert committee on environmental estrogen disrupters.

DIBUTYLENE TETRAFURFURAL • Derived from bran, rice hulls, or corncobs, it is used in the manufacture of medicinals and as a solvent and flavoring in cosmetics and food. Toxic when absorbed by the skin. Irritating to the eye.

DIBUTYLTIN DILAURATE • DBDL. Used in the manufacture of tin. Can be absorbed by ingestion. The additive may have affects on the liver,

kidneys, and gastrointestinal tract. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Butinorate, Davainex, and Tinostat are trade names.

DICALCIUM PHOSPHATE • A nutrient. See Calcium.

DICAMBA • An herbicide in or on sugarcane molasses.

DICHLORODIFLUOROMETHANE • Colorless, odorless gas used to freeze foods by direct contact and for chilling cocktail glasses. Narcotic in high doses. In the EPA Genetic Toxicology Program (see). ASP

3,4-DICHLORO-2,6-DIMETHYL-4-PYRIDINOL • See Clopidol.

DICHLOROETHANE • Colorless, clear liquid with a pleasant odor and sweet taste. Made from the action of chlorine on ethylene to production of vinyl chloride, trichloroethylene, wetting and penetrating agents, and many other solvents and fumigants. A human poison by ingestion. The JECFA (see) found it causes birth defects and cancer in mice and rats when administered orally. The committee expressed the opinion that 1,2 dichloroethane should not be used in food. Identified as priority hazardous substance by European Union. See Ethylene Dichloride.

DICHLOROHEXYL DISULFIDE • Used in the manufacture of photoresistant film. ASP

DICHLOROMETHANE • DCM. Methylene Chloride. High-volume chemical with production exceeding 1 million pounds annually in the United States. It can be found in some public or private drinking water supplies. The greatest use is as a paint remover, but other uses include as a solvent and cleaning agent in a variety of industries; a fumigant for strawberries and grains; and to extract substances from foodstuffs. In 1974, Congress passed the Safe Drinking Water Act. This law requires the EPA to determine safe levels of chemicals in drinking water that do or may cause health problems. These nonenforceable levels, based solely on possible health risks and exposure, are called maximum contaminant level goals. The MCLG for dichloromethane has been set at zero because EPA believes this level of protection would not cause any of the potential health problems described below. Based on this MCLG, the EPA has set an enforceable standard called a maximum contaminant level (MCL) set as close to the MCLGs as possible, considering the ability of public water systems to detect and remove contaminants. The MCL has been set at 0.5 parts per billion (ppb) because EPA believes, given present technology and resources, this is the lowest level to which water systems can reasonably be required to remove this contaminant. All public water supplies must abide by the National Primary Drinking Water Regulations. EPA has found dichloromethane to potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: damage to the nervous system and to blood. Long-term: When exposed for a lifetime, DCM at levels above the MCL can cause liver damage and cancer. Production of DCM has been decreasing. It is released in wastewater primarily from the following industries: paint and ink, aluminum forming, coal mining, photographic equipment and supplies, pharmaceutical, organic chemical/plastics, metal foundries and laundries. DCM is also formed during the chlorination of water. DCM is not likely to accumulate in aquatic life. The EPA requires your water supplier to collect water samples every three months for one year and analyze them to find out if dichloromethane is present above 0.5 ppb. If it is present above this level, the system must continue to monitor this contaminant. If contaminant levels are found to be consistently above the MCL, your water supplier must take steps to reduce the amount of dichloromethane so that it is consistently below that level. If the levels of dichloromethane exceed the MCL, 0.5 ppb, the system is supposed to notify you via newspapers, radio, TV, and other means. Additional actions, such as providing alternative drinking water supplies, may be required to prevent serious risks to public health. Is also identified as a priority hazardous substance by the European Union. See Methylene Chloride.

DICHLOROPHENOXYACETIC ACID • A widely used herbicide on milled barley, oats, rye, wheat (except their milled flour fractions), and sugarcane. FDA residue limits are up to 5 ppm in sugarcane molasses, 2 ppm in milled fractions (except flour) in barley, oats, and wheat, and 0.1 ppm in potable water. Poison by ingestion and other routes. Moderately toxic by skin contact. A suspected human cancer-causing additive. Human systemic effects by ingestion include sleepiness, convulsions, coma, and nausea or vomiting. Can cause liver and kidney injury. A skin and severe eye irritant. Human mutagenic data. Experimental reproductive effects. When heated to decomposition, it emits toxic fumes.

3-(3,4-DICHLOROPHENYL)-1,1-DIMETHYL UREA • Manner. Telvar Diuron Weed Killer. Vonduron. A widely used herbicide employed on animal feed. FDA limitation of 4 ppm in dried citrus pulp when used for livestock feed. In EPA Genetic Toxicology Program (see). Chlorophenol compounds are on the Community Right-to-Know List (see). Caused tumors and birth defects in laboratory animals.

DICHLOROPROPIONANILIDE • Propanil. Supernox. An herbicide used on animal feed, rice, rice bran, rice hulls, and rice polishings. FDA limitations are 10 ppm in rice bran, rice hulls, and rice polishings when used for animal feed. In the EPA Genetic Toxicology Program (see). Poison by ingestion. Mildly toxic by skin contact.

DICHLOROPROPIONIC ACID • Basinex. Crisapon. Revenge. Unipon. An herbicide used in animal feed, citrus pulp, and potable water. FDA residue allowances are 0.2 ppm in potable water and 20 ppm in citrus pulp used as animal feed. Moderately toxic by ingestion. Corrosive. A skin irritant.

a,a-DICHLOROPRIONIC ACID, SODIUM SALT • See Dichloropropionic Acid.

DICHLORVOS • Dimethyl Dichlorovinyl Phosphate. Apavap. DDVP. Vapona. 2,2-Dichlorovinyl. Atgard. Bay-19149. Canogard. Celcusan. Deriban. Dichlorophos. Dichlorovos Estrosol Bibesol. Cekusan. 2,2-Dichlorovinyl dimethyl phosphate. Fecama. o,o-Dimethyl dichlorovinyl phosphate. UDVF. Vaponite. Vinylophos 62-73-7 Astrobot. Brevinyl E50. Brevinyl Weedat 0002. Cyanophos. Dedevap. 2,2-Dichloroethenyl phosphoric acid dimethyl ester. Dichlorovos. Dichlorphos. Dichlorvos. Dimethyl 2,2-dichlorovinyl phosphate. Divipan. ENT 20738. Equigard. Estrosel. Ethenol, 2,2-dichloro-, dimethyl phosphate. Fly Fighter. Herkal. Krecalvin. Mafu. Mopari UN NA 2783. NCI-C00113. Nogos. Nogos 50. No-Pest Strip. NSC-6738. Nuvan. Nuvan 100 EC. o,o-Dimethyl o-2,2-dichlorovinyl phosphate. Phosphoric acid, 2,2-dichloroethenyl dimethyl ester. Phosvit. SD1750. Szklarniak. TAP 9VP. Task. Tenac. Unifos. Vapona II. Vapona insecticide. Verdican. Vinyl alcohol, 2,2-dichloro-, dimethyl phosphate. Derribante. OKO. Brevinyl. DDVF. Dichlorman. Dimethyl 2,2-dichloroethenyl phosphate. Chlorvinphos. 2,2-Dichloroethenyl phosphate. Dimethyl dichlorovinyl phosphate. Equigel. Fly-Die. Herkol. Marvex. Nerkol. Nogos G. Nuva. OMS 14. Phosphoric acid, 2,2-dichlorovinyl dimethyl ester. Task Tabs. Unifos 50 EC. Verdipor-Dimethylphosphate. An organophosphate insecticide with contact and vapor action. As you can see by the many names, it has been widely used for control of agricultural, industrial, and domestic pests since the 1950s. It is used in pet flea collars and flea sprays and in animal feed. DDVP is available in oil solutions, emulsifiable concentrations, and aerosol formulations. It is also impregnated in polyvinyl-chloride-based pellets, strips, and blocks for delayed release. It is used as a dewormer, administered orally to dogs, cats, and puppies. Its topical (skin) application has been approved for beef and dairy cattle, goats, sheep, swine, and chickens to control fleas, flies, and mites. It is also used in tomato greenhouses and applied to mushrooms, lettuce, and radishes. Aerosols and strips are used domestically for control of ants, bedbugs, ticks, cockroaches, flies, mosquitoes, silverfish, spiders, and wasps. It is also used as a disinfectant in airplanes. DDVP has been found on some fruits, vegetables, and grain, but washing and processing allegedly destroys the dichlorvos. People who live near a hazardous waste site containing dichlorvos could be exposed by breathing contaminated air or touching contaminated soil. If you work near or with the chemical or you have your home sprayed with it, you are likely to be exposed by breathing contaminated air or touching surfaces where dichlorvos was applied. Ingesting large doses may cause nausea and vomiting, restlessness, sweating, and muscle tremors, while very large doses may cause coma, inability to breathe, and death. Animal studies have also shown effects on the nervous system when animals drank water or ate food containing dichlorvos.

It is not known at this writing whether dichlorvos can affect reproduction or cause birth defects in people. Animal studies have not reported effects

on reproduction or birth defects when animals were exposed to dichlorvos. It is not known whether dichlorvos causes cancer in people. A study in rats and mice reported that rats had an increase in cancer of the pancreas and in leukemia, and female mice had an increase in stomach cancer after they were fed dichlorvos for two years. The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that dichlorvos is a probable cancer-causing agent in humans. The EPA in 1994 revoked this chemical's use in food packaging because it poses "more than a negligible risk." Check to see whether you have any DDVP around your home, yard, or office and get rid of it. Do not purchase products containing it. See Organophosphates.

DICYCLOHEXYL DISULFIDE • See Sulfides. ASP

DIELDRIN • Pesticide. It is number sixteen on the CERCLA Priority List of Hazardous Substances (see).

1,2(DI [1'-ETHOXY] ETHOXY) PROPANE • A gas. See Propane.

DI-(2-ETHYLHEXYL)ADIPATE • Light-colored, oily liquid used as a plasticizer, usually in processing polyvinyl and other polymers.

DI-(2-ETHYLHEXYL)PHTHALATE • A light-colored, odorless liquid used as a plasticizer for many resins. Identified as priority hazardous substance by the EU.

DI-(2-ETHYLHEXYL)SODIUM SULFOSUCCINATE • White, waxy solid widely used as an emulsifier and as a processing aid. Used in beverage mixes, cocoa, eggs, fruit juice drinks, gelatin desserts, hog carcasses, milk, molasses, and poultry. FDA limits from 9 ppm in finished foods to 25 ppm in molasses.

DIESTER • A compound containing two ester groupings. An ester is formed from an alcohol and an acid by eliminating water and is usually employed in fragrant liquids for artificial fruit perfumes and flavors.

DIETARY FOOD SUPPLEMENT • Any food product to which enough vitamins and minerals have been added to furnish more than 50 percent of the recommended daily allowance in a single serving, according to the FDA. Such foods must, of course, have ingredients identified on the label.

DIETHANOLAMIDE CONDENSATE FROM SOYBEAN FATTY ACIDS • Used as a surfactant (see). With pesticides. NUL

DIETHANOLAMINE (DEA) • Colorless liquid or crystalline fatty acid from soybeans or coconut oils. It is used as a solvent, emulsifying additive, and detergent.

Also employed in emollients for its softening properties and as a dispersing additive and humectant in other cosmetic products. Used to dilute pesticides. It may be irritating to the skin and mucous membranes. The FDA became aware of a National Toxicology Program (NTP) study showing an association between the topical application of diethanolamine and certain DEA-related ingredients and cancer in laboratory animals. For the DEA-related ingredients, the NTP study suggests that the cancer response is linked to possible residual levels of DEA. Although DEA itself may be used in few products, DEA-related ingredients such as oleamide DEA, lauramide DEA, and cocamide DEA are widely used as emulsifiers or foaming additives, generally at levels of 1 to 5 percent. The FDA is studying the problem and is going to consider legal options at this writing. See Ethanolamines.

DIETHYL ACETALDEHYDE • Ethyl Butyraldehyde. A flavoring additive used in many foods. Moderately toxic by ingestion. A skin irritant.

DIETHYL ACETIC ACID • Colorless, volatile liquid with a rancid odor used as a flavoring in a variety of foods. Moderately toxic by ingestion and skin contact.

DIETHYL ASPARTATE • The diester of ethyl alcohol and aspartic acid (see both).

DIETHYL DICARBONATE • Viscous liquid with a fruity odor used as a fermentation inhibitor and fungicide. Prohibited in the United States but permitted in wine in other countries. Poison by ingestion.

DIETHYL GLUTAMATE • See Glutamate.

DIETHYL MALATE • Malic Acid. A synthetic apple and rum flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin, and puddings. ASP

DIETHYL MALONATE • A synthetic berry, fruit, apple, grape, peach, and pear flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

DIETHYL METHYLPYRAZINE, 2,3 and 3,5 • Flavorings that taste like potatoes. The 2,3-diethyl-5-methylpyrazine is ASP. The others are EAF.

DIETHYL PALMITOYL ASPARTATE • See Aspartic Acid.

DIETHYL-o-PHTHALATE • Clear, colorless liquid used as a plasticizer in packaging material. Moderately toxic by ingestion. Has caused adverse effects in experimental animals.

DIETHYL PYROCARBONATE • DEP. A fermentation inhibitor in still wines, beer, and orange juice added before or during bottling at a level not to exceed 200 to 500 parts per million. DEP was widely used because it supposedly did its job of preserving and then decomposed within twenty-four hours. However, instead of disappearing, it reacted with the ammonia in beverages to form urethane, according to University of Stockholm researchers. They said that DEP caused urethane concentration of 0.1 to 0.2 milligrams per liter in orange juice and approximately 1 milligram per liter in white wine and beer. Since 1943 urethane has been identified as a cancer-causing additive. The FDA had not required listing of DEP on the label and therefore did not know how many beverages were actually treated with this additive. The FDA banned the use of DEP in 1976. BAN

DIETHYL SEBACATE • Sebacic Acid. A synthetic butter, coconut, apple, melon, peach, and nut flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Mildly toxic by ingestion. A skin irritant. ASP

DIETHYL SUCCINATE • A synthetic raspberry, butter, orange, and grape flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

DIETHYL SULFIDE • Synthetic flavoring with a garliclike odor. EAF

DIETHYL TARTRATE • See Tartaric Acid. ASP

DIETHYL TRISULFIDE • A flavoring determined GRAS by the Expert Panel of the

Flavor and Extract Manufacturers Association. EAF

DIETHYL-1,2,4-TRITHIOLANE • EAF

3,5-DIETHYL 1,2,4-TRITHIOLANE, cis and trans • A constituent of processed meat. Used for augmenting or enhancing the flavor or aroma of a foodstuff.

Determined GRAS by FEMA (see). EAF

0,0-DIETHYL S-2 (ETHYTHIO)ETHYL PHOSPHORODITHIOATE(DISYS-TON) • A pesticide applied to crops. FDA tolerance is 5 ppm alone or with deme-ton-S (see) in dehydrated sugar beet pulp or pineapple bran for livestock feed.

DIETHYLAMINOETHANOL • A water-absorbing liquid with the properties of ammonia and alcohol. Toxic by ingestion. Used to obtain fatty acid derivatives, as an emulsifier, and as a curing additive for resin. ASP

DIETHYLAMIDE CONDENSATE FROM STRIPPED COCONUT OIL FATTY ACIDS • See Coconut Oil and Fatty Acids. NUL

DIETHYLENE GLYCOL DISTEARATE • White, waxlike solid with a faint fatty odor. Used as an emulsifying additive for oils, solvents, and waxes, a lubricating additive for paper and cardboard, and as a thickening agent.

DIETHYLENETRIAMINE • Yellow liquid with an ammonia odor, strongly alkaline. Used as a solvent. NUL

DIETHYLHEXYL ADIPATE • DEHA. Has received a lot of media attention in recent years. DEHA is a plasticizer, a substance added to some plastics to make them flexible. DEHA exposure may occur when eating certain foods wrapped in plastics, especially fatty foods such as meat and cheese. But the levels are very low. The levels of the plasticizer that might be consumed as a result of plastic film use are well below the levels showing no toxic effect in animal studies, according to the FDA.

DIETHYLHEXYL PHTHALATE • DEHP. Polyvinylchloride used in building products, food packaging, toys, medical tubing. Linked to birth defects in mice; preterm birth in human infants; early puberty in girls. See Phthalates.

DIETHYLPYRAZINE • Derived from ethyl bromide or chloride, it is used as a corrosion inhibitor and insecticide.

DIETHYLSTILBESTEROL • DES. Stilbestrol. A synthetic estrogen fed to cattle and poultry to fatten them. A proven carcinogen, hormonal in nature, according to the FDA, which has given top priority to the study of the safety of DES. The FDA stipulates a zero tolerance for the compound after a proper withdrawal period. In 1971, three Harvard scientists linked DES to a rare form of vaginal cancer in the daughters of women who had taken DES during pregnancy. An estimated 100,000 to 150,000 head of cattle containing residues of the hormone have apparently gone to market. The EU has forbidden the use of DES in cattle.

2,5-DIETHYLTETRAHYDROFURAN • A solvent used in processing resins. See Furans. ASP

DIFENZOQUAT • Used as a postemergence herbicide to control wild oats in alfalfa (seed crop in CA only), wheat, and barley. No tolerances for feed items treated with difenzoquat will be issued until data gaps for animal metabolism and magnitude of residue have been fulfilled.

DIFLUBENZURON • An insecticide used on soybean crops. It is limited by the FDA to 0.5 ppm as a residue on soybean hulls for use in animal feeds.

DIFURFURYL ETHER • Used in the manufacture of food additives. ASP

DIFURFURYLFURAN • Flavoring. The JECFA (see) took note of the extensive positive damage to genes (see Genotoxicity) data for several members of this group of flavoring agents related to furan, which is carcinogenic. There is a paucity of in vivo genotoxicity data to allay concern. Also, specific in vivo assays to address potential carcinogenicity are lacking. Because of these concerns, the committee concluded that the Procedure for the Safety Evaluation of Flavoring Agents could not be applied to this group. See Furans. EAF

DIGLYCERIDES • Emulsifiers. See Glycerides.

DIHYDRO-ALPHA-IONONE • Flavoring. The JECFA has no safety concern at current levels of intake when used as a flavoring. ASP

DIHYDROANETHOLE • See p-Propyl Anisole.

DIHYDROCARVEOL • A synthetic flavoring additive occurring naturally in black pepper. Colorless oily liquid with a spearmint odor, it is used in liquor, mint, spice, and caraway flavorings for beverages, ice cream, ices, candy, baked goods, and alcoholic beverages. A moderate skin and eye irritant. ASP

DIHYDROCARVONE • Colorless liquid with a spearmintlike odor used as a flavoring additive in various foods. Moderately toxic when injected under the skin. NIL

DIHYDROCARVYL ACETATE • Occurs in celery and mint and is used as a flavoring. See Dihydrocarvone. ASP

DIHYDROCHALCONES • DHC. A new class of intensely sweet compounds—about fifteen hundred times sweeter than sugar—obtained by a simple chemical modification of naturally occurring bioflavonoids (see). Hydrogenation (see) of naringin and neohesperidin (the predominant bitter constituents in grapefruit and Seville orange rind) provides the intensely sweet dihydrochalcones. DHCs are seemingly safe. There have not been any reports, thus far, of side effects in either multigenerational feeding studies or in long-term feeding trials. The disadvantage is that they cannot be easily reproduced in the laboratory, so supplies are dependent upon natural sources. A more serious problem is that the intense, pleasant sweetness of DHCs is slow in onset, with considerable lingering taste, which renders them unsuitable for many food uses. Approval to use DHCs in toothpaste and chewing gum is pending. Food scientists are now trying to find derivatives and analogs of DHCs to overcome the slow onset and lingering factor in the natural compounds.

DIHYDROCHOLESTEROL • See Cholesterol.

DIHYDROCHOLESTERYL OCTYLDECANOATE • See Cholesterol and Octadecanoic Acid.

DIHYDROCOUMARIN • A synthetic flavoring additive occurring naturally in tonka bean, oil of lavender, and sweet clovers. Used in butter, caramel, coconut, floral, fruit, cherry, liquor, rum, nut, root beer, spice, cinnamon, vanilla, cream soda, and tonka bean flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and puddings. Prolonged feeding has revealed a possible trend toward liver injury. ASP

6,7-DIHYDRO-2,3-DIMETHYL-5H-CYCLOPENTAPYRAZINE • Flavoring additive declared GRAS by FEMA (see). EAF

4,5-DIHYDRO-2,5-DIMETHYL-4-OXO-3-FURANYL BUTYRATE • Flavoring declared GRAS by FEMA (see). See also Butanoic Acid. EAF

DIHYDRO-ALPHA-IONONE and DIHYDRO-BETA-IONONE • Flavorings. See Ionone. ASP

DIHYDRO-BETA-IONOL • Synthetic flavoring. See Ionone. ASP

3,6-DIHYDRO-4-METHYL-2(2-METHYLPROPEN-1-YL)-2H-PYRAN • Flavoring. EAF

5,7-DIHYDRO-2-METHYLTHIENO(3,4-D)PYRIMIDINE • Flavoring. ASP

DIHYDRONOOTKATONE • Synthetic, fruity, citruslike aroma of grapefruit used in flavors and fragrances. A derivative is used to repel termites. EAF

4,5-DIHYDRO-3(2H)THIOPHENONE • Synthetic flavoring. ASP

DIHYDRO-2,4,6-TRIMETHYL-4H-1,3,5-DITHIAZINE • Synthetic flavoring. EAF

DIHYDRO-2,4,6-TRIS(2-METHYLPROPYL)-4H-1,3,5-DITHIAZINE • Synthetic flavoring. EAF

DIHYDROFARNESOL • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association.

DIHYDROMINTLACTONE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. EAF

5,6-DIHYDROL-2-(2,6-XYLID│NO)-4H1, 3-THIAZINE • Bay. Xylazine. An animal drug used in meat. Poison by ingestion.

5,7-DIHYDRO-2-METHYLTHIENO(3,4-D)PYRIMIDINE • Derived from organic matter used in the manufacture of food additives.

2,3-DIHYDRO-3-OXO-BENZISOSULFONAZOLE • See Saccharin.

1,2-DIHYDROPYRIDAZINE-3,6-DIONE • A pesticide used on potato chips. FDA residue tolerance is 160 ppm. Moderately toxic by ingestion. Can

cause chronic liver damage and acute central nervous system effects. Being studied as a possible cancer-causing additive.

DIHYDROSAFAROL • Synthetic flavoring. Not legal in food.

DIHYDROSTREPTOMYCIN • An antibiotic used in beef and milk. FDA tolerance is zero in uncooked edible tissues of calves and in milk. May cause birth defects in humans. May be a mutagen.

DIHYDROXYACETONE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. See Acetone.

DIHYDROXYACETOPHENONE • Light tan crystals that absorb ultraviolet light. It is used in plastics, dyes, fungicides, and plant-growth promoters. NIL

2,4-DIHYDROXYBENZOIC ACID • Intermediate in food processing derived from many plants including chamomile and buckwheat. See Benzoic Acid. EAF

2,5-DIHYDROXY-1,4-DITHIANE • A flavoring imported mostly from Asia. Has not been assigned for toxicology as yet.

DIIODOSALYCYLIC ACID • A dietary supplement for animals. See Salicylic Acid. GRAS

DIISOBUTYL DIPATE • Diba. Isobutyl Adipate. A plasticizer used in packaging materials. Mildly toxic by ingestion.

DIISOBUTYL KETONE • Colorless liquid with mild odor used as a solvent and in coating compositions. ASP

DIISOPENTYL THIOMALATE • Flavoring. The JECFA has no safety concerns. EAF

DIISOPROPANOLAMINE • Dipa. White crystalline solid that is used as an emulsifying additive for polishes, textile specialties, leather compounds, insecticides, cutting oils, and water paints. See Propyl Alcohol.

DIISOPROPYL DISULFIDE • Flavoring. The JECFA (see) says it has no safety concerns. EAF

DIISOPROPYL TRISULFIDE • Flavoring used in baked goods, beverages, condiments, frozen dairy, fruit ices, gelatins, hard candy, and gum. FEMA (see) says it is GRAS. EAF

2,3-DIKETOBUTANE • See Diacetyl.

DILAURYL CITRATE • See Lauryl Alcohol and Citric Acid.

DILAURYL THIODIPROPIONATE • An antioxidant. White crystalline flakes with a sweet odor, in general food use to extend shelf life. In fat or oil up to 0.02 percent. The final report to the FDA of the Select Committee on GRAS. NIL

DILINOLEATE • Dimer Acid. Widely used as an emulsifier, it is derived from linoleic acid (see).

DILINOLEIC ACID • See Linoleic Acid.

DILL • Anethum graveolens. A natural flavoring additive from a European herb bearing a seedlike fruit. Used in sausage and spice flavorings for baked goods (4,800 ppm), meats, and pickles (8,200 ppm). Also used in medicine. Can cause sensitivity to light. GRAS ASP

DILL OIL • The volatile oil obtained from the crushed, dried seeds or fruits of the herb. Slightly yellow, with a caraway odor and flavor. Used in strawberry, fruit, sausage, and dill flavorings for beverages, ice cream, ices, baked goods, gelatin desserts, chewing gum, meat, liquors, pickles, and condiments. GRAS. See Dill. ASP.

DILLSEED • Indian Dill. The volatile oil from a variety of dill herbs. Obtained by steam distillation. Light yellow, with a harsh carawaylike odor. Used in rye flavorings for baked goods, condiments, and meats. GRAS. ASP

DILUENT • Any component of a color additive mixture that is not of itself a color additive and has been intentionally mixed in to facilitate the uses of the mixture in coloring cosmetics or in coloring the human body, food, and drugs. The diluent may service another functional purpose in cosmetics, as, for example, emulsifying or stabilizing. Ethylcellulose is an example.

DIMETHICONE • See Dimethyl Polysiloxane.

DIMETHIPIN • A growth regulator in animals. The FDA permits residues of 0.02 ppm as residues in meat, meat by-products, and fat of cattle, goats, hogs, and sheep. The tolerance for residue in and on cottonseed hulls used in animal feed is 0.7 ppm.

DIMETHOATE • A pesticide permitted at 5 ppm in dried citrus pulp for cattle feed. The tolerance for meat, fat, and meat by-products of cattle as a residue is 0.01 ppm and 0.001 ppm in milk.

3,4-DIMETHOXY-1-VINYLBENZENE • See Benzene and Vinyl.

1,2-DIMETHYOXYBENEZENE • Veratrole. A chemical compound derived from pyrocatechol (see) and benzene (see). EAF

m-DIMETHOXYBENZENE • A synthetic fruit, nut, and vanilla flavoring for beverages, ice cream, ices, candy, and baked goods. Used on the skin as a bactericidal and fungicidal ointment. p-DIMETHOXYBENZENE • A synthetic raspberry, fruit, nut, hazelnut, root beer, and vanilla flavoring additive for beverages, ice cream, ices, candy, and baked goods. See above for toxicity. ASP

3,4-DIMETHOXYBENZENECARBONAL • See Veratraldehyde.

N1-(2,4-DIMETHOXYBENZYL)-N2-(2-(PYRIDIN-2-YL)ETHYL)OXALAMIDE

• Flavoring with a meatlike taste. EAF

1,1-DIMETHOXYETHANE • See Ethylene Glycol.

2,6-DIMETHOXYPHENOL • See Phenol. ASP

1-([2,5-DIMETHOXYPHENYL] AZO)-2-NAPHTHOL • A coloring used on oranges with an FDA limit of 2 ppm by weight calculated on the basis of the whole fruit. Causes cancer in animals and is under International Agency for Cancer Research review.

S-(DIMETHOXYPHOSPHINYLOXY)n-METHYL-cis-CROTONAMIDE • Apadrin. Bilobran. A reddish brown solid with a mild odor widely used as an insecticide in tomato products. FDA tolerance is 2 ppm in concentrated tomato products. In the EPA Genetic Toxicology Program (see). The EPA considers it extremely hazardous. It is poisonous by ingestion, inhalation, and skin contact.

1,4-DIMETHYL-4-ACETYL-1-CYCLOHEXENE • Prepared from acetyl-aldehyde and methanol (see both), it is used in processing food additives. ASP

DIMETHYLAMINE • Gas with an ammonia odor. Derived from ammonia and methanol. Used as a solvent for the manufacture of some food additives and as a dehairing additive. Irritating. ASP

DIMETHYLAMINE-EPICHLOROHYDRIN COPOLYMER • Decolorizing agent in clarification of sugar liquors and juices. See Epichlorohydrin. EAF

DIMETHYLAMINE-EPICHLOROHYDRIN RESIN • Fixing agent for the immobilization of glucose isomerase for use in manufacturing high fructose corn syrup (see).

2,4-DIMETHYLANISOLE • Flavoring. The JECFA has cited as an additive to be reevaluated. See Anisole. EAF

2,2-DIMETHYL-1-1,3-BENZODIOXOL-4-OL METHLCARBAMATE • Pesticide for treating crack/crevices in feed manufacturing or other related

2,2-DIMETHYL-1,3-BENZODIOXOL-4-OL METHYLCARBAMATE • Pesticide for treating cloth/devices in feed manufacturing or other related facilities. p-a-DIMETHYLBENZYL ALCOHOL • Flavoring. Had cancer causing agent in male rats. Caused kidney tumors but the National Toxicology Program researchers did not think the results would apply to humans. See Benzyl Alcohol. NIL

DIMETHYL BENZYL CARBINOL and CARBINYL • Flavoring additives used in various foods. Moderately toxic by ingestion. See a,a-Dimethylphenethyl Alcohol. a-a-DIMETHYLBENZYL ISOBUTYRATE • Flavoring. See Benzyl Alcohol. ASP

3,4- and 3,5- DIMETHYL-1,2-CYCLOPENTADIONE • Sweet, maplelike flavorings. ASP

2,2-DIMETHYLCYCLOPROPYL-3-METHYL-2-PENTENAL • Flavoring. EAF

DIMETHYL DIALKYL AMMONIUM CHLORIDE • Used as a decoloring additive in the manufacture of sugar. See Quaternary Ammonium Compounds. ASP

DIMETHYL-0-(1,2-DIBROMO-2,2-DICHLOROETHYL)PHOSPHATE • Widely used insecticide on various foods. Poison by ingestion and inhalation. Moderately toxic by skin injection. See Organophosphates.

DIMETHYL DICARBONATE • A fungicide used in wine to inhibit yeast growth. The FDA set the tolerance of residues at 200 ppm. In ready-to-drink teas, the tolerance is 250 ppm. In beverages containing juice, fruit flavor, or both, with juice content not to exceed 50 percent, in an amount not to exceed 250 ppm. ASP. E

DIMETHYL DICHLOROVINYL PHOSPHATE • See Dichlorvos.

DIMETHYL-1,3-DIOXOLANE • Flavoring. EAF

DIMETHYL ETHER RESORCINOL • A benzene derivative originally obtained from certain resins but now usually synthesized. See m-Dimethoxybenzene.

DIMETHYL ETHERPROTOCATECHUALDEHYDE • See Veratraldehyde.

2,5-DIMETHYL-3-FURANTHIOL ACETATE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. See Furans. ASP

2,6-DIMETHYL-5-HEPTENAL • A synthetic fruit flavoring for ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

2,6-DIMETHYL-4-HEPTANOL • Flavoring. The JECFA says it has no safety concern at current levels of intake when used as a flavoring used in lean meat, beans, nuts, whole-grain cereals, fish, coffee, milk, beer, peanuts, popcorn, pork liver, shrimp, tomato, potato, grapes, and apples; secondary components do not raise a safety concern. See Heptanoic Acid. ASP

4,5-DIMETHYL-2-ISOBUTYL-3-THIAZOLINE • Flavoring that contains sulfur. Is used in lean meat, beans, nuts, whole-grain cereals, fish, coffee, milk, beer, peanuts, popcorn, pork liver, shrimp, tomato, potato, grapes, and apples. Latest JECFA evaluation in 2002 concluded there was no safety concern at current levels of intake when used as a flavoring agent. ASP

2,6,DIMETHYL-3-([2-METHYL-3-FURYL]THIO)-4-HEPTANONE • Flavoring. See Furans and Heptanoic Acid. ASP

3,7-DIMETHYL-7-HYDROXYOCTANAL • See Hydroxycitronellal.

DIMETHYL KETONE • See Diacetyl.

0,0-DIMETHYL METHYLCARBAMOYLMETHYL PHOSPHORODITHIOATE • A widely used insecticide in animal feed and citrus pulp. FDA limits are 5 ppm in dried citrus pulp when used for animal feed. Poison by ingestion, skin contact, and other routes. May cause cancer and birth defects.

N',N'-DIMETHYL-N-([METHYL CARBAMOYL] OXY)-1-METHYLTHIOOXA-MIMIDIC ACID • Widely used insecticide in animal feed, pineapple bran, and pineapples. Limitations of 6 ppm in pineapple bran when used for animal feed. Poison by ingestion and inhalation. Moderately toxic by skin contact. On the EPA Extremely Hazardous Substances List.

4,8-DIMETHYL-3,7-NONADIEN-2-ONE • Synthetic flavoring. See Nonanoic Acid. EAF

3,7-DIMETHYL-2,6-OCTADIENAL • Pale yellow liquid with a strong lemon odor used as a flavoring additive in baked goods, candy, and ice cream. Mildly toxic by ingestion. A human skin irritant. See Citral.

3,7-DIMETHYL-(E)-2,6-OCTADIEN-1-OL • See Geraniol.

3,7-DIMETHYL-1-OCTANOL • A synthetic flavoring, colorless, with a sweet roselike odor. Used in floral, rose, and fruit flavorings for beverages, ice cream, ices, candy, and baked goods. E.

2,6-DIMETHYL-1-OCTEN-8-OL • See Rhodinol.

2,4-DIMETHYL-2-PENTENOIC ACID • Flavoring. See Valeric Acid. ASP

DIMETHYL PHOSPHATE OF 3-HYDROXY-N-METHYL-CISCROTON-AMIDE • A pesticide. FDA tolerance is 2 ppm in concentrated tomato products when present as a result of application of the insecticide to growing tomatoes.

DIMETHYL PHTHALATE • See Phthalates.

DIMETHYL POLYSILOXANE • Dimethicone. Antifoam A. An antifoaming additive for use in processing foods in “amounts reasonably required to inhibit foaming.” Used as a chewing-gum base, in molasses, soft drinks, sugar distillation, skim milk, wine fermentation, syrups, soups, rendered fats, and curing solutions. Not to exceed 10 ppm in nonalcoholic beverages. Zero tolerance in milk; 250 ppm in salt for cooking and in other foods, 10 ppm in foods ready for consumption. Used to combat flatulence. Very low toxicity. ASP. E

2,5-DIMETHYL PYRROLE • Was used as a flavoring additive in various foods. Although allowed as a food additive, there is no current reported use of the chemical, and, therefore, although toxicology information may be available, it is not being updated, according to the FDA. GRAS. NIL

DIMETHYL RESORCINOL • See m-Dimethoxybenzene.

DIMETHYL SUCCINATE • Succinic Acid. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

DIMETHYL SULFIDE • See Methyl Sulfide.

2,4-DIMETHYLACETOPHENONE • Colorless liquid with the odor of mimosa, it is used as a synthetic grape, vanilla, and cream soda flavoring additive for beverages, ice cream, ices, candy, baked goods, and liquor. It is also used in perfumery.

2,4-DIMETHYLBENZALDEHYDE • IPCS INCHEM (see) says more information needed for this flavoring. See Benzyl Acetate. ASP

2,3-DIMETHYLBENZOFURAN • See Furfural and Benzene.

DIMETHYLBENZYL ALCOHOL • A constituent of the essential oil from Curcuma longa and related plants. It smells like menthol. It is used as a flavoring and scent. a,a-DIMETHYLBENZYL ISOBUTYRATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods.

0,0-DIMETHYL(0-3METHYL-4-METHYLTHIO-M-TOLYL)PHOSPHORO-THIONATE • A pesticide. FDA tolerance for residue in meat of cattle is 0.05

ppm.

DIMETHYL-3-METHYL-4-NITROPHENYLPHOSPHOROTHIONATE • Acco-thion. A widely used insecticide on wheat gluten. FDA tolerance for residue is 30 ppm in wheat gluten. In the EPA Genetic Toxicology Program and on the EPA Extremely Hazardous List (see both). Poisonous by ingestion, inhalation, and other routes. Moderately toxic by skin contact. Human systemic effects upon ingestion include overactivity, diarrhea, nausea or vomiting, and shortness of breath.

4,5-DIMETHYLTHIAZOLE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. See Thiazole. ASP a,a-DIMETHYLPHENETHYL ACETATE • Acetic Acid. A colorless liquid with a floral-fruity odor. A synthetic cherry and honey flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum.

0,0-DIMETHYL-0-(3,5,6-TRICHLORO-2-PYRIDYL)PHOSPHOROTHIOATE

• See Chlorpyrifos.

1,1-DIMETHYL-3-(a,a,a-TRIFLUORO-m-TOLYL)UREA • Cottonex. Herbicide used in animal feed. FDA limit of 0.2 ppm in sugarcane when used for animal feed.

In EPA Genetic Toxicology Program (see) and under review by the IARC (see).

Moderately toxic by ingestion. May be mutagenic.

DIMETHYLGLYOXAL • See Diacetyl.

DIMETHYLKETOL • See Acetoin.

DIMETHYLOCTADECYLBENZYLAMMONIUM CHLORIDE • Alkaquat. Quarternol 1. Varisoft SDC. An antimicrobial additive used in beets, sugarcane, and raw sugarcane juice. FDA residue limits are based on weight of raw sugarcane or raw beets. Moderately toxic by ingestion. A human skin irritant and severe eye irritant.

DIMETHYLOCTANOL • Pelargol. Colorless liquid with a sweet rose odor used as a flavoring additive in bakery products, beverages, chewing gum, confections, ice cream, and pickles. Moderately toxic by skin contact.

a,a-DIMETHYLPHENETHYL ALCOHOL • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, chewing gum, jellies, gelatin desserts, and baked goods.

a,a-DIMETHYLPHENETHYL BUTYRATE • Butyric Acid. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. a,a-DIMETHYLPHENETHYL FORMATE • Formic Acid. A synthetic spice flavoring additive for beverages, ice cream, ices, and candy.

DIMETHYLPYRAZINE • Flavoring additive with a nutty or potatolike taste and coffee odor used in various foods. Moderately toxic by ingestion and is an experimental mutagen. See Piperazine. GRAS. ASP

DIMETRIDAZOLE • A feed additive. Not legal for animal use.

DIMETHYL TRISULFIDE • Isolated from soybeans, it has a strong beany odor used in flavorings. See Triethyl Trisulfide.

DIMETHYL TRITHIOLANE • Fruit flavoring. ASP

4,5-DIMETHYL-2-ETHYL-3-THIAZOLINE • Flavoring.

2,5-DIMETHYL-3-FURANTHIOL • Flavoring. See Furans.

2,6-DIMETHYL-6-HEPTEN-1-OL • Flavoring. See Heptanal.

4,5-DIMETHYL-3-HYDROXY-2,5-DIHYDROFURAN-2-ONE • Flavoring.

2,5-DIMETHYL-3-MERCAPTOTETRAHYDROFURAN • Flavoring. See Furans.

2,5-DIMETHYL-4-METHOXY-3(2H)-FURANONE • Flavoring. See Furans.

2,6-DIMETHYL-10-METHYLENE-2,6,11-DODECATRIENAL • Flavoring.

2,2-DIMETHYL-5-(1-METHYLPROPEN-1-YL) TETRAHYDROFURAN • Flavoring. See Furans. NIL

4,8-DIMETHYL-3,7-NONADIEN-2-ONE CIS and TRANS • New flavorings used in baked goods, beverages, chewing gum, confectionery frostings, egg products, fish products, frozen dairy, fruit ices, gelatins, gravies, hard candies, instant coffee, meat products, nut products, seasonings, soft candy, and soups. See Nonyl Alcohol. EAF

2,3,7-DIMETHYLOCTA-2,6-DIENYL 2-ETHYLBUTANOATE • Flavoring.

2,6-DIMETHYLOCTANAL • Flavoring.

3,7-DIMETHYL-1,5,7-OCTATRIEN-3-OL • Flavoring. See Octanal.

3,7-DIMETHYL-6-OCTENOIC ACID • Flavoring. See Octanoic Acid.

2,3-2,6 DIMETHYLPYRAZINE • See Piperidine. ASP a-DIMETHYLSTYRENE • See Styrene. ASP

2,5-DIMETHYLTETRAHYDROFURAN-3-THIOL • Synthetic flavoring used in baked goods, beverages, chewing gum, condiments, relishes, frozen dairy, fruit ices, gelatins, nut products, snack foods, soft candy, and soups. Declared GRAS by FEMA (see).

2,5-DIMETHYL-3-THIOISOVALERYLFURAN • See Furfuryl Alcohol. ASP

3,5-DIMETHYL-1,2,4-TRITHIOLANE • Flavoring. ASP

2,6-DIMETHYLTHIOPHENOL • See Phenol. EAF

3,5-DINITROBENZAMIDE • A feed additive that the FDA says is supposed to be zero in edible tissues and by-products of chickens.

DI-N-ALKYL (C8-C18 FROM COCONUT OIL) DIMETHYL AMMONIUM-CHLORIDE • Sanitizing solutions for use as components of pesticide and for use on food contact surfaces. FDA tolerance is 5 percent by weight.

2,6-DINITRO-N,N-DIPROPYL-4(TRIFLUOROMETHYL)BENZENEAMINE • Agreflan. Crisalin. Widely used herbicide on barley, carrots, peppermint oil, soybeans, spearmint oil, and wheat. Residue tolerance set by FDA is 2 ppm in peppermint oil and spearmint oil. EPA Genetic Toxicology Program. Community Right-to-Know List (see both). Moderately toxic by ingestion. Caused cancer, tumors, and birth defects in experimental animals.

2,7-DINITROSOS-1-NAPHTHOL • Used in the manufacture of dyes. See Coal Tar.

DINKUM OIL • See Eucalyptus Oil.

2,4-DINTRO-6-OCTYLPHENYL CROTONATE +2,6-DINTRO-40CTYL-PHENYL CROTONATE • Fungicide on dried apple pomace as a result of application to growing apples as residue. FDA allows residue tolerance of 0.3 ppm. Derived from crotonic acid, which is obtained from crotonaldehyde, which is used in chemical warfare.

DIOCTYL • Containing two octyl groups. Octyl is obtained from octane, a liquid paraffin found in petroleum.

DIOCTYL ADIPATE • See Adipic Acid.

DIOCTYL DILINOLEATE • See Linoleic Acid.

DIOCTYL MALÉATE • See Malic Acid.

DIOCTYL SODIUM SULFOSUCCINATE • Docusate Sodium. A waxlike solid used as a dispersing and solubilizing additive in foods and beverages. It is used for gums, cocoa, and various hard-to-wet materials. Also a wetting additive in the cleaning of fruits, vegetables, and leafy plant material. Used in nonalcoholic beverages and sherbets at a rate not to exceed 0.5 percent of the weight of such ingredients. Finished cocoa beverages can have 75 ppm in the finished products. Eye irritation may result from use in eye preparations. ASP

DIOXANE • 1,4-Dioxane. A colorless liquid used as a solvent for cellulose esters, major component of plant cell walls and used as a solvent for fats, greases, and resins and in various products including paints, lacquers, glues, cosmetics, and fumigants. In animals it affected the liver. Dioxane is primarily used in solvents but is also found in fumigants. Additionally, the chemical is also used as a foaming agent. It is a suspected toxicant. Also an eye and respiratory tract irritant. It is suspected of causing damage to the central nervous system, liver, and kidneys. Accidental exposure to it has resulted in several deaths. Dioxane is classified by the IARC (see) as possibly carcinogenic to humans due to the fact that it is a known carcinogen in animals. It also forms contamination plumes in groundwater when released to the environment. Groundwater supplies have been adversely impacted in several areas. It should not be confused with dioxin (see) but neither should it be in so many flavorings.

DIOXATHION • A widely used pesticide in animal feed and dehydrated citrus pulp. Poisonous by ingestion. See Organophosphates.

DIOXIN • The commonly used name for TCDD. 2,3,7,8-tetrachlorodibenzo-p-dioxin. It is a halogenated aromatic hydrocarbon, and it causes mutagenic and carcinogenic changes in animals. It is a by-product of additive orange (2,4-D and 2,4,5-T). It is the most toxic of chlorine-containing dioxin compounds. The long-term human consequences of exposure to this compound are controversial, but it certainly would be wise to avoid exposure to it. It is a suspected cancer-causing additive. Research at the University of Maryland has shown that children exposed to dioxins and PCBs (see) prenatally or during infancy can suffer behavioral, memory, and learning problems. The Maryland investigators suggest that the underlying mechanism may be thyroid hormone disruption. Even moderate impairment of thyroid hormone function has been associated with various problems in behavior and intellectual development, and certain thyroid diseases are associated with attention deficit hyperactivity disorder and language disorders. Studies of adults exposed to dioxin and PCBs show no marked neurological effects. The Maryland research was funded by the university and by the American Thyroid Association. Being removed by NTP (see) as a human carcinogen. The EPA has it on its top ten toxic chemicals list to be studied.

DIOXYMETHYLENE PROTOCATECHUICALDEHYDE • See Piperonal.

DIPA • The abbreviation for diisopropanolamine (see).

DIPENTENE • See Limonene.

DIPHENYL ETHER • Colorless crystals with the odor of geranium. Used in perfumery. Toxic by inhalation. Also as an intermediate in processing. ASP

DIPHENYLKETONE • See Benzophenone.

1,3-DIPHENYL-2-PROPANONE • A synthetic fruit, honey, and nut flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

DIPHENYLAMINE • Big Dipper. An insecticide used on various products. Poison by ingestion. Has caused birth defects in experimental animals.

DIPHOSPHATES • See Phosphate. E

DIPOTASSIUM EDTA • See Ethylenediamine Tetraacetic Acid (EDTA).

DIPOTASSIUM GLYCYRRHIZATE • The dipotassium salt of glycyrrhizic acid (see).

DIPOTASSIUM GUANYLATE • Flavor enhancer. See Guanylate. E

DIPOTASSIUM INOSINATE • Flavor enhancer. E

DIPOTASSIUM PERSULFATE • White, odorless crystals used as a defoaming additive and a dispersing additive (see both) in fresh citrus fruit and in poultry. Moderately toxic and a skin irritant.

DIPOTASSIUM PHOSPHATE • A sequestrant. A white grain, very soluble in water. Used as a buffering additive to control the degree of acidity in solutions. It is used in the preparation of nondairy powdered coffee creams and in cheeses up to 3 percent by weight of cheese. It is used medicinally as a saline cathartic. GRAS. ASP

DIPROPYL DISULFIDE • A synthetic flavoring additive. Occurs naturally in onions. Used in imitation onion flavoring for pickle products and in baked goods.

DIPROPYL KETONE • See 4-Heptanone.

DIPROPYL TRISULFIDE • See Sulfides. ASP

DIQUAT DIBROMIDE • Yellow crystals used as an herbicide in animal feed, potable water, potato chips, potato wastes, and processed potatoes. FDA residue tolerance for it is 0.01 ppm in potable water, 0.5 ppm in processed potatoes including potato chips, and 1 ppm in dried potato wastes when used for animal feed. Poison by ingestion and other routes. Poisoning complications include vomiting, mucosal ulcers, diarrhea, and other intestinal tract problems. Heart damage and irregular heartbeats occur in severe poisonings. The EPA Genetic Toxicology Program (see) says it causes birth defects in experimental animals. A skin and eye irritant.

DISODIUM ADENOSINE TRIPHOSPHATE • A preservative derived from adenylic acid. See Adenosine Triphosphate.

DISODIUM CITRATE • White granular powder or crystals used as a buffer, nutrient for cultured buttermilk, and as a sequestrant (see). It is used in cured beef, carbonated beverages, nondairy creamers, cured meat products, margarine, evaporated milk, oleomargarine, and cured and fresh pork. The FDA says it is not to exceed 500 ppm or 1.8 mg/square inch of surface. Moderately toxic if injected under the skin. See Sodium Citrate. ASP

DISODIUM CYANODITHIOMIDOCARBONATE • Bacteria-killing component in the processing of sugarcane. Any substance that releases the cyanide ion can cause poisoning. Sodium cyanide is one of the swiftest poisons known. The FDA residue tolerance is less than 2.9 ppm in raw cane or sugar beets. ASP

DISODIUM EDTA • Edetate Disodium. Disodium Ethylene Diamine Tetraacetic Acid. White, crystalline powder, soluble in water, used as a food preservative and sequestering additive. Promotes color retention in frozen white potatoes (100 ppm), canned potatoes (110 ppm), cooked chickpeas (165 ppm), dried banana cereal (315 ppm), canned strawberry pie filling (500 ppm), gefilte fish (50 ppm), and salad dressing (75 ppm). As a sequestrant (see) in nonnutritive sweeteners. Used in animal feed to solubilize minerals. Was approved many years ago as an emergency treatment for very high levels of calcium in the blood or irregular heart rhythms. However newer drugs have been approved to treat

these conditions and the FDA issued an advisory in 2008 that children and adults have died when they were mistakenly given edetate disodium instead of edetate calcium disodium to remove lead from their blood. See Ethylenediamine Tetraacetic Acid (EDTA).

DISODIUM EDTA-COPPER • Copper Versenate. Used as a sequestering additive. See Ethylenediamine Tetraacetic Acid for toxicity.

DISODIUM ETHYLENE-1,2-DISODIUM ETHYLENE-1,2-BISDITHIO-CARBAMATE • Chem Bam. Spring-Bak. An antimicrobial additive used on beets and sugarcane. The FDA limits use to 3 ppm based on weight of raw sugarcane or raw beets. The EPA Genetic Toxicology Program (see). Poison by ingestion. Caused birth defects and mutations in experimental animals. ASP

DISODIUM GUANYLATE • A flavor intensifier believed to be more effective than sodium inosinate and sodium glutamate. It is the disodium salt of 5'-guanylic acid, widely distributed in nature as a precursor to RNA and DNA. Can be isolated from certain mushrooms and is used in canned vegetables. Changes in dietary purine intake over the past decade resulting from the use of guanylate and inosinate (see) as flavor enhancers are no greater than those due to variability in the consumption of major dietary contributors of purines. Exposure to purines is low—approximately 4 mg per person per day, according to the JECFA (see). The committee concluded that on the basis of available data, the combined total daily intake of disodium 5'-guanylate and disodium 5'-inosinate is not of significance. The committee decided there was no reason to recommend foods to which these substances have been added and withdrew its previous recommendation for labeling. Persons suffering from gout or uric acid kidney stones should limit their dietary sources of purines (see). ASP. E

DISODIUM INDIGO-5,5-DISULFONATE • Blue No. 2. Acid Blue W. Blue-brown powder used as a color additive on various products. The EPA Genetic Toxicology Program (see). Moderately toxic by ingestion. Caused tumors in experimental animals. See FD and C Colors.

DISODIUM 5'-INOSINATE • Flavor potentiator (see), odorless and colorless, or white crystal or powder, with a characteristic taste. Used in canned vegetables. Will be ineffective without MSG (see). See Inosinate. ASP

DISODIUM PHOSPHATE (DIBASIC) • A sequestrant (see) used in evaporated milk, up to 0.1 percent by weight of finished product; in macaroni and noodle products at not less than 0.5 percent or more than 1 percent. It is used as an emulsifier up to 3 percent by weight in specified cheeses. Cleared by the USDA's Meat Inspection Department to prevent cooked-out juices in cured hams, pork shoulders, and loins, canned hams, chopped hams, and bacon (5 percent in the pickling and 5 percent injected into the product). Used as a buffer to adjust acidity in chocolate products, beverages, sauces, and toppings, and enriched farina. Incompatible with alkaloids. It is a mild saline cathartic and has been used in phosphorous-deficiency treatment. It may cause mild irritation to the skin and mucous membranes and can cause purging. GRAS

DISODIUM PYROPHOSPHATE • Sodium Pyrophosphate. An emulsifier and texturizer used to decrease the loss of fluid from a compound. It is GRAS for use in foods as a sequestrant. See Sodium Pyrophosphate.

DISODIUM 5'-RIBONUCLEOTIDES • Flavor enhancer. Inosinates, guanylates, and ribonucleotides, according to the JECFA (see) are substances normally present in all tissues, and their role in purine metabolism as well as their breakdown in the majority of mammals, but not humans, is well known. The various products have been studied adequately in long-term, reproduction, and teratology tests. Ingestion of large amounts of these compounds by humans can increase the serum uric acid level and urinary uric acid excretion and this needs to be considered in people with gouty arthritis and those taking uric-acid-retaining diuretics. Thus, specific mention of the addition of these substances on the label may be indicated. The changes in dietary purine intake from the use of flavor enhancers is reportedly no greater than foods that contain purines. Acceptable daily intake not specified. E

DISODIUM SUCCINATE • See Succinic Acid and Sodium. ASP

DISOYAMINE • See Soybean Oil.

DISPERSANT • A dispersing additive, such as polyphosphate, for promoting the formation and stabilization of a dispersion of one substance in another. An emulsion, for instance, would consist of a dispersed substance and the medium in which it is dispersed.

DISTARCH PHOSPHATE • A combination of starch and sodium metaphosphate. It is a water softener, sequestering additive, and texturizer. A modified starch once commonly used in baby foods. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it is GRAS. E

DISTARCH PROPANOL • A modified starch. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that while there is no evidence in the available information that it demonstrates a hazard to the public at current use levels, uncertainties exist, requiring that additional studies be conducted. The FDA allowed GRAS status to continue while tests were being completed and evaluated. In 2006, the FDA said there is no evidence in the available information on distarch propanol that demonstrates, or suggests reasonable grounds to suspect, a hazard to the public when used at levels that are now current or might reasonably be expected in the future.

DISTEARYL THIODIPROPIONATE • Antioxidant used in packaging materials. The FDA limits it to 0.005 percent migrating from food packages.

DISTILLATE • The volatile material recovered by condensing the vapors of an extract or fruit material that is heated to its boiling point in a still.

DISTILLED • The result of evaporation and subsequent condensation of a liquid, as when water is boiled and steam is condensed.

DISTILLED ACETYLATED MONOGLYCERIDES • Food emulsifiers and binders in nutrient capsules and tablets to make them palatable; also food-coating additives. Use is “at level not in excess of the amount reasonably required to produce the intended effect.” Cleared by the USDA Meat Inspection Department as an emulsifier for shortening.

1,4-DITHIANE • Flavoring. The JECFA (see) stated that it is not of concern at the levels in food. However, the EPA and some scientists say it is a contaminant and possibly carcinogenic to humans. EAF

2,2'-(DITHIODIMETHYLENE)DIFURAN • Flavoring. ASP

DITTANY (FRAXINELLA) ROOTS • Dictamnus albus. See Dittany of Crete. NUL

DITTANY OF CRETE • Origanum dictamnus. A natural flavoring extracted from a small herb grown in Crete. Employed in spice flavorings for beverages and baked goods. NIL

DIURON • Preemergent herbicide and sugarcane flowering suppressant. Also employed in dried citrus pulp used as animal feed. Identified as priority hazardous substance by the EU. Repeated doses cause anemia in rats.

DIVANILLIN • Synthetic vanilla used in baked goods, alcoholic and nonalcoholic beverages, breakfast cereal, cheese, chewing gum, condiments/relishes, confectionery frostings, fats/oils, fish products, frozen dairy, fruit ices, gelatins, puddings, granulated sugar, gravies, hard candy, imitation dairy, instant coffee/tea, jams/jellies, and meat products. Although it has not been assigned for toxicology studies by the FDA, it has been declared GRAS by its producers. EAF

DM • The abbreviation for dose metric.

DNA • Deoxyribonucleic Acid. The complex substance that makes up genes. It contains the genetic information for all organisms.

DOCOSAHEXAENOIC ACID • DHA. A major component of the human brain tissues and the retinal tissues of the eyes. It also serves the other

important function of the transmission of nerve impulses in the nervous system. Found in fish oil.

DODECADIENALS • Synthetic flavorings. ASP

o- and d-DODECALACTONE • A synthetic flavoring. Occurs naturally in butter, cream, and milk. Used in butter, fruit, and pear flavorings for candy, baked goods, oleomargarine, and toppings. Not to exceed 20 ppm in oleomargarine. ASP

y-DODECALACTONE • A synthetic flavoring, colorless, with a coconut odor that becomes butterlike in low concentrations. Used in butter, butterscotch, coconut, fruit, maple, and nut flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, and jellies. ASP

1-DODECANAL • Lauryl Aldehyde. Found in pine needles, lime, orange, and other essential oils. It is used as a flavoring additive in various products. Mildly toxic by ingestion. ASP

DODECANOIC ACID • See Lauric Acid.

DODECENALS • Flavorings with the odor of coriander (see). Determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association (see). Some are ASP and others, EAF.

DODECYL ALCOHOL • See Lauryl Alcohol.

DOCECYLBENZENESULFONIC ACID • Sanitizer that may be used on glass containers for holding milk. See Benzene and Sulfonic Acid.

DODECYL GÁLLATE • An antioxidant. The JECFA (see) found that it caused a reduction in spleen weight and pathological changes in the liver, kidney, and spleen in a 150-day study in rats in which the substance was administered by gavage. In addition, the study with dodecyl gallate revealed a no-observed-effect level (NOEL) that was tenfold lower than the dietary NOEL for propyl gallate (see). The committee decided that this additive was unlikely to be carcinogenic or genotoxic (see) and therefore recommended a temporary acceptable daily intake (ADI) for this additive at 0-0.5 mg per kg of body weight. See Gallates. NIL. E

DODECYL ISOBUTYRATE • Flavoring. See Butryic Acid. ASP a-(P-DODECYLPHENYL)-OMEGA-HYDROXYPOLY(OXYETHYLENE) • Flavoring. NIL

a-(p-DODECYL PHENYL)-1,1-DIMETHYL UREA • A pesticide.

N-DODECYL SARCOSINE SODIUM SALT • Antifogging additive, antistatic additive used in packaging material. When heated to decomposition, it emits toxic fumes.

DODECYLBENZENESULFONIC ACID • A detergent used to sanitize glass containers for holding milk. The FDA permits a residue of less than 400 ppm in solution. May cause skin irritation. If swallowed, it will cause vomiting.

DOG GRASS EXTRACT • A natural flavoring extract used in maple flavoring for beverages, ice cream, ices, candy, and baked goods. Derives its name from the fact that it is eaten by sick dogs. GRAS. ASP

DOPAMINE • 3-Hydroxytyramine. An intermediate in tyrosine metabolism and the precursor of norepinephrine and epinephrine. It is a brain chemical that initiates movement.

DOWCO 179 • See Chlorpyrifos.

D-PSICOSE • Derived by the action of enzymes on fructose (see). May be useful in preventing high blood sugar in diabetics after eating “diet” foods containing table sugar (sucrose) and maltose (sugar alcohol). A noncalorie sugar with a reported lower glycemic response, D-psicose has 70 percent the sweetness of sucrose, but also has functional properties like gelling activity, good flavor, as well as high antioxidation activity. The sugar is not widely used at this writing, but research published in 2008 in the Journal of Agricultural and Food Chemistry indicates its potential to find application in a range of products, most notably as a sugar substitute. “The excessive consumption of sucrose can be ill-advised because of the high calorie content and a high glycemic response,” wrote lead author Yuanxia Sun from Kagawa University. “On the other hand, artificial intense sweeteners (such as aspar-tame, sucralose, saccharin, and cyclamate) are almost calorie-free, but their function is only to sweeten and lack the bulk of sucrose. Food formulators, therefore, generally need to blend them with sugar to obtain desired results in end products. Sucrose cannot be substituted by only intense sweeteners.”

DRACO RUBIN EXTRACT • See Dragon's Blood Extract.

DRAGÉES • Little metallic silver or gold balls used as decorations on holiday cookies and wedding cakes. They are safe to eat and have sugar inside, but they should be removed before serving because of the metal coating. The FDA has recommended dragées are for decorative purposes only and are technically not a food additive. Dragées have been banned in the state of California. See Silver Dragées.

DRAGON'S BLOOD EXTRACT • Daemonorops spp. The resinous secretion of the fruit of trees grown in Sumatra, Borneo, and India. Almost odorless and tasteless and available in the form of red sticks, pieces, or cakes. Makes a bright crimson powder. Used in bitters flavoring for beverages. NIL

DRIED ALGAE MEAL • The Food and Drug Administration (FDA) amended the color additive regulations in August 2000 to provide for the safe use of haemato-coccus algae meal as a color additive in the feed of salmonid fish to enhance the color of their flesh. This action was in response to a petition filed by Cyanotech Corp. NUL

DRIED SORGHUM GRAIN SYRUP • A corn syrup substitute produced from the starch of sorghum grain. See Sorghum.

DRIED YEAST • A dietary source of folic acid. Used to enrich farina, cornmeal, corn grits, and bakery products. Dried yeast is cleared for use in food provided the total folic acid content of the yeast does not exceed 0.04 milligrams per gram of yeast. Nontoxic.

DRIER • Food drying is one of the oldest methods of preserving food for later use. It can either be an alternative to canning or freezing, or complement these methods. With food dehydrators, fruit leathers, banana chips, and beef jerky can all be dried year-round. Drying removes the moisture from the food so bacteria, yeast, and mold cannot grow and spoil the food. Drying also slows down the action of enzymes (see), but does not inactivate them. Because drying removes moisture, the food becomes smaller and lighter in weight. When the food is ready for use, the water is added back, and the food returns to its original shape. In packaging, drier chemicals may be added to keep foods from being affected by moisture. Some can migrate into food. See Packaging.

DRY ICE • See Carbon Dioxide.

DRY MILK, NONFAT • See Nonfat Dry Milk.

DRYING ADDITIVES • See Rosin.

DRYING OILS AS COMPONENTS OF FINISHED RESINS • Oils that migrate from food packaging (as components of finished resins) include chinawood oil (tung oil), dehydrated castor oil, and linseed oil.

DS • The abbreviation for dietary supplement.

D-TAGALOSE • A sugar from fructose, tagalose is similar to fructose and derived from lactose (see both). About 80 percent of tagalose is not absorbed until it reaches the large intestine, where bacteria chemically break it down and release gas and fatty acids that are absorbed by the body.

absorbed until it reaches the large intestine, where bacteria chemically break it down and release gas and fatty acids that are absorbed by the body. It may be used in carbonated beverages, yogurts, chewing gum, mints, cereals, soft drinks, dairy desserts, diet health bars, candies, frostings, and fat-free ice cream. The FDA permits the claim that it does not cause dental cavities. The JECFA (see) pointed out that there is risk to people with hereditary fructose intolerance, which if untreated leads to metabolic disturbances, liver damage, kidney disease, and defective blood clotting. The committee previously noted that nausea, flatulence, and diarrhea have been reported in some individuals after the constitution of 30 g of D-tagalose in a single dose. GRAS.

DULCAMARA EXTRACT • Bittersweet Nightshade. Extract of the dried stems of Solanum dulcamara belonging to the family of the nightshades. It is used as a preservative. The ripe berries are used for pies and jams. The plant was called woody nightshade by the old herbalists to distinguish it from deadly nightshade. Its generic name Solanum is derived from Solor (I ease), and it is used medicinally by herbalists. The second name, Dulcamara, means "bittersweet," the common country name. If chewed, the taste is first bitter and then sweet. It is a narcotic, and in large doses it paralyzes the central nervous system without affecting the peripheral nerves or voluntary muscles. It slows the heart and respiration, lessens sensibility, lowers the temperature, and causes vertigo and delirium and can cause convulsions and death. The berries may be poisonous to children. BAN in food.

DULCIN • A nonnutritive sweetener that as of this writing is not legal in food. BAN

DULSE • A natural flavoring extract from red seaweed. Used as a food condiment. GRAS

DV • The abbreviation for daily value (see).

DYSPEPSIA • Indigestion.

E • Giving an additive an E number means that it has passed safety tests and has been approved for use by the Federation of European Food Additives and Food Enzymes Industries and the European Union. Some additives are restricted to very limited numbers of foods, whereas others may be permitted at the level necessary to achieve the desired technical effect (quantum satis) with no numerical limit stated. To regulate these additives, and inform consumers, each additive is assigned a unique number. Initially these were the "E numbers" used in Europe for all approved additives. This numbering scheme has now been adopted and extended by the Codex Alimentarius Committee (see) to internationally identify all additives, regardless of whether they are approved for use. E numbers are all prefixed by "E," but countries outside Europe use only the number, whether the additive is approved in Europe or not. For example, acetic acid is written as E260 on products sold in Europe, but is simply known as additive 260 in some countries. Additive 103, alka-net, is not approved for use in Europe so does not have an E number, although it is approved for use in Australia and New Zealand. The U.S. Food and Drug Administration listed these items as "Generally recognized as safe," or GRAS, and these are listed under both their Chemical Abstract Services number and FDA regulation listed under the U.S. Code of Federal Regulations.

EAF • The USDA's designation that there is use of a food additive but it has not yet beeen assigned for a toxicology literature search.

EAR • The abbreviation for estimated average requirement.

EARTH WAX • General name for ozocerite, ceresin, and montan waxes. See Waxes.

EC • The abbreviation for exposure concentration.

ECHINACEA • Echinacea angustifolia. Snakeroot. Stoneflower. Coneflower. The roots and leaves of this herb served as a medicine for the Plains Indians. Said by herbalists to be a natural antibiotic and immune enhancer. Contains an antiseptic volatile oil, glycosides (see), and phenol, which is also an antiseptic. The herb produces a numbing sensation when held in the mouth for a few minutes. E. COLI (ESCHERICHIA COLI) • A type of bacteria normally found in the gut of most animals, including humans. Much of the work scientists have done using recombinant DNA (see) techniques has used E. coli as a carrier because it is well understood. Some types of this bacteria class have been causing food poisoning, some of it fatal. Factory farming and overuse of antibiotics are believed to be contributing to the problem of resistant and dangerous types of E. coli.

ECZEMA • Inflammation of the skin.

ED • The abbreviation for exposure duration.

EDIBLE FILMS • The most common coatings are wax coverings for fruits, lipid films to protect meat products, and chocolate coating for a range of food items. Films made from pureed fruits and vegetables can add shelf life and tantalizing new flavors to lightly processed foods such as cut produce. Edible films may be cellulose ethers, starch, hydroxypropylated starch, corn zein, wheat gluten, soy proteins, and milk proteins. This could be a problem for those with a wheat gluten intolerance, milk protein allergies, or lactose intolerance. A newer film—a combination of the antimicrobials zein and nisin plus EDTA (see all)—is used to control the multiplication of the pathogen Campylobacter jejuni on poultry, the most common cause of bacterial diarrhea. Most edible coatings are not obvious. Edible coatings must be GRAS.

EDSTAC • The abbreviation for Endocrine Disruptor Screening and Testing and Advisory Committee (see) and page 560.

EDTA, CALCIUM DISODIUM • See Ethylenediamine Tetraacetic Acid (EDTA) and Calcium. ASP

EDTA, DISODIUM • See Ethylenediamine Tetraacetic Acid (EDTA) and Sodium. ASP

EDTA, DISODIUM IRON • See ETA Disodium and Iron. NUL.

EDTA, TETRASODIUM • Wash for peeling fruit. See Ethylenediamine Tetraacetic Acid (EDTA) and Sodium. ASP

EF • The abbreviation for exposure frequency.

EFROTOMYCIN • An antibiotic to improve swine-feed efficiency.

EFSA • The abbreviation for European Food Safety Authority (see).

EGG • Particularly associated with eczema in children. May also cause reactions ranging from hives to anaphylaxis. Eggs may also be found in root beer, soups, sausage, coffee, and in cosmetics.

EGG WHITE LYSOZYME • Antibacterial. It occurs naturally in eggs and it is isolated and used to attack the cell walls of bacteria. GRAS. EAF.

EICOSAPENTAENOIC ACID • EPA. Found in fish oil (see), it reduces production of thromboxane, a clotting additive, in the blood, thus making the platelets less "sticky." It is a member of the omega-3 fatty acid family and it is required for the production of a special group of substances in the body called prostaglandins, which control blood clotting and other arterial functions. EPA also provides a natural approach to lower serum triglycerides (see).

ELAIDIC ACID • See Oleic Acid.

ELDER FLOWERS • Sambucus canadensis. A natural flavoring from the small white flowers of a shrub or small tree. Used in fruit, wine, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and wine. The leaves and bark can cause nausea, vomiting, and diarrhea. GRAS. ASP

ELDER TREE LEAVES • Sambucus nigra. Flavoring for use in alcoholic beverages only. See Elder Flowers. NUL

ELDERBERRY JUICE POWDER • Dried powder from the juice of the edible berry of a North American elder tree. Used for red coloring.

ELECAMPANE RHIZOME and ROOT • ínula helenium. Flavoring in alcoholic beverages only. From a large, coarse European herb having yellow ray flowers. NUL

ELEMI • A soft, yellowish fragrant plastic resin from several Asiatic and Philippine trees. Slightly soluble in water but readily soluble in alcohol. An oily resin derived from the tropical trees. The gum is used in fruit flavoring for beverages, ice cream, ices, candy, and baked goods. The oil is used in citrus, fruit, vermouth, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and soups. EAF

EMUL • Abbreviation for emulsifier (see).

EMULSIFIERS • Widely used additives to stabilize a mixture and to ensure consistency. They make chocolate more mixable with milk and keep puddings from separating. They are growing in demand because they are being used in the increasing number of "low-fat" foods. One of the most widely used emulsifiers is lecithin (see) and another is polysorbate 60 (see). Di- and monoglycerides (see both) are also used in many products.

EMULSIFYING OIL • Soluble Oil. An oil, which when mixed with water, produces a milky emulsion. Sodium sulfonate is an example.

EMULSIFYING WAX • Waxes that are treated so that they mix more easily.

EMULSION • What is formed when two or more nonmixable liquids are shaken so thoroughly together that the mixture appears to be homogenized. Most oils form emulsions with water.

ENANTHIC ACID • Used in peeling solutions for fruits and vegetables. See Heptanoic Acid.

ENDOCRINE DISRUPTOR SCREENING AND TESTING AND ADVISORY COMMITTEE • EDSTAC. An advisory council used by the EPA to consider ways of screening industrial chemicals for hormonal effects. See page 560.

ENDOSULFAN • Thiodan. Brown crystals made from methane and benzene, related to the long banned but still environmentally present pesticide DDT. Endosulfan is used as an insecticide on fruits and vegetables and on growing tea. It is used especially on tomatoes, carrots, lettuce, and spinach. FDA residue limit on dried tea is 24 ppm. It is toxic by ingestion, inhalation, and skin absorption. Endosulfan has not been produced in the United States since 1982, but it has been used to make other chemicals. You can be exposed to endosulfan by breathing contaminated air or by eating or drinking contaminated food or water. It is possible that you can be exposed if you smoke cigarettes or breathe cigarette smoke. The central nervous system is the primary target affected by exposure to endosulfan. Breathing, eating, or drinking high doses of endosulfan can cause convulsions (shaking violently) and death. The effects of being exposed to low doses of endosulfan alpha over a long period of time are not known. Emerging evidence indicates that this insecticide and other chemicals that imitate the human reproductive hormone estrogen may be associated with instances of breast cancer, although definite proof is lacking. The U.S. Environmental Protection Agency (EPA), the Department of Health and Human Services, and the International Agency for Research on Cancer have not classified endosulfan as a cancer-causing substance. The EPA does prohibit more than 0.1 to 2.0 parts per million (ppm) of endosulfan to be present in food. The FDA recommends that no more than 24 ppm be found in dry tea. Endosulfan is on the EPA's top ten toxic chemicals list for priority study. Also identified as priority hazardous substance by the EU.

ENDOTHAL • Aquathol. Endothall. An herbicide in potable water. FDA residue tolerance is 0.2 ppm in potable water. Poisonous by ingestion. Very irritating to skin, eyes, and mucous membranes. Causes diarrhea.

ENTERIC NERVOUS SYSTEM • Our digestive systems are also chemical factories. In the linings of the esophagus, stomach, small intestine, and colon are millions of nerve cells that send stop-and-go messages to our brains. The components of this digestive control center are lumped under the title “the enteric [from the Greek entera meaning bowels] nervous system.” Current thinking among a number of scientists is that there is a “brain” in the gut, independent from the brain encased in the skull and that the enteric nervous system may be able to learn and remember independently of the central nervous system.

ENVIRONMENTAL DEFENSE FUND • National nonprofit organization representing more than five hundred thousand members. Since 1967 it has linked science, economics, and law to create equitable and cost-effective solutions to society's most urgent environmental problems. See page 48.

ENVIRONMENTAL WORKING GROUP • The mission is to use the power of public information to protect public health and the environment. See page 49.

ENZ • The abbreviation for enzyme (see).

ENZYMATICALLY HYDROLYZED CARBOXYMETHYL CELLULOSE • See Carboxymethyl Cellulose and Enzymes. E

ENZYMATICALLY HYDROLYZED PROTEIN • Enzymes are used to break down the protein in solution. GRAS

ENZYMES • Enzymes are formed in living cells. One enzyme can cause a chemical process that no other enzyme can do. Among the fungi used to produce enzymes in foods are Aspergillus niger and Aspergillus oryzae for bakery products and for milk clotting. Enzymes are used to remove visceral mass in clam processing, in bakery products, for making cheese, for flavorings, and for many other food-processing purposes. A number are recognized as GRAS and others have not yet been evaluated by the FDA.

ENZYME-MODIFIED FATS • Produced by enzyme action of fats obtained from milk, refined beef fat, or steam-rendered chicken fat. Enzyme-modified milk fat may be prepared from milk, concentrated milk, dry whole milk, cream, concentrated creams, dry cream, butter, butter oil, dried butter, or dried milk fat. Enzyme-modified milk fat may also be prepared from optional dairy ingredients including skim milk, nonfat dry milk, and buttermilk as well as dried whey. Enzymes such as lipase, for example, are used to break down fats that are used in the manufacture of cheese and similar foods. As a flavoring, it has a strong fatty acid odor and taste. GRAS. NUL

ENZYME-MODIFIED LECITHIN • See Lecithin, Modified.

ENZYME-MODIFIED SOY PROTEIN • A foaming additive in soda water.

ENZYME, BACTERIAL • Enzymes (see) often are derived from amylase, protease, isomerase, lactase (many types of each), rennet, oxidase, catalase, beta-glucanase, hemicellulase (see all). ASP

ENZYMES, CARBOHYDRASE, and CELLULASE from ASPERGILLUS NIGER

• For the removal of visceral mass in clam processing. See Aspergillus. ASP

ENZYMES from ASPERGILLUS ORYZAE • Used for browning in baking products. See Aspergillus. ASP

ENZYMES (FOR MILK CLOTTING) from ENDOTMS PARASÍTICA or BACILLUS CEREUS • For use in preparation of standardized cheese or cheese products.

ENZYMES from PLANT and ANIMAL SOURCES • The following are considered GRAS: bromelin, catalase, ficin, lipase, malt extract, pancreatic extract, pepsin, and trypsin (see all).

ENZYME, PROTEOLYTIC • The decomposition of protein by enzymes. See various Enzyme entries. ASP

EPA EXTREMELY HAZARDOUS LIST • A list of highly toxic chemicals cited by the Environmental Protection Agency.

EPHEDRA • Ephedra gerardiana. E. trifurca. E. sinica. E. equisetina. E. helvetica. Ma Huang. Mormon Tea. There are about forty species of this herb mentioned in ancient scriptures of India, and it was used by the Chinese for more than five thousand years. The stems contain alkaloids (see) including ephedrine (see). Herbalists use the herb to treat arthritis, asthma, emphysema, bronchitis, hay fever, and hives. The FDA proposed in 1997 to reduce risks associated with dietary supplement products containing ephedrine alkaloids by limiting the amount in products and requiring labeling and marketing measures that give adequate warning and information to consumers. Ephedrine alkaloids are amphetaminelike compounds with potentially powerful stimulant effects on the nervous system and heart. Hundreds of consumer illnesses and injuries associated with the use of these products have been reported. Pregnant women, too, should avoid the use of dietary supplements with ephedrine alkaloids. Reported adverse events range from episodes of high blood pressure, irregularities in heart rate, insomnia, nervousness, tremors, and headaches to seizures, heart attacks, strokes, and death. Most events occurred in young to middle-aged, otherwise healthy adults using the products for weight control and increased energy.

EPHEDRINE • Derived from the plant Ephedra equisetina and others of the forty species of ephedra or produced synthetically. Ephedra has been used for more than five thousand years in Chinese medicine and has become more and more popular in Western medicine. It acts like epinephrine (see) and is used as a bronchodilator, as a nasal decongestant, to raise blood pressure, and topically to constrict blood vessels. The FDA banned the use of ephedrine in dietary supplements in 2004 because alkaloids pose a risk of serious adverse events, including heart attack, stroke, and death; these risks are unreasonable in light of any benefits that may result from the use of these products. This action was taken under the Dietary Supplement Health and Education Act of 1994 (DSHEA), which amended the FD&C Act. See Ephedra.

EPICHLOROHYDRIN • A colorless liquid with an odor resembling chloroform. A modifier for food starches that the FDA permits to be used up to level of 0.3 percent in starch. A strong skin irritant and sensitizer. Daily administration of 1 milligram per kilogram of body weight to skin killed all of a group of rats in four days, indicating a cumulative potential. Chronic exposure is known to cause kidney damage. A two-year study of workers who had been exposed to the substance for six months or more before January 1966 showed an increase in the incidence of cancer. Chronic exposure is known to cause kidney damage in humans. Germany regulates it as a known carcinogen. FDA residue tolerances are less than 0.1 percent with propylene and less than 5 ppm in modified food starch. NUL

EPICHLORHYDRIN CROSSLINKED WITH AMMONIA • Decolorizing additive in clarification of sugar liquors and juices. See Epichlorhydrin and Ammonia. NUL

EPIGALLOCATECHIN CÁLLATE • EGCG. Compound found in green tea that reportedly provides stronger damage protection to cells and their genetic material than vitamins E and C.

EPINEPHRINE • Adrenaline. The major hormone of the adrenal gland that increases heart rate and contractions, vasoconstriction or vasodilation, relaxation of the muscles in the lungs and intestinal smooth muscles, and the processing of sugar and fat.

2,8-EPITHIO-CIS-P-METHANE • A flavoring agent that tastes somewhat like grapefruit. EAF

EPOXIDIZED SOYBEAN OIL • Used as a stabilizer not to exceed 1 percent in brominated soybean oil.

EPOXY • Chemical term describing an oxygen atom bound to two linked carbon atoms. They are important chemical intermediates and the basis of epoxy resins (see).

4,5-EXPOXY-(e)-2-DECENAL • A flavoring determined GRAS by FEMA (see). EAF

1,8-EPOXY-p-MENTHANE • See Eucalyptol.

EPOXY RESINS • The versatile epoxy resins are used widely in manufacturing for adhesives and as films and durable coatings. When epoxy resins are used, the resin is combined with a curing additive. As the mixture “cures” it becomes hard. Epoxies are one of the most common causes of occupational health complaints. The Hazard Evaluation System and Information Service of California, for example, cites frequent effects of overexposure to the chemicals used in epoxy resins as eye, nose, throat, and skin irritations, allergies, and asthma. Hardened epoxy products are practically nontoxic unless they are cut, sanded, or burned.

EPSILON-DODECALACTONE • Synthetic peach flavoring. The JECFA concludes there is no safety concern at current levels of intake when used as a flavoring agent. ASP

EQUISETIC ACID • See Aconitic Acid.

ERGOCALCIFEROL • Vitamin D2.

ERIGERON CANADENSIS • See Erigeron Oil.

ERIGERON OIL • Erigeron canadensis. Horseweed. Fleabane Oil. Derived from the leaves and tops of a plant grown in the northern and central United States. Used in fruit and spice flavorings for beverages, ice cream, ices, candy, baked goods, and sauces. NIL

ERUCIC ACID • Docosenoic Acid. An acid found in rapeseed, mustard seed, and wallflower seeds. Used in polyethylene film (see) and water-resistant nylon.

ERYTHORBIC ACID • Isoascorbic Acid. Antioxidant that contains one-twentieth the vitamin capacity of ascorbic acid (see). It is used in pickling brine at a rate of 7.5 ounces per 100 gallons; in meat products at the rate of 0.75 ounces per hundred pounds; in beverages; baked goods; cured cuts and cured pulverized products to accelerate color fixing in curing, to 0.75 ounce per 100 pounds. Nontoxic. GRAS. ASP. E

ERYTHRITOL • A sugar alcohol produced through fermentation of glucose by a microorganism known as Trichosporonoides megachiliensis. Naturally occurs at low levels in many fruits and at higher levels in fermented foods such as soy sauce, cheese, wine, and beer. Its reputed benefits include low-calorie content, low GI index (see) and a low laxative effect. Used in bakery fillings, cakes, and cookies, chewing gum, dairy drinks, fat-based cream used in modified fat/calorie cookies, pastries, hard candies, frozen dairy desserts, puddings, reduced and low-calorie beverages, soft candies, sugar substitutes and yogurt as a flavor enhancer, formulation aid, humectant, nutritive sweetener, stabilizer and thickener, sequestrant, and texturizer at varying levels. The sweetener has been allowed for use in the United States since 1997 and in Japan since the early 1990s. In Europe, it gained novel foods approval in 2006, and the subsequent directive required that all member states recognize it as a permitted ingredient within eighteen months. Erythritol can be used on its own, or in conjunction with higher-intensity sweeteners in a wide range of low-calorie indulgence foods, including bakery items, dairy-based desserts, and confectionery items. Erythritol is used in Japan in candies, chocolate, yogurt, fillings, jellies, jams, beverages, and as a sugar substitute. Erythritol has not been found to affect blood sugar or insulin levels and has a zero glycemic index. Producers of erythritol notified the FDA that the companies believe erythritol is GRAS through scientific procedures, for use as a flavor enhancer, formulation aid, humectant, nutritive sweetener, stabilizer and thickener, sequestrant, and texturizer in a variety of foods as described. There are some challenges to erythritol's use—it cannot be used as a 100 percent replacement sugar, but rather is combined with another sweetener. E

ERYTHRITOL FATTY ACID ESTERS • As a surface active agent or microencap-sulant in certain foods at the minimum level required to achieve the intended technical effect. The producer notified FDA of GRAS status.

ERYTHROMYCIN • An antibacterial obtained from the strains of Streptomyces erythraeus found in the soil. Used to treat a wide range of bacterial infections in humans. It is used as a drug for beef, chicken eggs, pork, and turkey. FDA tolerances are 0.1 ppm in uncooked edible tissues of swine, zero in uncooked edible tissues of beef cattle and milk, 0.025 ppm in uncooked eggs, 0.125 ppm in uncooked edible residue of chickens and turkeys. In the EPA Genetic Toxicology Program (see). Moderately toxic by ingestion. The use of antibiotics in animal feed is highly controversial because it could lead to resistance to the antibiotic in humans as well as allergic reactions. See page 85.

ERYTHROSINE • Sodium or potassium salt of tetraiodofluorescein, a coal-tar derivative. A brown powder that becomes red in solution. FD and C Red No. 3 is an example. The intake of erythrosine could exceed the ADI of 0-0.1 mg/kg body weight if the levels proposed by the JECFA's General Standard for Food Additives are widely adopted. Nonfood sources of erythrosine, such as pharmaceutical products, should be included in intake assessments. The JECFA says on the basis of national assessments, the long-term intake of erythrosine is unlikely to exceed the ADI. See Coal Tar for toxicity. E

ERYTHROXYLON COCA • See Coca Leaf Extract (Decocainized). ESCHERICHIA COLI • E. coli. A gram-negative (see) bacteria commonly found in fecal matter and in the human intestines, certain strains may cause intestinal and urinary tract infections. See E. coli.

ESO • Abbreviation for essential oil and/or oleoresin (solvent free).

ESSENCE • An extract of a substance that retains its fundamental or most desirable properties in concentrated form, such as a fragrance or flavoring.

ESSENTIAL OIL • The oily liquid obtained from plants through a variety of processes. The essential oil usually has the taste and smell of the original plant. Essential oils are called volatile because most of them are easily vaporized. The only theories for calling such oils essential are (1)

original plant. Essential oils are called volatile because most of them are easily vaporized. The only theories for calling such oils essential are (1) the oils were believed essential to life and (2) they were the "essence" of the plant. The use of essential oils as preservatives is ancient. A large number of oils have antiseptic, germicidal, and preservative action; however, they are primarily used for fragrances and flavorings. Nontoxic when used on the skin. A teaspoon may cause illness in an adult and less than an ounce may kill.

ESTER • A compound formed from alcohol and acid by elimination of water, as ethyl acetate (see). Usually, fragrant liquids used for artificial fruit perfumes and flavors. Esterification of rosin, for example, reduces its allergy-causing properties. Toxicity depends on the ester.

ESTERASE-LIPASE • Derived from Mucor miehei. An enzyme used as a flavor enhancer in cheese, fats, oils, and milk products. There is no reported use of the chemical, and there is no toxicology information available. NUL

ESTRADIOL • Oestradiol. Estrace. Estinyl. Estra-L. Estraderm. depGynogen. Depo-Estradiol. Dura-Estrin. E-Cypionate. Estro-Cyp. Estrofem. Estroject-LA. Estronol-LA. Delestrogen. Dioval. Duragen 10. Estraval. Menaval. Valergen. Most potent of the natural estrogenic female hormones. In animals it is implanted in steers, heifers, and lambs. It is also implanted in combination with testosterone or progesterone, two other powerful sex hormones. The FDA permits zero tolerance in meat. Potential adverse reactions include nausea, vomiting, depression, high blood pressure, dizziness, migraine, libido changes, blood clots, water retention, increased risk of stroke, blood clots to the lung, and heart attack. May also worsen nearsight-edness, cause intolerance of contact lenses, and lead to loss of appetite, increased appetite, excessive thirst, pancreatitis, and bloating and abdominal cramps. Women may have breakthrough bleeding, altered menstrual flow, painful or absent menstruation, enlargement of benign tumors of the uterus, cervical erosion, abnormal secretions and vaginal candidiasis. In men there may be enlargement of the breast, testicular atrophy, and impotence. In both sexes there may be jaundice, high blood sugar, high calcium in the blood, folic acid deficiency, dark spots appearing on the skin, hives, acne, oily skin, hairiness or loss of hair, leg cramps, and hemorrhages into the skin. Contraindicated in persons with blood clot disorders; cancer of the breast, reproductive organs, or genitals; and in those with undiagnosed abnormal genital bleeding and in pregnancy. Should be used with caution in high blood pressure, asthma, mental depression, bone disease, blood problems, gallbladder disease, migraines, seizures, diabetes, absence of menstruation, heart failure, liver or kidney dysfunction, and a family history of breast or genital tract cancer.

Estradiol's use as implants in animals is unnecessary and should be outlawed. On January 1, 1989, the European Union implemented a ban on imports of red meat from animals treated with six growth promoters—natural and synthetic—cutting off U.S. beef exports to the EU. The products used in the United States, three natural hormones and three synthetic products, have been thoroughly tested and are claimed to have no adverse effects on human or animal health. The EU, however, continued to publicly rule out an end to the hormone ban, stating that economic, environment, and consumer concerns must be considered in addition to the scientific evidence. Therefore, the United States and Canada launched separate WTO (see) dispute settlement panel cases against the EU regime in 1996. On August 18, the WTO distributed its final report. In a major victory for the hard-fought Sanitary and Phytosanitary (SPS) Agreement, the panel strongly upheld all the principles argued by the United States and ruled that the EU ban was inconsistent with the principles of the SPS Agreement. The EU appealed this finding. On January 16, the Appellate Body (AB) released its report and firmly upheld the panel findings. The WTO kept the ban in effect because it ruled "Endogenous hormones in animals and humans are known to cause a wide variety of adverse effects from reproductive function to malignancies. These considerations demonstrate that some fraction of the population will be at higher risk for hormone-related adverse outcomes, no matter the dose, due to consumption of hormone-implanted meat. A number of publications, some of which have been submitted by the European Communities to this panel, have explored the threshold concept and the activity of hormones at very low doses." The conflict goes on. We may know in thirty years if the hormones we ate in meat today are harmful or not. That may be how long it will take for the answer.

ESTRADIOL BENZOATE • Used as a growth promoter in beef and lamb. FDA tolerances are set at 120 parts per trillion (ppt) in muscle; 480 ppt in fat; 360 ppt in kidney; 240 ppt in liver of heifers, steers, and calves. Tolerance of 120 ppm in muscles, 600 ppm in fat, kidney, and liver of lambs. Has caused cancer in experimental animals as well as birth defects. It is an estrogen used in human medication for birth control and postmenopausal symptoms and does cause side effects in humans as a medication. See Estradiol.

ESTRADIOL MONOPALMITATE • An estrogen used to promote growth in chickens. It has a zero tolerance in chickens for market. See Estradiol.

ESTRADIOL VALERATE • Used as an implant in combination with progesterone. The FDA bans its use in veal calves.

ESTRAGÓLE • Occurs naturally in anise, star anise, basil, estragon oil, and pimento oil. Used as a synthetic fruit, licorice, anise, and spice flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. Has induced tumors in rats, especially newborns. It is not strongly mutagenic in bacterial or yeast systems. FEMA (see) says that at current doses, it probably offers no danger to humans but, nevertheless, it requires further study. GRAS. ASP

ESTRAGÓN • Tarragon. A flavoring additive from the oil of leaves of a plant native to Eurasia and used in fruit, licorice, liquor, root beer, and spice flavorings for beverages, ice cream, ices, candy, baked goods, meats, liquor, and condiments. GRAS

ESTROGEN • A hormone produced by the ovaries that is mainly responsible for female sexual characteristics. Estrogen influences bone mass by slowing or halting bone loss, improving retention of calcium by the kidney, and improving the absorption of dietary calcium by the intestine. See Estradiol.

ETHALFLURALIN • An herbicide. FDA tolerance for residues in fat, meat, meat by-products of cattle, hogs, goats, poultry, sheep, and milk is 0.05 ppm.

ETHANAL • See Acetaldehyde and Heptanal.

ETHANE • Colorless, odorless gas used as a source of ethylene (see).

1,2-ETHANEDITHIOL • Derived from ethylene glycol, it is used as a chelating additive (see). The vapors cause a severe headache and nausea. NIL

ETHANE-1,1-DITHIOL • Meaty, roasted aroma, colorless liquid. It is also a common building block in organic synthesis. EAF

ETHANESULFONIC ACID, 2-(1-DIFLUORO-[(TRIFLOROETHENEYL) OXY]-METHYL)-1,2,2,2,-TETRAFLUOROETHYOXY)-1,1,2,2,-TETRAFLUORO-, POLYMER WITH TETRAFLUOROETHANE • Adds fluorine to products to increase biological activity for pharmaceuticals and agro chemicals, giving them greater heat and oxidative stability and increased chemical resistance. NUL

ETHANOL • Ethyl Alcohol. Rubbing Alcohol. Ordinary Alcohol. Used as a solvent in candy, candy glaze, beverages, ice cream, ices, baked goods, liquors, sauces, and gelatin desserts. Clear, colorless, and very flammable, it is made by the fermentation of starch, sugar, and other carbohydrates. Use as a preservative in the filling used in shelf-stable croissants at a concentration of 3,000 ppm. When it is deliberately denatured (see), it is poisonous. GRAS

ETHANOLAMINES • Three compounds—monoethanolamine, diethanolamine, and triethanolamine—with low melting points and soluble in both water and alcohol. Widely used in detergents and emulsifiers. Very large quantities are required for a lethal dose. Can be irritating to the skin if very alkaline. See Diethanolamine.

ETHANTHALDEHYDE • See Heptanal.

ETHANTHIC ALCOHOL and ETHANTHYL ALCOHOL • See Heptyl Alcohol.

ETHEPHON • A pesticide used in raisin water waste for use in animal feed. FDA residue tolerance is 65 ppm.

ETHER • An organic compound. Acetic ether. It is obtained chiefly by the distillation of alcohol with sulfuric acid and is used chiefly as a solvent. A mild skin irritant. Inhalation or ingestion causes central nervous system depression. See Ethyl Acetate.

ETHION • An insecticide to kill mites. In fat of cattle it is permitted 2.5 ppm; in meat and by-products of cattle as residue, 0.75 ppm, in milk, zero, and in animal feed from 4 to 10 ppm. It inhibits nerve signals. See Organophosphates.

ETHOFUMESATE • An herbicide with an FDA tolerance of 0.5 ppm as a residue in or on sugar beet molasses.

ETHOPABATE • Odorless white to pink crystals used as an animal drug in chickens. The FDA limits residue to 1.5 ppm in uncooked liver and kidney, 0.5 ppm in uncooked muscles of chickens. Used to combat bacteria.

ETHOVAN • See Ethyl Vanillin.

p-ETHOXY BENZALDEHYDE • A synthetic fruit and vanilla flavoring for beverages, ice cream, ices, candy, and baked goods. See Benzyl Acetate. ASP

2-(1-[ETHOXY IMINO] BUTYL)-5-(2-[ETHYL THIO] PROPYD-3HYDROXY-2-CYCLOHEXENE-1-ONE) • An herbicide used in animal feed, flaxseed meal, potato pomace, sunflower meal, tomato products (concentrated), and peanut soap stock. FDA limitations of residue: 24 ppm in tomato products, concentrated, 15 ppm in cottonseed soap stock, 7 ppm in flaxseed meal, 75 ppm in peanut soap stock, and 20 ppm in sunflower meal used for animal feed.

ETHOXYLATE • An ethyl (see) and oxygen compound is added to an additive to make it less or more soluble in water, depending upon the mixture. Ethoxylate acts as an emulsifier.

ETHOXYLATED MONO- and DI-GLYCERIDES • Dough conditioners in bread used to increase the volume of the loaf not to exceed 0.5 percent of flour used. Also used as an emulsifier in pan-release additives for yeast-leavened bakery products. In solid, edible fat water emulsions as coffee creamer substitute. See Glycerides.

1-ETHOXY-3-METHYL-2-BUTENE • Flavoring. An aromatic ether. EAF

0-(ETHOXYMETHYL)PHENOL • Synthetic flavoring derived from phenol (see) rapidly absorbed from the gastrointestinal tract. The JECFA concluded there are no safety concerns to date. ASP

ETHOXYQUIN • 1,2-Dihydro-6-Ethoxy-2,2,4-Trimethylquinoline. An antioxidant (see) to preserve color in chili powder, paprika, and ground chili at levels not to exceed 100 ppm. Used in feed. The residues in or on edible products of animals are restricted to 5 ppm in or on the uncooked fat of meat from animals except poultry; 3 ppm in or on the uncooked liver and fat of poultry; and 0.5 ppm in or on the uncooked muscle meat of animals. There was a significant question about this additive in the late 1980s because its use in animal feed caused dogs to have symptoms from itchy skin and lethargy to thyroid and kidney problems. Reproductive disorders and cancer were also reported. It is used in both human and animal food as an antioxidant. In 1995, there was a report in Biochemical Pharmacology by Mexican researchers that ethoxyquin affected the kidneys of rats. The FDA's toxicology program reported no adverse health effects from the additive. Then in 1997, the FDA reduced the amount of ethoxyquin allowed in dog food. It is still permitted in human food. See Quinoline for toxicity. See also Santoquin. ASP

2-ETHOXYTHIAZOLE • Synthetic scent of nuts, burning, frozen food, roasted food, and candies. ASP

ETHYL • Signifies a hydrocarbon derived from natural gas.

ETHYL ABIETATE • Amber-colored, thick liquid made from ethyl chloride and rosin. It is used in lacquers and coatings. Skin irritant. Although allowed as a food additive, there is no current reported use of the chemical, and therefore, although toxicology information may be available, it is not being updated, according to the FDA. NIL

ETHYL ACETATE • A colorless liquid with a pleasant fruity odor that occurs naturally in apples, bananas, grape juice, pineapple, raspberries, and strawberries. It is employed as a synthetic flavoring additive in blackberry, raspberry, strawberry, butter, lemon, apple, banana, cherry, grape, peach, pineapple, brandy, muscatel, rum, whiskey, mint, almond, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatins, puddings, and liquor. It is a mild local irritant and central nervous system depressant. The vapors are irritating and prolonged inhalation may cause kidney and liver damage. Irritating to the skin. Its fat-solvent action produces drying and cracking and sets the stage for secondary infections. GRAS. ASP

ETHYL ACETOACETATE • Acetoacetic Ester. A synthetic flavoring that occurs naturally in strawberries. Pleasant odor. Used in loganberry, strawberry, apple, apricot, cherry, peach, liquor, and muscatel flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Moderately irritating to skin and mucous membranes. ASP

ETHYL ACETONE • See 2-Pentanone.

ETHYL 3-ACETOXY-2-METHYLBUTYRATE • A flavoring determined GRAS by FEMA (see). See Butanoic Acid.

S-ETHYL 2-ACETYLAMINOETHANETHIOATE • A flavoring in baked goods, breakfast cereals, cheese, condiments, gravies, milk products, poultry, reconstituted vegetables, and many other food products. Determined GRAS by FEMA (see). See Ethane. EAF

ETHYL 2-ACETYL-3-PHENYLPROPIONATE • A synthetic fruit flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

ETHYL ACONITATE • Aconitic Acid. A synthetic fruit, liquor, and rum flavoring for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

ETHYL ACRYLATE • A synthetic flavoring additive that occurs naturally in pineapple and raspberries. Used in fruit, liquor, and rum flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. Highly irritating to the eyes, skin, and mucous membranes and may cause lethargy and convulsions if concentrated vapor is inhaled. Although it was found to be carcinogenic in rats in 1986, it was delisted as a carcinogen in 2000 because it was decided that the doses given to animals were in higher concentrations than those to which humans would be exposed. ASP

ETHYL ALCOHOL • Contains ethanol (see), grain alcohol, and neutral spirits and is used as a solvent in candy glaze, beverages, ices, ice cream, candy, baked goods, liquors, sauces, gelatin desserts, and pizza crusts. It is rapidly absorbed through the gastric and intestinal mucosa. For ingestion within a few minutes, the fatal dose in adults is considered to be 1.5-2 pints of whiskey (40 to 55 percent ethyl alcohol). It was approved in 1976 for use in pizza crusts to extend handling and storage life. GRAS. EAF

ETHYL p-ANISATE • A synthetic flavoring additive, colorless to light yellow liquid with a light fruity smell. Used in berry, fruit, grape, licorice, anise, liquor, rum, and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

ETHYL ANTHRANILATE • Colorless liquid, fruit odor, soluble in alcohol and propylene glycol. A synthetic flavoring additive, clear, colorless to amber liquid with an odor of orange blossoms. Used in berry, mandarin, orange, floral, jasmine, neroli, fruit, grape, peach, and raisin flavorings for

beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

ETHYL ASPARTATE • The ester of ethyl alcohol and aspartic acid (see both).

4-ETHYL BENZALDEHYDE • Flavoring. See Benzoic Acid. NUL

ETHYL BENZENECARBOXYLATE • See Ethyl Benzoate.

ETHYL BENZOATE • Essence de Niobe. Ethyl Benzenecarboxylate. An artificial fruit essence almost insoluble in water, with a pleasant odor. Used in currant, strawberry, fruit, cherry, grape, liquor, nut, walnut, vanilla, and raspberry flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and liquors. ASP

ETHYL BENZOYLACETATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. Pleasant odor. ASP

ETHYL BENZYL ACETOACETATE • See Ethyl-2-Acetyl-3-Phenylpropionate.

ETHYL BENZYL BUTYRATE • Synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. NIL

ETHYL BRASSYLATE • Artificially synthesized flavors that have not been identified in natual products. ASP

ETHYL BUTYL ACETATE • A synthetic fruit flavoring for beverages, ice cream, ices, and candy. AS

ETHYL BUTYRATE • Butyric Acid. Pineapple Oil. Colorless, with a pineapple odor. It occurs naturally in apples and strawberries. In alcoholic solution it is known as pineapple oil. Used in blueberry, raspberry, strawberry, butter, caramel, cream, orange, banana, cherry, grape, peach, pineapple, rum, walnut, and eggnog flavorings for beverages, ice cream, ices, candy, baked goods, gelatins, puddings, and chewing gum (1,400 ppm). Mildly toxic by ingestion. A skin irritant. GRAS. ASP

ETHYL CAPRATE and ETHYL CAPRYLATE • See Cognac Oil.

ETHYL CAPROATE • Colorless to yellowish liquid, pleasant odor, soluble in alcohol and ether. Used in artificial fruit essences. See Cognac Oil.

ETHYL CARBAMATE • is a compound that occurs in fermented foods and beverages, such as spirits, wine, beer, bread, soy sauce, and yogurt. Therefore, the major source of human dietary exposure to ethyl carbamate is through the consumption of fermented foods and beverages, e.g., as a consequence of its unintentional formation during the fermentation process, distillation, or during storage. The most important precursors from ethyl carbamate in stone fruit brandies are hydrogen cyanide or its salts thereof, the cyanides. At the 64th meeting in February 2005, the JECFA concluded that ethyl carbamate is genotoxic and is a multisite carcinogen in all animal species tested and is considered to be a potential carcinogen in humans. As hydrogen cyanide and its salts are important precursors for ethyl carbamate formation, possible health risks related to the presence of these two compounds may lead EFSA to change techniques to reduce the chemicals in their products. It is still a work in progress.

ETHYL CARBONATE • Solvent used in animal feed.

ETHYL CARVACROL • See Carvacryl Ethyl Ether.

ETHYL CELLULOSE • Cellulose Ether. White granules prepared from wood pulp or chemical cotton and used as a binder and filler in dry vitamin preparations up to 35 percent; chewing gum, up to 0.025 percent; and in confectionery, up to 0.012 percent. Also used as a diluent (see) and as a protective coating for vitamin tabs and as a fixative in flavor compounds. Not susceptible to bacterial or fungal decomposition. GRAS. ASP. E

ETHYL CINNAMATE • Cinnamic Acid. An almost colorless oily liquid with a faint cinnamon odor. Used as a synthetic flavoring in raspberry, strawberry, cherry, grape, peach, plum, spice, cinnamon, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Moderately toxic by ingestion. ASP

ETHYL CITRATE • A bitter, oily sequestrant used in dried egg whites. See Sequestrants.

ETHYL CROTONATE • Flavor identical to natural flavor from aromatic raw materials or chemically identical synthesized materials. See Butanoic Acid. ASP

ETHYL CYCLOHEXANECARBOXYLATE • Flavoring. ASP

ETHYL CYCLOHEXANEPROPIONATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ETHYL DECANOATE • Decanoic Acid. A synthetic flavoring occurring naturally in green and white cognac oils. Used in strawberry, cherry, grape, pineapple, liquor, brandy, cognac, and rum flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and liquors. ASP

ETHYL 2,4,7-DECATRIENOATE • Flavoring. The JECFA said it has no concern about it. EAF

ETHYL 4,4'-DICHLOROBENZILATE • An insecticide for citrus fruits. The FDA allows a residue of 5 ppm in and on citrus fruits and 0.5 ppm as a residue in fat, meat, and meat by-products of sheep and cattle.

ETHYL DIHYDROXYPROPYL • The ester of ethyl alcohol and p-dihydroxypropyl aminobenzoic acid. See Ethyl Alcohol and para-Aminobenzoic Acid.

ETHYL DIISOPROPYL CINNAMATE • See Cinnamic Acid.

2-ETHYL-3,5(6)-DIMETHYLPYRAZINE • A colorless to slightly yellow liquid with the smell of roasted cocoa used as a flavoring in various products. GRAS. ASP

ETHYL 0-P (DIMETHYLSULFO/AMOYL) PHENYL PHOSPHOROTHIOATE • An insecticide to combat grubs in animal feed. The FDA residue tolerance is 0.1 ppm in meat, fat, and meat by-products of cattle.

ETHYL DODECANOATE • See Ethyl Laurate.

ETHYL ESTER OF FATTY ACIDS • Compound for coating raisins. See Fatty Acids. ASP

ETHYL ESTER OF BETA-APO-8'-CAROTENIC ACID • See Beta-apo-8'-carotenic acid. E

ETHYL p-ETHYLPHENOL • Flavoring. The JECFA's (see) evaluation in 2000 found no safety concern at current levels of intake when used as a flavoring additive. See Phenol. ASP

0,0-ETHYL-S-2 (ETHYL THIO)ETHYL PHOSPHORODITHIOATE • Widely used insecticide on animal feed, pineapples, and dehydrated sugar beet pulp. FDA limitation of 5 ppm in dehydrated sugar beet pulp and pineapple bran when used for animal feed. Poisonous by ingestion, inhalation, and skin contact. May cause mutations. EPA considers it extremely hazardous and it is on the EPA Genetic Toxicology Program (see).

O-ETHYL-S (2 FURYLMETHYL)THIOCARBONATE • Flavoring used in currants, rum, whiskey, red wine, plum brandy, and Cape gooseberry. The JECFA (see) took note of the extensive positive genotoxicity data for several members of this group of flavoring agents related to furan, which is a known carcinogen. EAF

ETHYL N-ETHYLANTHRANILATE • See Ethyl Anthranilate. ASP

ETHYL-2-ETHYL-3-PHENYLOPROPANOATE • See Ethyl Phenylopropanoate. ASP

ETHYL FORMATE • Formic Acid. Occurs naturally in apples and coffee extract. Used as a yeast and mold inhibitor and as a fumigant for bulk and

packaged raisins and dried currants; fungicide for cashew nuts, cereals, tobacco, and dried fruits. Also a synthetic flavoring additive for blueberry, raspberry, strawberry, butter, butterscotch, apple, apricot, banana, cherry, grape, peach, plum, pineapple, tutti-frutti, brandy, rum, sherry, and whiskey flavorings for beverages, ice cream, ices, candy, baked goods, liquor, gelatin, and chewing gum. Irritating to the skin and mucous membranes, and in high concentrations it is narcotic. GRAS. See Formic Acid for further toxicity. ASP

ETHYL FORMIC ACID • See Propionic Acid.

2-ETHYLFURAN • Flavoring. In 2005, the JECFA (see) noted the extensive toxicity to genes of this flavoring. It is related to furan, a known carcinogen. The JECFA says there is a paucity of information about 2-Ethylfuran concerning toxicity to genes and potential carcinogenicity. Because of these concerns, the committee concluded that the Procedure for the Safety Evaluation of Flavoring Agents could not be applied to this additive. See Furans. ASP

ETHYL 2-FURAN PROPIONATE • Synthetic raspberry, apple, cherry, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Furans. ASP

ETHYL FURYLPROPIONATE • See Ethyl 2-Furan Propionate. EAF

ETHYLFURURYL ETHER • Flavoring. See Furans. EAF

ETHYL GLUTAMATE • The ester of ethyl alcohol and glutamic acid. See Glutamate.

4-ETHYL GUAIACOL • A synthetic coffee and fruit flavoring additive for beverages, ice cream, ices, and gelatin desserts. ASP

2-ETHYL-2-HEPTANAL • A synthetic pineapple flavoring additive for beverages and candy. ASP

ETHYL HEPTANOATE • A synthetic flavoring additive, with a fruity, winelike odor and taste, and a burning aftertaste. Used in blueberry, strawberry, butter, butterscotch, coconut, apple, cherry, grape, melon, peach, pineapple, plum, vanilla, cheese, nut, rum, brandy, and cognac flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and liqueurs. ASP

ETHYL HEXADECANOATE • See Ethyl Palmitate.

ETHYL 2,4-HEXADIENOATE • See Ethyl Sorbate.

ETHYL HEXANEDIOL • See Sorbic Acid.

ETHYL HEXANOATE • A synthetic flavoring additive that occurs naturally in apples, pineapples, and strawberries. Used in fruit, rum, nut, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and jelly. ASP

2-ETHYL-1-HEXANOL • A flavoring additive derived from alcohol. The JECFA (see) concluded that doses greater than about 350 mg per kg of body weight per day administered orally to rats and mice caused changes in the liver but did not result in cancer with long-term administration. In high doses, it did cause birth defects in mice but at lower doses did not. On the basis of NOEL (see) of 50 mg per kg of body weight per day from the long-term study in rats and a safety factor of 100, the committee established an ADI (see) of 0-.05 mg per kg of body weight for this additive. ASP

ETHYL-p-HYDROXYBENZOATE • See Hydroxy and Benzoates. E

ETHYL 3-HYDROXYBUTYRATE • Used as a stabilizer and antioxidant. ASP

ETHYL HYDROXY CELLULOSE • HEC. Widely used in pharmaceutical industry as surface activators, thickeners, emulsifiers, film formers, and other manufacturing uses. The EU was asked to add it to its E list (see page 11), but it was not added and further evaluation was requested in 2004.

3-ETHYL-2-HYDROXY-CYCLOPENTEN-1-ONE • Synthetic flavoring. ASP

2-ETHYL-4-HYDROXY-4-METHYLCYCLOPEN-2-EN-1-ONE • Synthetic flavoring. ASP

ETHYL HYDROXYMETHYL OLEYL OXAZOLINE • A synthetic wax.

ETHYL a-HYDROXY PROPIONATE • See Ethyl Lactate.

ETHYL ISOBUTYRATE • Isobutyric Acid. A synthetic strawberry, fruit, cherry, and butter flavoring for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and toppings. ASP

N-ETHYL-2-ISOPROPOYL-5-METHYLCYCLHEXAMINE CARBOXAMIDE • Synthetic flavoring. See Isopropyl Alcohol. ASP

ETHYL ISOVALERATE • Colorless, oily liquid with a fruity odor derived from ethanol and valerate. A synthetic flavoring used in alcoholic solution for pineapple flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. Used in essential oils and perfumery. See Valeric Acid. ASP

ETHYL LACTATE • Derived from lactic acid with ethanol. Used as a solvent for nitrocellulose, lacquers, resins, and enamels. Used in strawberry, butter, butterscotch, coconut, grape, rum, maple, cheese, and nut flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (3,100 ppm), gelatin desserts, syrup, and brandy (1,000 ppm). See Lactic Acid. ASP

ETHYL LAURATE • The ester of ethyl alcohol and lauric acid used as a synthetic flavoring. It has a light, fruity odor. Used in berry, coconut, fruit, grape, liquor, cognac, rum, nut, spice, nutmeg, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and liqueurs. It is also used as a solvent. ASP

ETHYL LEVULINATE • Levulinic Acid. Colorless liquid soluble in water. Used as a solvent for cellulose acetate and starch and flavorings. A synthetic apple flavoring for beverages, ice cream, ices, candy, and baked goods. See Levulinic Acid. ASP

ETHYL LINOLEATE • Prepared from sunflower seed oil, it is used in the vitamin industry.

ETHYL MALATE • See Diethyl Malate.

ETHYL MALONATE • Colorless liquid, sweet ester odor. Insoluble in water. Used in certain pigments and flavoring.

ETHYL MALTOL • White crystalline powder with a sweet fruity taste, it is used as a flavoring and processing aid in chocolate, desserts, and wine. Moderately toxic by injection. ASP

ETHYL 2-, and 3-MERCAPTOPROPIONATE • Flavoring used to provide a pleasant Concord grape flavor and aroma. ASP

ETHYL N-METHYLANTHRANILATE • Flavoring. Yellowish solid; fruity mandarin-type aroma. The JECFA says there is no safety concern. EAF

4-ETHYL-2-METHOXYPHENOL • See 4-Ethyl Guaiacol.

ETHYL 3-METHYL BUTYRATE • A synthetic fruit flavoring for beverages, ice cream, ices, and candy. EAF

ETHYL METHYL CELLULOSE • See Methyl Cellulose. E

ETHYL METHYL DISULFIDE • A flavoring determined GRAS by FEMA (see). See Pentane. EAF

ETHYL METHYLENE PHOSPHORODITHIOATE • A widely used insecticide in animal feed, citrus pulp, raisins, and dried tea. The FDA allows residue tolerance of up to 10 ppm in dried tea, 4 ppm in raisins, and 10 ppm in dried citrus pulp when used for animal feed. Extremely hazardous substance. Poison by ingestion and skin contact. Human systemic effects by ingestion include paralysis, motor activity changes, fever, and

substances. Poison by ingestion and skin contact. Human systemic effects by ingestion include paralysis, motor activity changes, fever, and interference with nerve transmission.

ETHYL-3-METHYL-4-(METHYL THIO) PHENYL(1-METHYL-ETHYL) PHOS-PHORAMIDATE • A pesticide allowed up to 1 ppm as residue in or on grape pomace; 2.5 in or on dried citrus pulp or citrus molasses that is fed to animals.

ETHYL-4-(METHYLTHIO)BUTYRATE • Flavoring. The JECFA says it has no safety concern but the ADI has not been set. See Butric Acid. NIL

ETHYL METHYLPHENYLGLYCIDATE • Strawberry Aldehyde. A synthetic flavoring with a strong odor suggestive of strawberry. Used in loganberry, raspberry, strawberry, coconut, fruit, cherry, grape, pineapple, liquor, and wine flavoring for beverages, ice cream, ices, candy, baked goods, gelatin, puddings, and chewing gum. Caused growth retardation in rats, particularly males, and testicular atrophy. Females showed paralysis of hindquarters and deterioration of muscles. GRAS

2-ETHYL-METHYLPYRAZINE • Liquid with a strong raw potato odor. Used as a flavoring in various foods. GRAS. ASP

ETHYL-6-METHYLPYRAZINE • The JECFA says there is no safety concern at current levels of intake when used as a flavoring agent. EAF

ETHYL MYRISTATE • The ester of ethyl alcohol and myristic acid (see both). Synthetic coconut, fruit, honey, and cognac flavoring for beverages, ice cream, ices, candy, baked goods, and liqueurs. ASP

ETHYL NITRITE • Sweet Spirit of Niter. Spirit of Nitrous Ether. A synthetic flavoring additive with a burning, sweetish taste. Used in strawberry, cherry, pineapple, liquor, brandy, and rum flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, syrups, and icings. It may cause hemoglobinemia, in which oxygen is diminished in the red blood cells, low blood pressure, and, when it is in high concentration, narcosis. ASP

ETHYL NONANOATE • Nonanoic Acid. A synthetic fruit and rum flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, icings, and liqueurs. Mildly toxic by ingestion. A skin irritant. ASP

ETHYL CIS-4-7-OCTADIENOATE • Flavoring. EAF

ETHYL CIS-4-OCTENOATE and ETHYL TRANS-2-OCTENOATE • Flavorings. See Octanoic Acid.

ETHYL OCTANOATE • Octanoic Acid. A synthetic flavoring additive that occurs naturally in both cognac green and cognac white oils. Used in strawberry, butter, citrus, apple, pineapple, rum, nut, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Mildly toxic by ingestion. A skin irritant. ASP

4-ETHYLOCTANOIC ACID • Flavoring. See Octanoic Acid. EAF

ETHYL OCTYNE CARBONATE • See Ethyl 2-Nonynoate.

ETHYL OLÉATE • Oleic Acid. Synthetic flavoring additive used in butter and fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and puddings. An ingredient in nail polish remover. It is made from carbon, hydrogen, oxygen, and oleic acid (see).

ETHYL 3-OXOBUTANOATE • See Ethyl Acetoacetate.

ETHYL 3-OXOHEXANOATE • Flavoring and flavor enhancer. NIL

ETHYL OXYHYDRATE • See Rum Ether.

ETHYL PALMITATE • Ethyl Hexadecanoate. The ester of ethyl alcohol and palmitic acid (see both). Synthetic flavoring additive used in butter, honey, apricot, and cherry flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

ETHYL 4-PENTENOATE • Flavoring with pleasant ethereal fruity odor. Used for tropical fruit and berry formulations. Claimed GRAS by FEMA (see).

ETHYL PERSATE • Persic Oil Acid. Ethyl Ester. The ethyl ester of the fatty acids derived from either apricot kernel oil or peach kernel oil. See Apricot Kernel Oil and Peach Kernel Oil.

ETHYL PHENYLACETATE • Phenylacetic Acid. A synthetic flavoring additive with a sweet honey rose odor. Used in honey, butter, apricot, and cherry flavorings for beverages, ice cream, ices, candy, baked goods, and syrups. Moderately toxic by ingestion. ASP

ETHYL PHENYL ACRYLATE • See Ethyl Cinnamate.

ETHYL 3-, 4-PHENYL BUTYRATE • A synthetic berry, strawberry, fruit, and cherry flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts.

ETHYL PHENYLGLYCIDATE• Colorless liquid with a strong strawberry odor used as a flavoring additive. Moderately toxic by ingestion. May be mutagenic.

ETHYL 3-PHENYLPROPIONATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Ethyl Cinnamate. ASP

ETHYL 1-PROPENE-1,2,3-TRICARBOXYLATE • See Ethyl Aconitate.

ETHYL PROPIONATE • Propionic Acid. A synthetic flavoring additive, colorless, transparent liquid, with a fruit odor. Occurs naturally in apples. Used in butter, fruit, and rum flavorings for beverages, ice cream, gelatin desserts, baked goods, and chewing gum (1,100 ppm). Moderately toxic by ingestion. A skin irritant.

ETHYL PROPYL DISULFIDE • A flavoring determined GRAS by FEMA (see). See Heptanal. EAF

ETHYL PROPYL TRISULFIDE • A flavoring determined GRAS by FEMA (see). See Octanal. ASP

ETHYL PYRUVATE • Pyruvic Acid. A synthetic chocolate, fruit, rum, maple, and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ETHYL SALICYLATE • Salicylic Ether. Occurs naturally in strawberries and has a pleasant odor. Used as a synthetic flavoring additive in fruit, root beer, sassafras, and wintergreen flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatins, and puddings. May interact with harmful results with medications such as anticoagulants, antidepressants, and medications for cancer, such as methotrexate. May cause allergic reaction in persons allergic to salicylates (see). ASP

ETHYL SEBACATE • See Diethyl Sebacate.

O-ETHYL S (-2-FURYLMETHYL)THIOCARBONATE • A flavoring determined GRAS by FEMA (see). See Heptanal.

ETHYL SÓRBATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ETHYL STEARATE • The ester of ethyl alcohol and stearic acid (see both).

ETHYL TETRADECANOATE • See Ethyl Myristate.

ETHYL THIOACETATE • Flavoring. Warm, fruity-tasting clear liquid used in baked goods and candy. ASP

ETHYLTHIOPHENOL • Colorless liquid with an unpleasant taste used in flavorings. See Ethyl Alcohol and Phenol. ASP

ETHYL TIGLATE • Tiglic Acid. A synthetic raspberry, strawberry, pineapple, and rum flavoring additive for beverages, ice cream, ices, candy, and liquor. ASP

ETHYL TRANS-2,CIS-4-DECADIENOATE • Flavoring. The ethanol in this compound is oxidized in body to acetic acid (see). The JECFA has evaluated acetic acid and concluded that it was of no safety concern at present intake levels. In a 63-day study in rats, the NOEL (see) for acetic acid was 350 mg/kg per body weight per day. ASP

ETHYL TRANS-2-DECENOATE • Flavoring agent or adjuvant. Can be used in milk. ASP

ETHYL TRANS-2-METHYL-2-BUTENOATE • See Ethyl Tiglate.

ETHYL 10-UNDECENOATE • A synthetic coconut, fruit, cognac, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, and liquor. ASP

ETHYL UROCANATE • The ester of ethyl alcohol and urocanic acid. See Imidazoline.

ETHYL VALERATE • Valeric Acid. A synthetic butter, apple, apricot, peach, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

ETHYL VANILLIN • Odor and flavor stronger than vanilla. Used as a synthetic flavoring additive in raspberry, strawberry, butter, butterscotch, caramel, rum, butter, chocolate, cocoa, citrus, coconut, macaroon, cola, fruit, cherry, grape, honey, liquor, muscatel, rum, maple, nut, pecan, root beer, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, chewing gum, imitation vanilla extract (28,000 ppm), liquor, icings, and toppings. Caused mild skin irritation in humans. In rats, it produced a reduction in growth rate and heart, kidney, liver, lung, spleen, and stomach injuries. GRAS. ASP

ETHYL VANILLIN BETA-D-GLUCOPYRANOSIDE • Flavoring with a very slight vanilla odor. EAF

ETHYLACETIC ACID • See Butyric Acid.

ETHYLAMINE • Widely used in chemical industry and organic synthesis. May cause cough, labored breathing, sore throat, redness, pain, and blurred vision. The substance is harmful to aquatic organisms. The JECFA (see) concludes there is no safety concern (conditional) at current levels of intake when used as a flavoring agent. The evaluation is conditional because the estimated daily intake is based on the anticipated annual volume of production. The conclusion of the safety evaluation of this substance were to be revoked if use levels or poundage data were not provided before the end of 2007. At this writing there was no change by the JECFA. EAF

2-ETHYLBUTYRALDEHYDE • An aldehyde flavoring. May cause toxic effects if inhaled or absorbed through skin. Inhalation or contact with material may irritate or burn skin and eyes. Fire will produce irritating, corrosive, and/or toxic gases. Vapors may cause dizziness or suffocation. ASP

2-ETHYLBUTYRIC ACID • A synthetic fruit, nut, and walnut flavoring additive for beverages, ice cream, ices, candy, and baked goods.

ETHYLENE • The sixth-highest-volume chemical produced in the United States, it is a colorless gas with a sweet odor and taste. It is derived from heat-cracking hydrocarbon gases or from fluid removal of ethanol. It is used to make chemical compounds, including those used to make plastics, refrigerants, anesthetics, and orchard sprays to accelerate fruit ripening. It is highly flammable and potentially explosive. It can asphyxiate.

ETHYLENE BRASSYLATE • See Erucic Acid.

1,2-ETHYLENE DIBROMIDE • A colorless, nonflammable liquid with a sweetish odor derived from bromine and ethylene. Used as a scavenger for lead in gasoline, as a fumigant, general solvent, and in waterproofing products. A cancer-causing additive, toxic by inhalation, ingestion, and skin absorption; a strong irritant to eyes and skin.

ETHYLENE DICHLORIDE • EDC. Dutch Liquid. 1,2-Dichloroethane. Ethylene Chloride. The halogenated hydrocarbon (see) derived from the action of chlorine on ethylene. It is widely used as a fumigant for cereal grains, corn grits, cracked rice, and fermented malt beverages; as a solvent for fats, waxes, spices, and resins; as a lead scavenger in antiknock gasolines; in paint, varnish, and finish removers; as a wetting additive; as a penetrating additive; in organic synthesis; and in the making of polyvinyl chloride (PVC) (see). It can be highly toxic whether taken into the body by ingestion, inhalation, or skin absorption. It is irritating to the mucous membranes. In cancer testing, the National Cancer Institute found this compound caused stomach cancer, vascularized cancers of multiple organs, and cancers beneath the skin in male rats. Female rats exposed to EDC developed mammary cancers—in some high-dose animals as early as the twentieth week of the study. The chemical also caused breast cancers as well as uterine cancers in female mice and respiratory tract cancers in both sexes. Deaths due to liver and kidney injury following ingestion of large amounts (30 to 70 grams) have been reported. Clouding of the eyes, hemorrhages, and destruction of the adrenal cortex have been reported in humans and dogs. Annual production in the United States is now estimated at about 10 billion pounds—the sixteenth largest of all chemicals on the market. EDC has been found in human milk and in the exhaled breath of nursing mothers who were exposed to the chemical. FDA tolerances for residues are 125 ppm in cereal grain, 25 ppm in fermented malt beverages. A solvent used in the production of spices, it is also used in processing animal by-products for use in animal feeds and in pesticide compounds. The FDA's residue tolerances for spices is 30 ppm and 300 ppm in extracted by-products. On the Community Right-to-Know List and under IARC Cancer Review (see both). Human poison by ingestion. Skin irritant. Implicated in worker sterility. The JECFA (see) found it causes birth defects and produces cancer in mice and rats when administered orally. The committee expressed the opinion that this solvent (1,2-dichloroethane) should not be used in food. NIL

ETHYLENE DIOLEAMIDE • See Fatty Acids.

ETHYLENE DISTEARAMIDE • See Fatty Acids.

ETHYLENE GLYCOL • A slightly viscous liquid with a sweet taste. Absorbs twice its weight in water. Used as an antifreeze and humectant (see); also as a solvent. Toxic when ingested, causing central nervous system depression, vomiting, drowsiness, coma, respiratory failure, kidney damage, and possibly death.

ETHYLENE GLYCOL DISTEARATE • See Ethylene Glycol and Stearic Acid. NUL

ETHYLENE GLYCOL MONOBUTYL ETHER • See Ethylene Glycol and Butyl Acetate. ASP

ETHYLENE GLYCOL MONOETHYL ETHER • See Ethylene Glycol. ASP

ETHYLENE OXIDE • EtO. A high-volume fumigant with production exceeding 1 million pounds annually in the United States. Used on ground spices and other processed natural seasonings. Irritant to the eyes and skin. A suspected human carcinogen. On the Community Right-to-Know List and under IARC Cancer Review (see both). Used in consumer products, building materials, or furnishings that contribute to indoor air pollution. Used in pesticide products. OSHA (see) says EtO possesses several physical and health hazards. It is both flammable and highly reactive. Acute exposures to EtO gas may result in respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, shortness of breath, and cyanosis. Chronic exposure has been associated with the occurrence of cancer, reproductive effects, mutagenic changes, neurotoxicity, and sensitization. ASP

ETHYLENE OXIDE-METHYL FORMATE MIXTURE • A mold and yeast control additive in dried and glazed fruits. Ethylene oxide is highly irritating

ETHYLENE OXIDE/METHYL FORMATE MIXTURE • A mold and yeast control additive in dried and glazed fruits. Ethylene oxide is highly irritating to the mucous membranes and eyes. High concentrations may cause pulmonary edema. Inhalation of methyl formate vapor produces nasal and eye irritation, retching, narcosis, and death from pulmonary irritation. Exposure to 1 percent vapor for two and a half hours or 5 percent vapor for a half hour is lethal.

ETHYLENE OXIDE POLYMER • Used as a stabilizer in fermented malt beer (300 ppm by weight). See Ethylene Oxide and Polymers. NIL

ETHYLENE OXIDE POLYMER, ALKYL ADDUCT, PHOSPHATE ESTER • See Ethylene Oxide. NUL

ETHYLENE OXIDE/PROPYLENE OXIDE COPOLYMER • See Ethylene Oxide and Propylene Glycol. ASP

ETHYLENE OXIDE/PROPYLENE OXIDE COPOLYMER, ALKYL ADDUCT • See Ethylene Oxide and Propylene Glycol. ASP

ETHYLENE OXIDE/PROPYLENE OXIDE COPOLYMER, ALKYL ADDUCT, PHOSPHATE ESTER • See Ethylene Oxide and Propylene Glycol. NUL

ETHYLENE UREA • See Urea.

ETHYLENEBUTYRALDEHYDE • A synthetic chocolate flavoring additive for beverages, ice cream, ices, candy, and baked goods.

ETHYLENEDIAMINE • Colorless, clear, thick, and strongly alkaline. A component of a bacteria-killing agent in processing sugarcane. Also used as a solvent for casein, albumin, and shellac. Has been used as a urinary acidifier. It can cause sensitization leading to asthma and allergic skin rashes.

ETHYLENEDIAMINE TETRAACETIC ACID • EDTA. Used as a sequestrant in carbonated beverages. EDTA salts are also used in crabmeat (cooked and canned) to retard struvite (crystal) formation and promote color retention. It is also used in nonstandardized dressings. It may be irritating to the skin and mucous membranes and cause allergies such as asthma and skin rashes. When ingested, it may cause errors in a number of laboratory tests, including those for calcium, carbon dioxide, nitrogen, and muscular activity. It is on the FDA list of food additives to be studied for toxicity. It can cause kidney damage. The trisodium salt of EDTA was fed to rats and mice for nearly two years. According to a summary of the report, “Although a variety of tumors occurred among test and control animals of both species, the test did not indicate that any of the tumors observed in the test animals were attributed to EDTA.” The tests were part of the National Cancer Institute's Carcinogenesis Bioassay Program.

1,2-ETHYLENEDICARBOXYLIC ACID • See Fumaric Acid.

EUBATUS, RUBUS • See Blackberry Bark Extract.

EUCALYPTOL • Eucalyptus Oil. A chief constituent of eucalyptus and cajeput oils. Occurs naturally in allspice, star anise, bay, calamus, and peppermint oil. Eucalyptus oil is 70 to 80 percent active eucalyptol. Eucalyptol is used in mint flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. An antiseptic, antispasmodic, and expectorant. Fatalities followed ingestion of doses as small as 3 to 5 milliliters (about a teaspoon), and recovery has occurred after doses as large as 20 to 30 milliliters (about 4 to 5 teaspoons). Symptoms of poisoning are epigastric burning with nausea, weakness, water retention, and delirium. ASP

EUCALYPTUS EXTRACT • See Eucalyptus Oil.

EUCALYPTUS GLOBULUS LEAVES • A flavoring. See Eucalyptus Oil.

EUCALYPTUS OIL • Dinkum Oil. From the fresh leaves of the eucalyptus tree. It is 70 to 80 percent eucalyptol and has a spicy cool taste and a characteristic aromatic, somewhat camphorlike odor. Used in fruit, mint, root beer, spice, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and liquor. Used as a local antiseptic. Has been used as an expectorant, vermifuge, and local antiseptic. Doses as small as 3 to 5 milliliters (about equal to a teaspoon) and about 1 milliliter have caused coma. Fatalities have followed doses as small as 3.5 milliliters. Symptoms include epigastric burning with nausea. Symptoms have been reported to occur as long as two hours after ingestion. ASP

EUCHEUMA COTTON EXTRACT • A flavoring. See Eucheuma Seaweed.

EUCHEUMA SEAWEED (PROCESSED) • Eucheuma cottonii Extract. Eucheuma spinosum Extract. A stabilizing and thickening additive derived from eucheuma seaweed used in dairy products to suspend particles and for gelling in foods. In a ninety-day study in rats, processed eucheuma administered at 0.5 percent, 1.5 percent, and 5 percent in the diet produced “no effects of toxicological significance” according to JECFA (see). However, in 2007, JECFA requested that based on laboratory results, carrageenan should be restricted in infant formulas but that it is acceptable for use as a food additive. See Hydrogenation and Carrageenan. E EUCHEUMA SPINOSUM EXTRACT • An emulsifier and stabilizer. See Eucheuma Seaweed.

EUGENOL • A synthetic fruit, nut, and spice flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, meats (2,000 ppm), and condiments. Used as a defoamer in yeast production, in the manufacture of vanilla. Eugenol also acts as a local antiseptic. When ingested, may cause vomiting and gastric irritation. Because of its potential as an allergen, it is left out of hypoallergenic cosmetics. Toxicity is similar to phenol, which is highly toxic. Death in laboratory animals given eugenol was due to vascular collapse. Methyl eugenol, a flavoring, has also been found to cause tumors in rats. FEMA (see) says that at current use, it probably offers no danger to humans, but, nevertheless, it requires further study. GRAS. ASP

EUGENYL ACETATE • Acetic Acid. A synthetic berry, fruit, mint, spice, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. ASP

EUGENYL BENZOATE • Synthetic fruit and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

EUGENYL FORMATE • Formic Acid. Synthetic spice flavoring additive used in condiments. See Formic Acid for toxicity. ASP

EUGENYL METHYL ETHER • Synthetic raspberry, strawberry, fruit, spice, clove, and ginger flavoring additive for beverages, ice cream, ices, candy, baked goods, and jellies. ASP

EUROPEAN FOOD SAFETY AUTHORITY • EFSA. Funded by the European Union, it provides risk assessment regarding food and feed safety. It strives to remain flexible to adapt to a changing environment and tackles new challenges posed by emerging risks and technological advances while focusing on prioritizing its workload to respond to the needs of the EU food safety system. In close collaboration with national authorities and in open consultation with its stakeholders, EFSA provides independent scientific advice and clear communication on existing and emerging risks.

EVERNIA FURFURACEA • See Oakmoss, Absolute.

EVERNIA PRUNASTIC • See Oakmoss, Absolute.

EWG • Abbreviation for Environmental Working Group (see).

EXATOLIDE • See Pentadecalactone.

EXCITOTOXICOLOGY • The study of chemicals that overstimulate and damage nerves. Glutamate (see) is considered an excitotoxin.

EXCITOTOXIN • See Excitotoxicology.

EXFOLIATED HYDROBIOTITE • Verxite. Highly purified form of vermiculite, which is a micalike mineral. Used as feed for poultry, swine, or ruminants and as an anticaking, blending agent in dog feed.

EXTRACT • The solution that results from passing alcohol or an alcohol-water mixture through a substance. Examples of extracts would be the alcohol-water mixture of vanillin, orange, or lemon extracts found among the spices and flavorings on the supermarket shelf. Extracts are not as strong as essential oils (see).

EYE ALLERGY • There are many forms of allergy of the eye. The mucous membranes of the eye may be involved in allergic rhinitis. Such allergic conjunctivitis may also occur by itself without irritation of the nose. Dust, mold spores, foods, and eye medications may all cause conjunctivitis. There is also a less severe, chronic form of allergic conjunctivitis. Symptoms include prolonged photophobia, itching, burning, and a feeling of dryness. There may be a watery discharge, and finding the source of allergy is often difficult.

FABULESS • Reputedly said to suppress hunger by encapsulating particles of palm oil in oats, which are then formulated in a novel emulsion. The manufacturer claims slow digestion of the oat fraction enables fabuless to penetrate deeply into the intestinal system and, since digestion is delayed, it sends a message of fullness to the brain.

FALCPA • The abbreviation for Food Allergen Labeling and Consumer Protection Act. See Food Allergen Labeling.

FAMPHUR • A pesticide used in animal feed as a pour-on liquid or as a paste in combination with the antibiotic Levamisole. Suspected neurotoxicant. There is a serious lack of information about this chemical's carcinogenicity and its reproductive and developmental toxicity. Water contamination potential. Known to be toxic to aquatic organisms. This chemical was not included in EPA's survey of basic testing data.

FANTESK • A fat replacer developed by the U.S. Department of Agriculture and licensed exclusively to Opta Food Ingredients. It is based on a combination of starches or gums with a small amount of oil. It has the taste and texture of regular fat but provides less than 0.5 grams of fat per serving.

FAO • The abbreviation for the Food and Agriculture Organization of the United Nations.

FARNESAL • Flavoring. See Farnesol. EAF

FARNESENE • Flavoring. See Farnesol. EAF

FARNESIANA • Mimosa soliflores. Acacia farnesiana. Large shrub to small tree. Used as a flavoring that tastes like a buttery almond pastry. The powdered dried leaves have been applied externally as a treatment for wounds. The green pods have been decocted and used in the treatment of dysentery and inflammations of the skin and raucous membranes. An infusion of the pod has been used in the treatment of sore throats, diarrhea, leucorrhoea, conjunctivitis, and uterine bleeding. The juice of the bark is used in Nepal to treat swellings. See Cassia.

FARNESOL • A flavoring with a fresh green odor that occurs naturally in ambrette seed, star anise, cassia, linden flowers, oils of muskseed, citronella, rose, and balsam. Used in berry, apricot, banana, cherry, melon, peach, citrus, fruit, raspberry, and strawberry flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Mildly toxic when ingested. Caused mutations in laboratory animals. ASP

FARNESYL ACETATE • Synethic flavoring with a green floral, rosy odor.

FASEB • The abbreviation for the Federation of American Societies for Experimental Biology, members of which evaluate studies for the FDA.

FAT • The most concentrated source of food energy and very necessary to health. Fat deposits provide insulation and protection for body structure as well as a storehouse for energy. Fats are composed of fatty acids and glycerol. Fatty acids consist of a long chain of carbons with a carboxyl group at one end. Depending on their structure, fatty acids can be saturated or unsaturated. While fats have been denigrated to the point that many believe that fat should be eliminated from the diet, fat serves many useful purposes. Fats store energy, help to insulate the body, and cushion and protect. Food fats are carriers of fat-soluble vitamins and include certain essential unsaturated fatty acids (see). Saturated fats contain only single-bond carbon linkages and are the least active chemically. They are usually solid at room temperature. Most animal fats are saturated. The common saturated fats are acetic, butyric, caproic, caprylic, capric, lauric, myristic, palmitic, stearic, arachidic, and behenic. Butterfat, coconut oil, and peanut oil are high in saturated fats. Unsaturated fats contain one or more double-bond carbon linkages and are usually liquid at room temperature. Vegetable oils and fish oils most frequently contain unsaturated fats. Among the unsaturated fats are caproleic, lauroleic, myristoleic, palmitoleic, oleic, and linoleic. See Saturated Fats, Phospholipids, Steroids, and Unsaturated Fats.

FAT CAL • Listing on labels signifying calories from fat.

FAT FREE • Less than 0.5 grams per serving. However, manufacturers are permitted to “round down” and claim zero fat even if a product contains 0.6 grams of fat. Very few foods are actually completely fat free.

FATIGUE • Everyone's nose becomes “fatigued” when smelling a certain odor. No matter how much you like an aroma, you can only smell it for a short interval. It is nature's way of protecting humans from overstimulation of the olfactory sense.

FAT REPLACERS • These additives are aimed at reducing a food's fat and calorie level while maintaining some of the desirable qualities of fat such as “mouthfeel,” texture, and flavor. Under FDA regulations, these additives usually fall into one of two categories: food additives or “generally recognized as safe” (GRAS) substances. Food additives must be evaluated for safety and approved by the FDA before they can be marketed. They include substances with no proven track record of safety or with no known amount in food that may serve the purpose of fat replacement. Examples are polydextrose, carrageenan, and olestra (see all), which are used as fat replacers. GRAS substances, on the other hand, are used in foods because they are generally recognized as safe by scientists because of their long history of use in foods. Examples of such fat replacers are cellulose gel, dextrins, guar gum, and gum arabic. Fat replacers may be carbohydrate, protein, or fat-based substances.

FATTY ACIDS • One of any mixture of liquid and solid acids, capric, caprylic, lauric, myristic, oleic, palmitic, and stearic. In combination with glycerin they form fat. Necessary for normal growth and skin. In foods they are used as emulsifiers, binders, and lubricants, and defoamer components in the processing of beet sugar and yeast. Polyglycerol esters of fatty acids are prepared from edible fats, oils, corn, cottonseed, palm, fruit, peanut, safflower, soybean oils, lard, and tallow. Used as emulsifiers and defoaming additives in beet sugar and yeast production, and as lubricant binders and components in the manufacture of other food additives. Fatty acid salt (one or more of the aluminum, ammonium, calcium, magnesium, potassium, and sodium salts of all the above fatty acids) are used as emulsifiers, binders, and anticaking additives. A free fatty acid (FFA) is the uncombined fatty acid present in a fat. Some raw oils may contain as much as 3 percent FFA. These are removed in the refining process, and refined fats and oils ready for use as foods usually have extremely low FFA content. See Stearic Acid. EAF. E

FATTY ALCOHOLS, SYNTHETIC • Solid alcohols made from acids. In foods, synthetic fatty alcohols include hexyl, octyl, decyl, lauryl, myristyl, cetyl, and stearyl alcohols. They are used as substitutes for the corresponding naturally derived fatty alcohols. Very low toxicity. EAF

FDA (FOOD and DRUG ADMINISTRATION) • The U.S. Food and Drug Administration is part of the Public Health Service of the U.S. Department of Health and Human Services. It is the regulatory agency responsible for ensuring the safety and wholesomeness of all foods sold in interstate commerce except meat, poultry, and eggs, which are under the jurisdiction of the U.S. Department of Agriculture. The FDA develops standards for the composition, quality, nutrition, safety, and labeling of foods, including food and color additives. It conducts research to improve detection and prevention of contamination. It collects and interprets data on nutrition, food additives, and pesticide residues. The agency also inspects food plants, imported food products, and feed mills that make feeds containing medications or nutritional supplements that are destined for human consumption. And it regulates radiation-emitting products such as microwave ovens. The FDA also enforces pesticide tolerances established by the Environmental Protection Agency for all domestically produced and imported foods, except for foods under USDA jurisdiction.

FD and C COLORS • Food, Drug, and Cosmetic Colors. A color additive is a term to describe any dye, pigment, or other substance capable of coloring a food, drug, or cosmetic, on any part of the human body. In 1900, there were more than eighty dyes used to color food. There were no

regulations and the same dye used to color clothes could also be used to color candy. In 1906, the first comprehensive legislation for food colors was passed. There were only seven colors, which, when tested, were shown to be composed of known ingredients that demonstrated no harmful effects. Those colors were orange, erythrosine, ponceau 3R, amaranth, indigotin, naphthol yellow, and light green. A voluntary system of certification for batches of color dyes was set up. In 1938, new legislation was passed, superseding the 1906 act. The colors were given numbers instead of chemical names and every batch had to be certified. There were fifteen food colors in use at the time. In 1950, children were made ill by certain colorings used in candy and popcorn. These incidents led to the delisting of FD and C Orange No. 1, Orange No. 2, and FD and C Red No. 32. Since that time, because of experimental evidence of possible harm, Red 1 and Yellow 1, 2, 3, and 4 have also been delisted. Violet 1 was removed in 1973. In 1976, one of the most widely used of all colors, FD and C Red No. 2, was removed because it was found to cause tumors in rats. In 1976, Red No. 4 was banned for coloring maraschino cherries (its last use), and carbon black was also banned, because both contain cancer-causing additives. Earlier, in 1960, scientific investigations were required by law to determine the suitability of all colors in use for permanent listing. Citrus Red No. 2 (limited to 2 ppm) for coloring orange skins has been permanently listed; Blue No. 1, Red No. 3, Yellow No. 5, and Red No. 40 are permanently listed but without any restrictions. In 1959, the Food and Drug Administration approved the use of "lakes," in which the dyes are mixed with alumina hydrate to make them insoluble. See FD and C Lakes. The other food coloring additives remained on the "temporary list." The provisional list permitted colors then in use to continue on a provisional, or interim, basis pending completion of studies to determine whether the colors should be permanently approved or terminated. FD and C Red No. 3 (erythrosin) is permanently listed for use in food and ingested drugs and provisionally listed for cosmetics and externally applied drugs. It is used in foods such as gelatins, cake mixes, ice cream, fruit cocktail cherries, bakery goods, and sausage casings. The FDA postponed the closing date for the provisionally listed color additives—FD and C Red No. 3, D and C Red No. 33, and D and C Red No. 36—to May 2, 1988, to allow additional time to study "complex scientific and legal questions about the colors before deciding to approve or terminate their use in food, drugs, and cosmetics." The agency asked for sixty days to consider the impact of the October 1987 U.S. Court of Appeals ruling that there is no exception to the Delaney Amendment (see), which says that cancer-causing additives may not be added to food. On July 13, 1988, the Public Citizens Health Research Group announced that the FDA agreed to revoke by July 15, 1988, the permanent listing of four color additives used in drugs and cosmetics—D and C Red No. 8, D and C Red No. 9, D and C Red No. 19, and D and C Orange No. 17. In a unanimous decision in October 1987, the U.S. Court of Appeals for the District of Columbia said the FDA lacked legal authority to approve two of the colors, D and C Orange No. 17 and D and C Red No. 19, since they had been found to induce cancer in laboratory animals. The Supreme Court ruled against an appeal on April 18, 1988. Meanwhile, Public Citizen also brought a similar suit, challenging the use of D and C Red No. 8 and D and C Red 9, which was before the U.S. Circuit Court of Appeals in Philadelphia. Under an agreement between FDA and Public Citizen, the case was sent back to the FDA, and the agency delisted these colors as well as D and C Orange No. 17 and D and C Red No. 19. Other countries as well as the World Health Organization maintain there are inconsistencies in safety data and in the banning of some colors, which in turn affects international commerce. As of this writing, there is still a great deal of confusion about the colors, with the FDA maintaining that the cancer risk is minimal—as low as one in a billion—while groups such as Ralph Nader's Public Citizen maintain that any cancer risk for a food additive is unacceptable. In 1990, the lakes of Red No. 3 were removed for all uses from the approved list. The color itself was also removed in 1990 for cosmetic and external drug use. It is still, as of this writing, approved for food and ingested drugs.

FD and C BLUE NO. 1 • Brilliant Blue FD and C. A bright blue, coal-tar derivative, triphenylmethane, it is used as a coloring in bottled soft drinks, gelatin desserts, ice cream, ices, dry drink powders, candy, confections, bakery products, cereals, and puddings. It is also used for hair colorings, face powders, and other cosmetics. May cause allergic reactions. On the FDA permanent list of color additives. Rated 1A—that is, completely acceptable for nonfood use by the WHO. However, it produces malignant tumors at the site of injection and by ingestion in rats. Manganese dioxide is now permitted in the manufacturing process. The FDA warned in 2003 of several reports of toxicity, including death, temporally associated with the use of FD and C Blue No. 1 (Blue 1) in enteral feeding solutions. In these reports, Blue 1 was intended to help in the detection and/or monitoring of pulmonary aspiration in patients being fed by an enteral feeding tube. Reported episodes were manifested by blue discoloration of the skin, urine, feces, or serum; and some were associated with serious complications such as refractory low blood pressure, metabolic acidosis, and death. Case reports indicate that seriously ill patients, particularly those with a likely increase in gut permeability (e.g., patients with sepsis), may be at greater risk for these complications. Because these events were reported voluntarily from a population of unknown size, it is not possible to establish the incidence of these episodes. A causal relationship between systemic absorption of Blue 1 and the reported serious and life-threatening patient outcomes (including death) has not been definitively established. See Colors. ASP

FD and C BLUE NO. 1, CALCIUM LAKE • See FD and C Lakes. NUL

FD and C BLUE NO. 2 • Indigotin. Indigo Carmine. A royal blue powder, a coal-tar derivative, triphenylmethane, almost always contains sodium chloride or sulfate. Easily faded by light. Used in bottled soft drinks, bakery products, cereals, candy, confections, and dry drink powders. Is also in mint-flavored jelly, frozen desserts, candy, confections, and rinses and as a dye in kidney tests and for testing milk. It is a sensitizer in the allergic. Produces malignant tumors at the site of injection when introduced under the skin of rats. The WHO gives it a toxicology rating of B—available data not entirely sufficient to meet requirements acceptable for food use. Permanently listed for foods and drugs in 1987. See FD and C Colors. ASP

FD and C BLUE NO. 2 ALUMINUM LAKE • See FD and C Lakes. ASP

FD and C BLUE NO. 2 CALCIUM LAKE • See FD and C Lakes. NUL

FD and C BRILLIANT BLUE NO. 1 ALUMINUM LAKE • Aluminum salt of certified FD and C Brilliant Blue No. 1 (see). Can be used around the eye in cosmetics. Also permitted for drug use. See FD and C Colors, Lakes. ASP

FD and C CITRUS RED No. 2 • Found in 1960 to damage internal organs and to be a weak cancer-causing additive. Permitted for use only to color orange skins. The World Health Organization said the color has been shown to cause cancer and that toxicological data available were inadequate to allow the determination of a safe limit; they recommended that it not be used as a food color. The FDA ruled on October 28, 1971, that the results of several rodent studies and one dog study using both oral and injected Citrus Red No. 2 showed either no adverse effect or no adverse effect levels. No abnormalities in urinary bladders were reported. The FDA noted that a paper presented in 1965 by the University of Otega Medical School reported a significant level of urinary bladder cancers in rodents fed the dye for up to twenty-four months. The FDA said that since slides of the tissues in photographs were not yet available for examination, and since there has been no confirmation of the studies, the listing of Citrus Red No. 2 should remain unchanged until the Otega results can be confirmed by examination. See FD and C Colors.

FD and C GREEN NO. 1 • Guinea Green B. A dull, dark green powder used as a coloring in bottled soft drinks. The certified color industry did not apply for the extension of this color because of the small demand for its use, so it was automatically deleted from the list of color additives in 1966. Rated E by the WHO, meaning it was found to be harmful and not to be used in food. No longer authorized for use by the FDA. See FD and C Colors. BAN

FD and C GREEN NO. 2 • Light Green S.F. Yellow. Coloring used in bottled soft drinks. Because of lack of demand for this color, the certified color industry did not petition for extension and it was automatically deleted in 1966. It produces tumors at the site of injection under the skin of rats. No longer authorized for use by the FDA. See FD and C Colors. BAN

FD and C GREEN NO. 3 • Fast Green. A sea green color permanently listed for use in food, drugs, and cosmetics, except in the area of the eye, by the FDA in 1983. Used as a coloring in mint-flavored jelly, frozen desserts, gelatin desserts, candy, confections, baking products, and cereals. Has been suspected of being a sensitizer in the allergic. On the FDA permanent list of approved color additives. Produces malignant tumors at the site of injection when introduced under the skin of rats. The WHO gives it a toxicology rating of 1A, meaning that it is completely acceptable. See FD and C Colors. ASP

FD and C GREEN NO. 3 ALUMINUM LAKE • See FD and C Lakes. ASP

FD and C GREEN NO. 3, CALCIUM LAKE • See FD and C Lakes. NUL

FD and C LAKES • Aluminum or Calcium Lakes. Lakes are pigments prepared by combining FD and C colors with a form of aluminum or calcium, which makes the colors insoluble. Aluminum and calcium lakes are used in confection and candy products and for dyeing eggshells and other products that are adversely affected by water. See FD and C Colors for toxicity.

FD and C RED NO. 1 • BAN

FD and C RED NO. 2 • Amaranth. Formerly one of the most widely used cosmetic and food colorings. A dark, reddish brown powder that turns bright red when mixed with fluid. A monoazo color, it was used in lipsticks, rouges, and other cosmetics as well as in cereals, maraschino cherries, and desserts. The safety of this dye was questioned by American scientists for more than twenty years. Two Russian scientists found that FD and C Red No. 2 prevented some pregnancies and caused some stillbirths in rats. The FDA ordered manufacturers using the color to submit data on all food, drug, and cosmetic products containing it. Controversial tests at the FDA's National Center for Toxicological Research in Arkansas showed that in high doses Red No. 2 caused a statistically significant increase in a variety of cancers in female rats. The dye was banned by the FDA in January 1976. Red No. 2 is still permitted in Canada and Europe.

FD and C RED NO. 3 • Erythrosin. Bluish Pink. A cherry red coal-tar derivative, a xanthene color, used in toothpaste, canned fruit cocktail, ice cream, hot dogs, barbecue potato chips, cereals, puddings, fruit salad, sherbets, gelatin desserts, cherry pie mix (up to 0.01 percent), candy, confections, and mixes as maraschino cherries. Has been determined a carcinogen. It was reported in 1981 by NIH researchers that Red No. 3 may interfere with transmission of nerve impulses in the brain. It contains iodine and has been shown to affect the thyroid glands of laboratory animals but not of humans. Children who eat large amounts of artificially colored cherries, gelatin desserts, and other FD and C Red No. 3 colored products could be at risk. See FD and C Colors. The FDA was supposed to permanently list this color in 1988 but postponed the ruling “to allow the agency additional time to study complex scientific and legal questions about the color before deciding to approve or terminate its use in food.” Now permanently listed for food and ingested drugs, its lake use was terminated on February 1, 1990. All cosmetic uses were terminated on February 1, 1990. In 1996, Red No. 3 was found to be a cancer-causing additive and may contribute to breast cancer. Scientists at Oak Ridge National Laboratory and Northeastern Illinois University reported Red No. 3 causes breast cancer in the laboratory. When the dye was added to a human cell culture, genetic damage and rapid cell growth occurred even when the concentration of the dye was quite low. The cells responded as if they had been exposed to estrogen, which damaged genetic material and caused rapid reproduction. It is still permitted in food but its lake (see) was removed from all uses while Red No. 3 itself was removed from the list for use in cosmetics and external drugs. The FDA has said that it intends “to propose rescinding” its use in food and internal drugs. That was in 1990. Though FDA viewed Red No. 3 cancer risks as small—about 1 in 100,000 over a seventy-year lifetime—the agency banned provisional listings because of Delaney directives. At the same time, Red No. 3 has “permanent” listings for food and drug uses that are still allowed, although the agency has announced plans to propose revoking these uses as well. For now, Red No. 3 can be used in foods and oral medications. Products such as maraschino cherries, bubble gum, baked goods, and all sorts of snack foods and candy may contain Red No. 3. ASP

FD and C RED NO. 3 ALUMINUM LAKE • The aluminum salt of certified FD and C Red No. 3 (see). Was terminated February 1, 1990. See FD and C Colors, Lakes. BAN

FD and C RED NO. 4 • A monoazo color and coal tar. Used in mouthwashes, bath salts, and hair rinses. The FDA banned it in food in 1964 when it was shown to damage the adrenal glands and bladders of dogs. The agency then relented and gave it provisional license for use in maraschino cherries. It was banned in all food in 1976 because it was shown to cause urinary bladder polyps and atrophy of the adrenal glands in animals. It was also banned in orally taken drugs but is still permitted in cosmetics for external use only. See FD and C Colors. BAN

FD and C RED NO. 20 • Permanently listed by the FDA in 1983 for general use in drugs and cosmetics (except in areas around the eyes).

FD and C RED NO. 22 • Permanently listed by the FDA in 1983 for general use in drugs and cosmetics (except in areas around the eyes).

FD and C RED NO. 40 • Allura Red AC. Newest color. Used widely in the cosmetics industry. Approved in 1971, Allied Chemical has an exclusive patent on it. It is substituted for FD and C Red No. 4 in many cosmetics, food, and drug products. Permanently listed because unlike the producers of “temporary” colors, this producer supplied reproductive data. However, many American scientists feel that the safety of Red No. 40 is far from established, particularly because all the tests were conducted by the manufacturer. Therefore, the dye should not have received a permanent safety rating. The National Cancer Institute reported that p-credine, a chemical used in preparation of Red No. 40, was carcinogenic in animals. In rats, a high (3,800-8,350 mg/kg) oral dose of the coloring caused adverse reproductive effects. The FDA permanently listed Red No. 40 for use in foods and ingested drugs and cosmetics, including use around the eye area. Its lake (see) is permitted only for drug and cosmetic use. The British and European Parliament, at this writing, are seeking to ban it because of its adverse affect on hyperactivity in children. See also Azo Dyes and FD and C Colors. ASP E

FD and C RED NO. 40 ALUMINUM LAKE • See FD and C Lakes. ASP

FD and C RED NO. 40 CALCIUM LAKE • See FD and C Lakes. ASP

FD and C VIOLET NO. 1 • Used as a coloring matter in gelatin desserts, ices, carbonated beverages, dry drink powders, candy, confections, bakery products, cereals, puddings, and as the dye used for the Department of Agriculture's meat stamp. A Canadian study in 1962 showed the dye caused cancer in 50 percent of the rats fed the dye in food. The FDA did not consider this valid evidence since the exact nature of the dye used could not be determined, and all records and specimens were lost and not available for study. Furthermore, previous and subsequent studies have not confirmed evidence of Violet 1 causing cancer in rats. However, a two-year study with dogs did show noncancerous lesions on the dog's ears after being fed Violet 1. The FDA again felt the study was not adequate but that the ear lesions did appear to be dye related and that perhaps two years may be too short a period to determine the eventual outcome. The FDA ruled on October 28, 1971, that Violet 1 should remain provisionally listed pending the outcome of a new dog study to be started as soon as possible and to last seven years. The FDA finally banned the use of Violet 1 in 1973. In 1976, however, the U.S. Department of Agriculture found that Violet 1 was still being used as a “denaturant” on carcasses, meats, and food products. The USDA ruled that any such use of mixing Violet 1 with any substance intended for food use would cause the final product to be “adulterated.” See FD and C Colors. BAN

FD and C YELLOW NO. 5 • Tartrazine. A lemon yellow coal-tar derivative, this is a pyrazole color used in prepared breakfast cereals, imitation strawberry, jelly, bottled soft drinks, gelatin desserts, ice cream, sherbets, dry drink powders, candy, confections, bakery products, spaghetti, and

puddings. Also used as a coloring in hair rinses, hair-waving fluids, and in bath salts. Causes allergic reactions in persons sensitive to aspirin. The certified color industry petitioned for permanent listing of this color in February 1966, with no limitations other than good manufacturing practice. However, in February 1966, the FDA proposed the listing of this color with a maximum rate of use of 300 ppm in food. The color industry had objected to the limitations. Yellow No. 5 was thereafter permanently listed as a color additive without restrictions. Rated 1A by the WHO—acceptable in food. It is estimated that half the aspirin-sensitive people plus 47,000 to 94,000 others in the nation are sensitive to this dye. It is used in about 60 percent of both over-the-counter and prescription drugs. Efforts were made to ban this color in over-the-counter pain relievers, anti-histamines, oral decongestants, and prescription antiinflammatory drugs. Aspirin-sensitive patients have been reported to develop life-threatening asthmatic symptoms when ingesting Yellow No. 5. Since 1981 it is supposed to be listed on the label if it is used. Its lake (see) is for drug and cosmetic use only. There is reported use of the chemical; it has not yet been assigned for toxicology literature. See FD and C Colors. ASP

FD and C YELLOW NO. 5 ALUMINUM LAKE • For drug and cosmetic use only. See FD and C Yellow No. 5, Colors, Lakes. ASP

FD and C YELLOW NO. 5 CALCIUM LAKE • See FD and C Lakes. EAF

FD and C YELLOW NO. 6 • Monoazo. Sunset Yellow FCF. A coal-tar, monoazo color, used in carbonated beverages, bakery products, candy, confectionery products, gelatin desserts, and dry drink powders. It is also used in hair rinses as well as other cosmetics. It is not used in products that contain fats and oils. Since there is evidence that this causes allergic reactions, alcoholic beverages that contain it must list it on the label according to the Bureau of Alcohol. Rated 1A by the WHO—acceptable in foods. Permanently listed December 22, 1986. In 1989, a ruling went into effect that it had to be listed on the labels because of its ability to induce allergic reactions. The British and the European Parliament, at this writing, are seeking to ban it because of its reported effects on hyperactive behavior in young children. On the U.S. Codex Committee on Food Additives and Contaminants high priority list for toxicology studies. See FD and C Colors. ASP. E

FD and C YELLOW NO. 6 ALUMINUM LAKE • See FD and C Yellow No. 6, Colors, Lakes. ASP

FD and C YELLOW NO. 6 CALCIUM LAKE • See FD and C Lakes. EAF

FECULOSE STARCH ACETATE • See Modified Starch.

FEED • Substance under the Food Additives Amendment added directly to feed.

FEMA • Stands for the Expert Panel of the Flavor and Extract Manufacturers Association. In 1960, the organization created the FEMA GRAS program in which "the safety of flavor ingredients would be evaluated for potential GRAS [see] status by an independent panel of experts in the fields of chemistry, toxicology, pharmacology, medicine, pathology, and flavor assessment." The FDA has acknowledged the validity of the FEMA GRAS program and has recognized the FEMA GRAS publications as "reliable industry GRAS lists."

FENAMIPHOS • A worm killer used in animal feeds, pineapples, and raisins. The FDA's residue tolerance is 25 ppm in citrus oil, 0.3 ppm in raisins, 5 ppm in dried apple pomace, 2.5 ppm in citrus molasses, 10 ppm in pineapple bran, and 3 ppm in raisin waste when used for animal feed. The EPA considers it extremely hazardous. Poison by ingestion, inhalation, and skin contact.

FENARIMOL • White odorless crystals used as a fungicide in animal feed and apples. Limited to 0.2 ppm in wet and dry apple pomace when used for animal feed. The FDA residue tolerance for meat and meat by-products of cattle, goats, hogs, or sheep is 0.01 ppm; as a residue in fat, kidney, and livers of cattle, sheep, hogs, goats, and poultry, it is 0.1; in eggs, 0.01; in milk, 0.003. Moderately toxic by ingestion. Caused mutations in experimental animals.

FENBENDAZOLE • Panacur. Animal drug used to combat worms in animal feed and in beef and pork. FDA tolerance of residues in liver of cattle is 0.8 ppm, 5 ppm in swine muscle, and 20 ppm in swine kidney and skin. Can cause mutations.

FENCHOL • See Fenchyl Alcohol.

d-FENCHONE • A synthetic flavoring occurring naturally in common fennel (see). It is an oily liquid with a camphor smell and practically insoluble in water. Used in berry, liquor, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and liquors. ASP

FENCHYL ALCOHOL • A synthetic berry, lime, and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

FENNEL • Common. Sweet. One of the earliest known herbs from the tall beautiful shrub. The fennel flowers appear in June and are bright yellow, with a characteristic fennel taste. Common fennel is used as a sausage and spice flavoring for beverages, baked goods, meats, and condiments. Sweet fennel has the same function but includes ice cream, ices, and candy. Sweet fennel oil is used in raspberry, fruit, licorice, anise, rye, sausage, root beer, sarsaparilla, spice, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, condiments, meats, and liquors. Organic cosmeticians use compresses of fennel tea to soothe inflamed eyelids and watery eyes. May cause allergic reactions. GRAS. ASP

FENOXAPROP-ETHYL • Acclaim. Furore. Puma. Whip. A selective postemergent herbicide to control grassy weeds in broad-leaved crops and turf grass. The FDA limits residue to 0.05 ppm on cottonseed, peanuts, peanut hulls, rice grain, and soybeans. The tolerance limits in meat, meat by-products, and fat of cattle, goats, hogs, and sheep is also 0.05 ppm, and in milk, 0.02 ppm.

FENPROSTALENE • Bovilene. An animal drug used to treat beef. FDA residue limits 20 ppb in liver; from 10 to 30 ppm in uncooked edible parts, and 100 ppb at injection site in cattle. A prostaglandin used to induce abortion in feedlot heifers and for estrus control in beef and nonlactating dairy cattle.

FENRIDAZON • A pesticide. The residues allowed by the FDA in fat, meat, and meat by-products of cattle, goats, hogs, and sheep is 0.5 ppm. Residues in kidney and liver of cattle, goats, hogs, and sheep is 1 ppm. Residues in eggs and milk is 0.05 ppm and in poultry, fat, meat, and meat by-products, 0.3 ppm.

FENTHION • Mercaptophos. Widely used insecticide in fish, meat, and sauces. The FDA limits residues in grass, alfalfa, and rice as well as in fat, meat, and meat byproducts of hogs, poultry, and in milk to 1 ppm. EPA Genetic Toxicology Program (see). A human poison by any route. Caused tumors and birth defects in experimental animals. See Organophosphates.

FENUBTATIN OXIDE • A spider and mite-killing compound. The FDA now has a project under way to develop a method to evaluate residues on apples, oranges, and cucumbers as to toxicity. At this writing, the agency does not have a method to identify this pesticide.

FENUGREEK SEED • Greek Hay. An annual herb grown in southern Europe, North Africa, and India. The seeds are used in making curry. Fenugreek is a butter, butterscotch, maple, black walnut, and spice flavoring for beverages, ice cream, ices, candy, baked goods, syrups, meats, and condiments. The extract (see) is a butter, butterscotch, caramel, chocolate, coffee, fruit, maple, meat, black walnut, walnut, root beer, spice, and vanilla flavoring additive for beverages, ice cream, ices, pickles, liquors, and icings. The oleoresin (see) is a fruit, maple, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, puddings, and syrups. GRAS. ASP

FENVALERATE • Sumifly. An insecticide used in animal feed, sunflower seeds, and tomatoes. Insecticide residue tolerance of 0.05 ppm on all food items. Limitation of 20 ppm in animal feed. Cyanide and its compounds are on the Community Right-to-Know List. Poison by ingestion. Moderately toxic by skin contact. Highly toxic to fish and bees. Corrosive and causes eye damage. A skin irritant.

FERMENTATION DERIVED MILK-CLOTTING ENZYME • Used in the production of cheese as permitted by standards of identity (see).

FERMENTED AMMONIATED CONDENSED WHEY • See Whey.

FERRIC AMMONIUM CHLORIDE • A nutrient. See Ferric Chloride. GRAS

FERRIC AMMONIUM CITRATE • Food and water purification. Green powder very soluble in water and has a mild iron-metallic taste. It is odorless, and its solutions are acid to litmus. GRAS. EAF

FERRIC CHLORIDE • Flavoring additive for various foods. EPA Genetic Toxicology Program (see). Withdrawn as a coloring additive. Moderately toxic by ingestion. Corrosive. Causes adverse reproductive effects in experimental animals. GRAS as a nutrient. ASP

FERRIC CHOLINE CITRATE • See Iron Salts.

FERRIC CITRATE • Odorless white crystals with a metallic taste. Used as a nutrient supplement in various foods. See Ferric Chloride. GRAS. NUL

FERRIC ORTHOPHOSPHATE • See Iron Salts.

FERRIC OXIDE • Occurs naturally as hematite ore and rust and is used in pigments and metal polishes and on magnetic tapes. Underground hematite miners have a higher incidence of lung cancer. No conclusive carcinogenic effect was observed in mice, hamsters, or guinea pigs given ferric oxide intratracheally or by inhalation. Ferric oxide is not classifiable as to its carcinogenicity to humans, according to IARC (see). ASP

FERRIC PEPTONATE • Nutrient. GRAS. NUL

FERRIC PHOSPHATE • A nutrient supplement. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and should continue its GRAS status with limitations on the amounts that can be added to food. See Iron Salts. GRAS. ASP

FERRIC PYROPHOSPHATE PYROPHOSPHATE • Nutrients. There is reported use of the chemical; it has not yet been assigned for toxicology literature by the FDA. See Iron Salts. GRAS. ASP

FERRIC SODIUM PYROPHOSPHATE • Iron salt known as the “oxygen carrier.” It has the ability to carry oxygen to all the cells of the body for use in conversion to energy. Homeopaths use it to combat inflammation, infections, fevers, colds, acute anemia, blood loss, fatigue, acute ear pain, headaches, and other issues with symptoms of redness, throbbing, and heat. GRAS. NIL

FERRIC SULFATE • A flavoring additive. There is reported use of the chemical; it has not yet been assigned for toxicology literature. See Iron Salts. GRAS. ASP

FERROCHOLINATE • Greenish brown solid used as a nutrient supplement. See Iron Salts.

FERROCYANIDE SALTS • Salts of ferrocyanic acid obtained by the reaction of cyanide with an iron sulfate. Used as a coloring. ASP

FERROUS ASCORBATE • Blue-violet solid used as a nutrient supplement. See Iron Salts. GRAS. NUL

FERROUS CARBONATE • A nutrient supplement. See Iron Salts. GRAS. NIL

FERROUS CITRATE • A nutrient supplement. See Iron Salts. GRAS. NUL

FERROUS COMPOUNDS • Synthetic nutrient supplements derived from iron.

FERROUS FUMARATE • Dietary supplement. Used in special dietary foods. See Iron Salts. GRAS. ASP

FERROUS GLUCONATE • Gluconic Acid. Iron Salt. Iron Gluconate. A nutrient and also used as a food coloring for ripe olives only. It is also used to treat iron-deficiency anemia. It may cause gastrointestinal disturbances. When painted on mouse skin in 2,600 milligram doses per kilogram of body weight, it caused tumors. GRAS. ASP. E

FERROUS LACTATE • Lactic Acid. Iron Salt. Iron Lactate. Greenish white crystals that have a slightly peculiar odor. It is derived from the interaction of calcium lactate with ferrous sulfate or the direct action of the lactic acid on iron fillings. It is used as a food additive and dietary supplement. Used to color black olives. Causes tumors when injected under the skin of mice. GRAS. ASP. E

FERROUS PEPTONATE • An organic form of iron (see). NUL

FERROUS SULFATE • Green or Iron Vitriol. A source of iron used medicinally. See Iron Salts. GRAS. ASP

FERROUS SULFATE HEPTAHYDRATE • Pale green crystals or granules used as clarifying additive, dietary supplement, nutrient supplement, processing aid, or stabilizer in baking mixes, cereals, infant foods, pasta products, and wine. Moderately toxic by ingestion. Caused mutations in rats. Withdrawn by the FDA as a coloring additive for food. See Iron Salts. BAN

FERULA ASAFOETIDA • See Asafetida Extract.

FETOTOXICITY • A compound-induced toxic effect on the fetus during the latter phase of pregnancy.

FIBER • Commonly termed “bulk”—the indigestible carbohydrates, including cellulose, hemicellulose, and gums. Fiber is added to food to reduce calorie content, as a thickening additive, and a stabilizer. If an apple a day keeps the doctor away, it may be because of the fiber content. Scientists have suspected that the high intestinal cancer rate in the United States may be linked to the 80 percent decrease of consumption of fiber in the average diet during the past century. Essentially, there are three classes of fiber found in the fruit, leaves, stems, seeds, flowers, and roots of different plants. The first class is the insoluble cellulose found in the plant-cell wall. Some of the other polysaccharides constitute a second class and are also found in the cell wall (hemicellulose and pectic polyerms), in the endosperm of seeds (mucilages), or in the plant's surface (gums). The third class, the lignins, are noncarbohydrates that infiltrate and contribute to the death of the plant cell, which then becomes part of the woody reinforcing plant structure. Enzymes from a number of the more than four hundred kinds of bacteria in the human colon are capable of digesting many components of plant fiber. Doctors have found that the water-holding capacity of some fibers may be helpful in treating colon disease. The fiber's bile absorption properties might be used in modifying cholesterol metabolism. Plant fibers are also capable of binding trace metals and bile acids. These properties modify the action of the gut contents. Fibers pass through the gut somewhat like a sponge, probably altering metabolism in the intestine. The fibers appear to protect intestinal cells by removing foreign substances, such as carcinogens produced by charbroiling. Increased fiber consumption has been recommended for relief of some symptoms of diverticular disease, irritable bowel syndrome, and constipation.

FICIN • An enzyme occurring in the latex of tropical trees. A buff-colored powder with an acrid odor. Absorbs water. Concentrated and used as a meat tenderizer. Ten to twenty times more powerful than papain tenderizers. Used to clot milk, as a protein digestant in the brewing industry, and as a chill-proofing additive in beer. Also used in cheese as a substitute for rennet in the coagulation of milk, and for removing casings from sausages. Can cause irritation to the skin, eyes, and mucous membranes, and in large doses can cause purging. GRAS. ASP

FIELD POPPY EXTRACT • Extract of the petals of Papaver rhoeas used in coloring and as an odorant.

FILLED MILK • A combination of skim milk and vegetable oil to replace milk fat. Usually has the same amount of protein and calories as whole milk. Used as a milk substitute. It often contains the high cholesterol fatty acids (see) of coconut oil.

FINOCCHIO • See Fennel.

FIR NEEDLE OIL • Fir Oil. Pine. Balsam. An essential oil obtained by the steam distillation of needles and twigs of several varieties of pine trees native to both Canada and Siberia. Used as a flavoring. ASP

FIR NEEDLES AND TWIGS • Abies sibirica. Flavoring. See Fir Needle Oil. EAF

FISH GLYCERIDES • See Fish Oil and Glycerin.

FISH OIL • Fatty oil from fish or marine mammals, predominantly Sardine, Anchovy, and Tuna Oil. Used as direct food ingredients in the food categories listed at levels that are no more than 67 percent of the levels specified. Included are baked goods and baking mixes, cereals, cheese products, chewing gum, condiments, confections and frostings, dairy products, egg products, fats and oils (not in infant formulas) fish products, frozen dairy desserts, gelatins, puddings, gravies, hard candy, jams and jellies, meat products, milk products, nut products, pastas, plant protein products, poultry products, processed fruit juices, processed vegetable juices, snack foods, soft candy, soup mixes, sugar substitutes, sweet sauces, toppings, syrups, and white granulated sugar. The GRAS notice from the producers describes fish oil (predominantly sardine and anchovy) as an eicosapentaenoic acid (EPA)-rich oil and tuna oil as a docosahexaenoic acid (DHA)-rich oil and are GRAS, through scientific procedures, for use as direct food ingredients. Puleva Biotech concludes that its fish oils are safe for use as a direct ingredient provided that the combined daily intake of EPA and DHA from consumption of foods containing these fish oils does not exceed 3 g/p/d and that these fish oils are added as the sole source of EPA and DHA in any given food category. Rich in Omega-3 fatty acids which are reported to reduce fat in human blood. ASP

FISH PROTEIN CONCENTRATE WHOLE AND ISOLATE • Dietary supplement. ASP

5-A-DAY • Refers to the dietary recommendation to consume five servings of fruits and vegetables every day. The tagline 5-a-day became a promotional message in campaigns to increase fruit and vegetable consumption.

FIXATIVE • A chemical that reduces the tendency of an odor or flavor to vaporize by making the odor or flavor last longer. An example is musk (see), which is used in perfume and undecylaldehyde as a fixative for citrus flavors.

FK/AD • The abbreviation for a substance used in conjunction with flavors.

FL/ADJ • Substance used in conjunction with flavors.

FLAV • The abbreviation for natural flavoring agent.

FLAVONOIDS • A large group of compounds widely distributed throughout nature. They include quercetin, present in onion skins, and anthocyanins, the major commercially used group. See Bioflavonoids.

FLAVOPHOSPHOLIPOL • An antibiotic used as an antimicrobial growth promoter (AMGP) in animal feeds, although some studies show that this substance does not cause as much antibiotic-resistant bacteria as some other antibiotics used in feed. EU and U.S. agencies believe that it might cause resistance in humans because it is used in human medicine.

FLAVOR ENHANCER • An ingredient that has little or no taste or smell on its own in a standard dose, but which can complement, enhance, or otherwise modify the flavor of a food. This may take the form of a flavor modifier or a flavor potentiator (see).

FLAVOR MODIFIER • A substance that enhances, suppresses, or otherwise changes a food's flavor.

FLAVOR POTENTIATOR • A substance that can increase the “perceived intensity” of the flavor of another substance. One of the newest and fastest-growing categories of additives, potentiators enhance the total seasoning effect, generally without contributing any taste or odor of their own. They are effective in minute doses—in parts per million or even less. Potentiators produce no identifiable effect themselves but exaggerate one's response. They alter the response of the sensory nerve endings on the tongue and in the nose. The first true potentiators in the United States were the 5'-nucleotides, which are derived from a natural seasoning long in use in Japan: small flakes of dry bonito (a tunalike fish) are often added to modify and improve the flavor of soups, and from bonito a 5'-nucleotide, disodium inosi-nate (see), has been isolated and identified as a flavor potentiator. Another 5'-nucleotide is disodium guanylate (see), one of the newer additives on the market, which gives one a sensation of “fullness” and “increased viscosity” when eating. The product is advertised as being able to give diners a sense of “full-bodied flavor” when ingesting a food containing it.

FLAVORING COMPOUND • A flavoring composed of two or more substances. The substances may be natural or synthetic, and they are usually closely guarded secrets. Normally, a flavoring compound is complete; that is, it is added to a food without any additional flavorings being necessary. A strawberry flavoring compound, for example, may contain twenty-eight separate ingredients before it is complete.

FLAVORINGS • There are more than two thousand flavorings added to foods, of which approximately five hundred are natural and the rest synthetic. This is the largest category of additive. Lemon and orange are examples of natural flavorings, whereas benzaldehyde and methyl salicylate (see both) are examples from the laboratory. It would neither be realistic to require, nor meaningful to consumers to be provided with, the chemical names of the individual flavoring substances present, even if they could all be identified. An apple, for example, contains over a thousand natural flavoring substances. Some common flavorings may contain substances that can be toxic if consumed in excess. The levels of these substances in foods usually remain well below toxic levels, and the flavorings containing them are themselves mostly used in very small quantities. To guard against unsafe levels of toxicants, some maximum levels are specifically listed in the Code. Standard 1.4.1 of Contaminants and Natural Toxicants covers natural toxicants that can be present in foods as a result of the use of flavoring agents or from other sources in certain foods. Clause 4 of this standard contains a table listing certain natural toxicants that can result in foods from the use of flavorings, the foods these substances can be present in or added to, and the maximum level of natural toxicant permitted. When one or more components of a mixed food contains natural toxicants, these can be carried over into the final mixed food product. A mixed food is one that is prepared from other foods (e.g., cheese coated with nuts, battered fish, pizza). Clause 1(6) of Standard 1.4.1 gives a formula for calculating how much of a natural toxicant may be present in a mixed food from the addition of a flavoring substance.

FLAVORIST • A professional in the flavor industry that compounds the final flavors as a building block for creating the final flavor.

FLAX • The seed of the flax plant may be “hidden” in cereals and the milk of cows fed flaxseed. It is also in flaxseed tea and the laxative Flaxolyn. It is a frequent allergen when ingested, inhaled, or in direct contact. Flaxseeds are the source of linseed oil. Among other hidden sources are dog food, Roman meal, and muffins.

FLEABANE OIL • Oil of Canada Fleabane. Erigeron Oil. The pale yellow volatile oil from a fresh flowering herb. It takes its name from its supposed ability to drive away fleas. Used in fruit and spice flavorings for beverages, ice cream, ices, candy, baked goods, and sauces.

FLOUR • Primarily consists of five nutrients: fat, minerals, moisture, starches, and proteins. Fat and minerals each generally account for less than 1 percent of flour's content. The moisture content of flour is also relatively low—when packaged, it cannot exceed 15 percent under government standards. But its actual moisture content varies depending on climatic conditions and storage. In damp areas, flour absorbs moisture from the atmosphere. Starches compose 63 percent to 77 percent of flour and are necessary for the absorption of moisture during baking. This process, known as gelatinization, occurs primarily at temperatures above 1400° F (600°C). Starches also provide food for yeast during fermentation. Flour proteins are important because of their gluten-forming potential. Gluten is the tough, rubbery substance created when wheat flour is mixed with

water. Gluten strands are both plastic (i.e., they change shape under pressure) and elastic (they resume their original shape when that pressure is removed). Gluten is responsible for the volume, texture, and appearance of baked goods. It provides structure and enables dough to retain the gases given off by leavening agents. Without gluten, there could be no raised breads: the gases created by yeast fermentation or chemical leaveners would simply escape if there were no network of gluten strands to trap them in the dough. The higher a flour's protein content, the greater that flour's gluten-forming potential. The proteins responsible for gluten formation are glutenin and gliadin. Some people cannot digest gluten and there are now special diet products without gluten.

FLOUR, BLEACHED • While aging, flour turns white through a natural oxidation process referred to as bleaching. Natural aging and bleaching are somewhat unpredictable, time-consuming processes, however, so chemicals are now used to do both. Potassium bromate and chlorine dioxide gas rapidly age flour. Chlorine dioxide and other chemicals bleach flour by removing yellow pigments in order to obtain a uniform white color. Bleaching destroys small amounts of the flour's naturally occurring vitamin E, which is replaced in fortified or enriched products.

FLUAZIFOP-BUTYL • An herbicide used on animal feed. The FDA permits a residue of from 0.2 to 1 ppm on various feeds.

FLUCYTHRINATE • An herbicide used on animal feed. FDA tolerance is 10 ppm for apple pomace; 0.2 on cottonseed oil; 0.1 ppm in cottonseed and corn grain, 2 on cabbage, 3 on corn forage, and 0.2 on sugar bagasse.

FLUORIDE • An acid salt used in toothpaste to prevent tooth decay. It is also added to drinking water for the same purpose. Nearly 70 percent of U.S. residents who get water from community water systems now receive fluoridated water, according to a study by the Centers for Disease Control and Prevention. The proportion of the U.S. population receiving fluoridated water, about 184 million people, increased from 65.8 percent in 1992 to 69.2 percent in 2006, said the study published in the Morbidity and Mortality Weekly Report. See Sodium Fluoride.

FLUORIDONE • An herbicide. The FDA residue tolerance in fish and crayfish is 0.05 ppm; as a residue in milk and eggs, 0.05 ppm; as a residue in fat, meat, and meat by-products of cattle, goats, or hogs, 0.05 ppm. As a residue in kidney and liver of cattle, hogs, or goats, 0.1 ppm, and 0.1 to 1 ppm as a residue on various fruits and vegetables.

FLUORINE COMPOUNDS • Calcium Fluoride. Hydrofluorsillic Acid. Potassium Fluoride. Sodium Fluoride. Sodium Silicofluoride. Fluorine is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. All have been used in the fluoridation of water. Fluorides cross the placental barrier and the effects on the fetus are unknown. New clinical evidence shows that kidney disturbance sometimes is due to the amount of fluoride it contributes to the blood. Fluorine-containing compounds (sodium, potassium, or calcium fluoride) are illegal. A petition for extension in dietary supplements was terminated in 1973. Addition of fluorine compounds to food is limited to that from fluoridation of public water supplies and to that resulting from the fluoridation of bottled water within limits set by the FDA. The Commissioner of Food and Drugs has concluded that it is in the interest of the public health to limit the addition of fluorine compounds to foods to that resulting from the fluoridation of public water supplies and to that resulting from the fluoridation of bottled water. There is no information available from studies on humans to determine what effects can result from being exposed to individual PAHs like fluorine. However, breathing PAHs and skin contact seem to be associated with cancer in humans. The U.S. Environmental Protection Agency (EPA) has indicated that not enough information exists to classify fluorine as a cancer-causing substance but it is on the EPA's Priority List of Toxic Chemicals to be studied. It is number 211 on the CERCLA Priority List of Hazardous Substances (see).

FLUOMETURON • Herbicide. Reputedly a practically nontoxic compound. It is, however, in the EPA's (see) toxicity class II due to its potential to cause skin sen-sitization. Labels of fluometuron products must bear the signal word WARNING. Fluometuron is a selective herbicide that acts on susceptible plants by inhibiting photosynthesis. Fluometuron is registered by the EPA exclusively for use on cotton and sugarcane. It can be applied preemergence, for weed control before planting, or postemergence, after target crops and weeds come up, and may have residual activity for several months.

4'-FLUORO-4-(4-[2-PYRIDYL]-1p IPERAZINYL)BUTYROPHENONE • Azap-erone. Suicahn. A sedative and tranquilizer used on animals. Poison by ingestion.

FOAM INHIBITOR • An antifoaming additive such as dimethyl polysiloxane (see) used in chewing-gum bases, soft drinks, and fruit juices to keep them from foaming. See Defoaming Additive.

FOAM STABILIZERS • Used in soft drinks and brewing. See Vegetable Gums.

FOAMING ADDITIVE • Used to help whipped topping peak when it is being whipped with cold milk. A commonly added foaming additive is sodium caseinate (see).

FOLIC ACID • A yellowish orange compound and member of the vitamin B complex, used as a nutrient. Occurs naturally in liver, kidney, mushrooms, and green leaves. Aids in cell formation, especially red blood cells. As of January 1, 1998, manufacturers of enriched breads, flours, cornmeals, pastas, rice, and other grain products were required to add the nutrient folic acid to their products—a move to reduce the risk of neural tube birth defects in newborns. Folic acid, when consumed in adequate amounts by women before and during early pregnancy, reduces the risk of such birth defects as spina bifida. It is estimated that folic acid supplementation will reduce by about two thousand per year the number of American babies born with birth defects. It took ten years for U.S. government agencies to recommend that “all women of childbearing age in the United States who are capable of becoming pregnant should consume 0.4 mg. of folic acid per day for the purpose of reducing their risk of having a pregnancy affected by spina bifida or other neural tube defects.” ASP

FOOD ALLERGEN LABELING AND CONSUMER PROTECTION ACT OF 2004 • FALCPA. This act amends the Federal Food, Drug, and Cosmetic Act to require that the label of a food that is or contains an ingredient that bears or contains a “major food allergen” declare the presence of the allergen. FALCPA defines a “major food allergen” as one of eight foods or food groups (i.e., milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans) or a food ingredient that contains protein derived from one of those foods. The Alcohol and Tobacco Tax and Trade Bureau (TTB) of the Department of the Treasury regulates, under the Federal Alcohol Administration Act, alcohol beverages. TTB subsequently announced that it is considering rulemaking to require allergen labeling for alcohol beverage products.

FOOD-BORNE DISEASE • Disease, usually gastrointestinal, caused by organisms or their toxins carried in ingested food. Also commonly known as “food poisoning.”

FOOD GUIDE PYRAMID • The Food Guide Pyramid is a graphic design used to communicate the recommended daily food choices contained in the 1995 Dietary Guidelines for Americans. The information provided is developed and promoted by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services. The Food Guide Pyramid shows at its wide base what should form the foundation of a healthful diet—six to eleven servings daily from the bread, cereal, rice, and pasta group. The next level up the tapered pyramid is divided between the vegetable group, three to five servings daily, and the fruit group, two to four servings daily. The next level up the narrowing pyramid is divided between the milk, yogurt, and cheese group, two to three servings daily, and the meat, poultry, fish, dry beans, eggs, and nuts group, two to three servings daily. The smallest part of the pyramid at the top shows the fats, oils, and sweets in the diet that should be used sparingly.

FOOD QUALITY PROTECTION ACT OF 1996 • FQPA. This act repealed the prohibition on cancer-causing pesticides in processed foods that exceed

these raw agricultural commodity tolerances and added a new, more restrictive safety standard that allows no more than a one-in-one-million risk of cancer from pesticide residues in both raw and processed foods

FOOD RED 6 • Formerly Ext. FD and C Red No. 15, FD and C Red No. 1, and Ponceau 3R. One of the first approved certified coal-tar colors. Food Red 6 was delisted as a food additive as possibly harmful. Dark red powder, it changes to cherry red in solution. See FD and C Colors.

FOOD STANDARDS • Standards of Identity. The FDA and USDA previously established a "recipe" for about three hundred foods, such as peanut butter and mayonnaise, fixing the ingredients by law. Many of these foods were exempted from the need for ingredient listings. The new labeling law, effective in 1994, requires manufacturers to give full ingredient listings for all foods.

FOOD STARCH ESTERFIED WITH n-OCTENYL SUCCINIC ANHYDRIDE TREATED WITH BETA-AMYLASE • Esters (see) and enzymes such as beta-amylase change the properties of a compound, often making it more soluble or reducing its allergenic potential. See Modified Starch.

FOOD STARCH MODIFIED • Various chemicals are permitted in modifying food starch and are listed under individual chemical names. See Modified Starch.

FORMALDEHYDE • Paraformaldehyde. Preservative in defoaming additives and in animal feeds. A colorless gas obtained by the oxidation of methyl alcohol and generally used in watery solution. Formaldehyde generally is known as a disinfectant, germicide, fungicide, defoamer, and preservative and is used in animal feed, in defoaming additives, and embalming fluid. One ounce taken by mouth causes death within two hours. Skin reaction after exposure. It is a highly reactive chemical that is damaging to the hereditary substances in the cells of several species. It causes lung cancer in rats and has a number of other harmful biological consequences. Researchers from the Division of Cancer Cause and Prevention of the National Cancer Institute recommended in April 1983 that since formaldehyde is involved in DNA damage and inhibits its repair, and potentiates the toxicity of X-rays in human lung cells, and since it may act in concert with other chemical additives to produce mutagenic and carcinogenic effects, it should be "further investigated." The question is whether we intake any formaldehyde when we ingest the animals that ate the feed and the products that underwent "defoaming" by formaldehyde. The ADI (see) set for formaldehyde is 3 mg/kg of body weight. Researchers at Italy's University of Milan studied the health risk from consumption of cheese made using formaldehyde (grana padano) and concluded there was no appreciable health risk. ASP

FORMALIN • Fungicide in water of salmon, trout, largemouth bass, catfish, and bluegills. See Formaldehyde. ASP

FORMESAFEN SODIUM • A pesticide used on soybeans. FDA tolerance is 0.05 ppm on soybeans.

FORMETANATE HYDROCHLORIDE • A pesticide in citrus molasses resulting from application to growing fruit. The FDA tolerance is 10 ppm in citrus and 8 ppm on growing fruit.

FORMIC ACID • Colorless, pungent, highly corrosive, it occurs naturally in apples and other fruit. Used as a decalcifier and for dehairing hides. Chronic absorption is known to cause albuminuria—protein in the urine. It caused cancer when administered orally in rats, mice, and hamsters in doses from 31 to 49 milligrams per kilogram of body weight. Used as a preservative for silage. Silage is not supposed to be fed to livestock within four weeks of treatment. FDA residue tolerance is 2.25 percent of silage on a dry basis and 0.45 percent when direct cut. ASP

FORMIC ETHER • See Ethyl Formate.

2-FORMYL-6,6-DIMETHYLBICYCLO(3.1.1)HEPT-2-ENE Myrtenal • Flavoring. Colorless liquid; refreshing, spicy-herbaceous odor from the genus Astartea (Myr-taceae) ranges from small (0.1-0.5 m) shrubs to small trees. The genus occurs primarily in the extreme southwest of western Australia in damp habitats such as swamps. Workers handling the substance may have eye and skin irritation. Ingestion may cause gastrointestinal irritation with nausea, vomiting, and diarrhea. Inhalation may cause respiratory tract irritation. Chronic effects may be delayed. ASP

FORTIFIED • Fortification of food refers to the addition of nutrients such as vitamin C to breakfast drinks and vitamin D to milk. It actually increases the nutritional values of the original food.

FOS • The abbreviation for fructooligosaccyarides (see).

FQPA • The abbreviation for the Food Quality Protection Act of 1996 (see).

FRANKINCENSE • Aromatic gum resin obtained from African and Asian trees and used chiefly as incense. For food use, see Olibanum Extract.

FREE • Product contains none or only insignificant amounts of a substance.

FREE RADICALS • Certain oxygen molecules that are underlying factors in aging and degenerative diseases because they damage DNA, the blueprint for life, within the cells. They also adversely affect enzymes, the workhorses of the cells, and damage cell membranes. Free radicals are formed during the course of normal metabolism, as well as from exposure to cigarette smoke and other environmental influences. Fat-soluble antioxidants, beta-carotene and other carotenoids, as well as vitamins C and E and pycnogenol (see), are believed to fight the damage from free radicals.

FRESH • A food that has not been heat processed or frozen and supposedly contains no preservatives.

FRUCTOOLIGOSACCHARIDES • FOS. Sugars that occur naturally in plants such as tomatoes, onions, and bananas. They are not digestible in the stomach and travel unabsorbed to the intestine. In the intestines they promote the growth of beneficial bacteria such as those used to culture yogurt. They are now used in poultry feed to enhance growth and reduce intestinal pathogens. Applications have been made to use them as a food additive for human foods.

FRUCTOSE • A sugar occurring naturally in large numbers of fruits and honey. It is the sweetest of the foodstuffs. It is also used as a medicine, preservative, common sugar, and to prevent sandiness in ice cream. Researchers at the General Clinical Research Center at the University of Colorado School of Medicine in Denver report that fructose is absorbed in the gastrointestinal tract more slowly than sugars like sucrose, which contain glucose. As a result, even though the body converts some fructose to glucose, 80 to 90 percent of the sugar is absorbed intact, and there is only a slight increase in blood glucose levels immediately after consumption. Fructose can be up to two times sweeter than sucrose. However, in 2004, a Louisiana State biomedical researcher linked high-fructose corn syrup to the increase in obesity since the 1980s. Recent advances in enzyme technology have made it possible to produce fructose on a commercial scale. It caused tumors in mice when injected under the skin in 5,000-milligram doses per kilogram of body weight.

FRUIT JUICE • Used to color foods consistent with good manufacturing practices. Permanently listed. ASP

FSIS • Abbreviation for Food Safety and Inspection Service of the U.S. Department of Agriculture. Personnel are responsible for inspecting meat and poultry facilities.

FULLER'S EARTH • A white or brown naturally occurring earthy substance. A non-plastic variety of kaolin (see) containing an aluminum magnesium silicate. Used as an absorbent and to decolorize fats and oils. No longer permitted as a coloring in food. It is used to keep fish eggs from sticking together in hatcheries. ASP

FUM • The abbreviation for fumigant.

FUMARIC ACID • White, odorless, derived from many plants and essential to vegetable and animal tissue respiration; prepared industrially. An

acidulant used as a leavening additive and a dry acid for dessert powders and confections (up to 3 percent). Also as apple, peach, and vanilla flavoring additive for beverages, baked goods (1,300 ppm), and gelatin desserts (3,600 ppm). Used in baked goods as an antioxidant and as a substitute for tartaric acid (see). ASP. E

FUMARIC ACID FERROUS SALT • A dietary supplement. See Ferrous Fumarate.

FUMICANTS • Chemicals and gases used to kill pests on crops. Among those approved for use by the FDA are carbon tetrachloride with either carbon disulfide or ethylene chloride, with or without pentane; or methyl bromide. Also carbon disulfide, carbon tetrachloride, ethylene dichloride, and ethyl bromide. All are highly toxic and should be applied only by experts. Ethyl bromide is a cancer-causing agent.

FUNCTIONAL CONFECTIONERY MARKET • Promoted as containing health ingredients. See page 22 in the introduction.

FUNCTIONAL FOODS • Foods that may provide health benefits beyond basic nutrition. Expected to be the fastest growth sector of food additives.

FUNG • FDA abbreviation for fungicide.

FUNGAFLOR • Imazalil. Fungicide used in animal feed. Poison by ingestion and causes adverse reproductive effects in experimental animals.

FUNGAL HEMICELLUASE • Enzyme used in food processing. NUL

FUNGAL PECTINASE • Enzyme used in fruit juice and wine processing. See Pectins. ASP

FUNGI • A group of simple plantlike organisms that don't have the green coloring known as chlorophyll. Fungi include mushrooms, yeasts, rusts, molds, and smuts.

FUNGICIDE • Pesticide to kill fungi.

FURADAN • White crystalline solid widely used as an insecticide in animal feed. Limitation in animal feed is from 2 ppm in grape pomace to 24 ppm in peanut soap-stock fatty acids. Insecticide residue tolerance of 2 ppm in raisins. Extremely hazardous substance, it is on the EPA Genetic Toxicology Program (see). Poisonous by inhalation, ingestion, and skin contact. Causes birth defects in experimental animals.

2-FURALDEHYDE • See Furfural.

FURANS • Furans are extremely toxic and are also found with dioxins. They are created in two major ways: (1) by the processes used to manufacture some products; for example, certain pesticides, preservatives, disinfectants, flavorings, and paper products; (2) when materials are burned at low temperatures; for example, certain chemical products, leaded gasoline, plastic, paper, and wood. Furan resins are made by the polymerization or polycondensation of furfural, furfural alcohol (see both), or other compounds containing a furan ring, or by the reaction of these furan compounds with other compounds. Furans are persistent, bioaccumulative, and result predominantly from human activity. It is toxic and may be carcinogenic. The JECFA said because of its potential cancer-causing properties it could not receive a safety recommendation of the organization for flavorings. Several newer flavorings are from furans such as isoamyl 2-furanbutyrate, a synthetic chocolate, coffee, fruit, and whiskey flavoring additive for beverages, ices, candy, baked goods, and gelatin and 3-acetyl-2,5-dimethylfuran, a powerful, slightly roasted, nutty tasting liquid used as a flavoring. Dow Chemical says in the United States, the primary way people are exposed to dioxins and furans is through eating meat and dairy products. The animals we eat are exposed to background levels of dioxins and furans in the soil, on vegetation, and in some commercial animal feeds. Eating meat or dairy products exposes us to these low levels of dioxins and furans. Over time, we accumulate dioxins and furans in the fatty tissues of our own bodies. The JECFA says it has no safety concern at current levels of intake when used as a flavoring agent. On the U.S. EPA's top toxic chemicals list for priority study.

2-FURAN ACROLEIN • See Furyl Acrolein.

FURANMETHANETHIOL • Flavoring that occurs in coffee, cooked beef, and chicken. See Furfural.

2-FURANMETHANETHIOL FORMATE • Furfuryl Mercaptan. Flavoring. Colorless oily liquid; extremely powerful and diffusive odor, which on dilution becomes agreeable, coffeelike, caramellic-burnt, and sweet. ASP

4-([FURANMETHYL]THIO)-2-PENTANONE • Flavoring. Clear yellow liquid; meaty aroma. EAF

FURCELLERAN • Sodium, Calcium, Potassium, and Ammonium. Extracted from red seaweed grown in northern European waters. It is a natural colloid and gelling additive. The processed gum is used as an emulsifier, stabilizer, and thickener in foods. Also used in puddings, ice cream, and jams, in products for diabetics, as a carrier for food preservatives, and in bactericides. It is also used in over-the-counter drugs for weight reduction and toothpastes. On the FDA list of additives to be studied for mutagenic, teratogenic, subacute, and reproductive effects since 1980. It is reportedly more stable than vegetable gums. ASP

FURCELLERAN SALTS OF FURCELLERAN • See Furcelleran. ASP

FURFURAL • Artificial Ant Oil. 2-Furaldehyde, Furfuraldehyde,I, Fural, 2-Furancarboxaldehyde, Pyromucic Aldehyde, 2-Formylfuran, 2-Furylmethanal. A colorless liquid with a peculiar odor. Occurs naturally in angelica root, apples, coffee, peaches, and skim milk. Used as a solvent, insecticide, fungicide, to decolor resins, and as a synthetic flavoring in butterscotch, butter, caramel, coffee, fruit, brandy, rum, rye, molasses, nut, and cassia flavorings for beverages, ice cream, ices, candy, gelatin desserts, syrups (the biggest user; up to 30 ppm), and spirits. It irritates mucous membranes and acts on the central nervous system. Causes tearing and inflammation of the eyes and throat. Ingestion or absorption of 0.06 grams produces persistent headache. Used continually, it leads to nervous disturbances and eye disorders (including photosensitivity). The JECFA in June 1998 requested animal studies to investigate whether this additive interacts with DNA in mice and a ninety-day study in rats to identify a no-observed-effect level (NOEL) for liver damage. Other studies, however, have demonstrated different results: Exposure of rats to furfural by ingestion or subcutaneous injection caused unsteadiness, paralysis, seizures, coma, and changes in liver, kidneys, blood, and bone marrow. Cats exposed to 2,800 ppm for thirty minutes developed fatal pulmonary edema. Solutions to 10 percent and 100 percent furfural instilled in rabbits' eyes caused pain in addition to transient swelling and redness of the lids and conjunctivitis. Chronic dietary exposure to furfural caused liver cirrhosis in rats. Dogs exposed at 130 ppm for six hours a day for four weeks developed liver damage, but dogs exposed at 63 ppm did not. Rabbits exposed to furfural vapors for several hours daily developed liver and kidney lesions as well as changes in their blood. Furfural is mutagenic in at least one bacterial species. Furfural is an irritant of the skin, eyes, mucous membranes, and respiratory tract. Concentrations of 1.9 to 14 ppm produced headache, itching of the throat, and redness and tearing of the eyes in some exposed workers. Workers exposed to furfural vapors in a plant with inadequate ventilation reported numbness of the tongue and mucous membranes of the mouth, loss of taste sensation, and difficulty in breathing. Exposure to high concentrations has produced pulmonary edema. Damage to the eyesight of some individuals has also been reported. Chronic skin exposure may produce eczema, allergic skin sensitization, and photosensitization. A worker exposed to furfural who has consumed alcohol may experience warmth and redness of the face, a throbbing sensation and pain in the head and neck, difficulty in breathing, nausea, vomiting, sweating, thirst, chest pain, uneasiness, weakness, dizziness, blurred vision, and confusion. This effect may last from thirty minutes to several hours but does not appear to have residual side effects. By analogy with effects seen in animals—liver lesions, death from respiratory effects, tox-icity by ingestion—furfural may affect the central nervous system, liver, kidneys, blood, and bone marrow of humans; however, these effects have not been reported in exposed workers. Listed as a cancer-causing agent by the Environmental Defense Fund.

The JECFA evaluated a group of fifteen furfuryl derivatives by the Procedure for the Safety Evaluation of Flavoring agents. The group comprises the parent furfuryl alcohol, the corresponding aldehyde, furfural, five esters formed from furfuryl alcohol and simple aliphatic carboxylic acids, five esters formed from simple aliphatic alcohols and furoic acid, and three structurally related furfuryl derivatives (5-methylfurfural, 2-benzofurancarboxaldehyde, and 2-phenyl-3-carbethoxyfuran). These flavoring agents were grouped on the basis of the criterion that all are hydrolyzed and/or metabolized to furoic acid or a substituted furoic acid. The estimated daily per capita intakes of all fifteen substances in this group are below the threshold of concern. In the unlikely event that all foods containing them were consumed concurrently on a daily basis, the estimated combined intake would exceed the threshold for human intake. Given the "wide margin of safety" between the level of intake and the NOEL (see) for furfural, the JEFCA concluded that the combined intake would not raise concern about safety. ASP

FURFURAL ACETONE • A flavoring with a sweet balsamic, vanilla odor, woody odor and taste. Used in nut flavors. See Furfural and Acetone.

FURFURYL ACETATE • Acetic Acid. A synthetic raspberry, fruit, and ginger ale flavoring for beverages, ice cream, ices, candy, baked goods, and chewing gum. See Furfuryl Alcohol for toxicity. ASP

FURFURYL ALCOHOL • A synthetic flavoring obtained mainly from corncobs and roasted coffee beans. Derived from furfural. Has a faint burning odor and a bitter taste. Used in butter, butterscotch, caramel, coffee, fruit, and brandy flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and icings. Toxicity: Workers warned inhalation, ingestion, or skin contact may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Any skin contact should be avoided. Effects of contact or inhalation may be delayed. ASP

FURFURYL HEXANOATE • Flavoring with a green, fatty, musty, waxy taste. See Furfural.

FURFURYL MERCAPTAN • A synthetic fruit, liquor, rum, nut, chocolate, and spice flavoring additive that occurs naturally in coffee and is used in beverages, ice cream, ices, candy, and baked goods. See Furfural. ASP

2-FURFURYLIDENE BUTYRALDEHYDE • A synthetic fruit, liquor, rum, nut, and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Furfural. ASP

FURFURYL ISOPROPYL SULFIDE • Flavoring. See Furfural. ASP

FURFURYL 3-METHYLBUTANOATE • Flavoring. See Furfural. ASP

FURFURYL METHYL DISULFIDE • Flavoring with a bread or roast beef-like taste. It is a roast note for pork, liver, chicken, salami, chocolate, coffee, toffee, bread. See Furfural. ASP

FURFURYL METHYL ETHER • Flavoring. See Furfural. ASP

FURFURYL METHYL SULFIDE • Synthetic flavoring with a pungent onion and garlic odor and taste. See Furfural. ASP a-FURFURYL OCTANOATE • Flavoring. See Furfural. ASP a-FURFURYL PENTANOATE • Flavoring with a woody, fruity pineapple odor and fruity taste, used in pineapple. See Furfural. ASP

FURFURYL PROPIONATE • Flavoring. See Furfural. ASP

FURFURYL PROPYL DISULFIDE • Flavoring. See Furfural. EAF

N-FURFURYLPYRROLE • Flavoring with a vegetable, green, earthy, pungent horseradish taste. Used in garnish flavors for soup. See Furfural. ASP

FURFURYL THIOACETATE • Flavoring. See Furfural. ASP

FURFURYL THIOPROPIONATE • Flavoring used in tuna fish at 5 ppm; in onion at 3 ppm; coffee at 1 ppm, and in seafood and mocha. See Furfural. ASP

FURYL ACETONE • See (2-Furyl)-2-Propanone.

FURYL ACROLEIN • A synthetic coffee, fruit, cassia, and cinnamon flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and puddings. ASP

4-(2-FURYL)-3-BUTEN-2-ONE • A synthetic nut, almond, and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

(2-FURYL)-2-PROPANONE • A synthetic fruit flavoring additive for ice cream, ices, candy, and baked goods. ASP

FUSARIUM • A rapidly growing fungi that can cause corneal ulcers; some species can cause widely disseminated infections. See Zearalenone.

FUSEL OIL (REFINED) • A synthetic flavoring that occurs naturally in cognac oil. It is also a product of carbohydrate fermentation to produce ethyl alcohol (see) and varies widely in composition. Used in grape, brandy, cordial, rum, rye, scotch, whiskey, and wine flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, puddings, and liquor. Commercial amyl alcohol (see), its major ingredient, is more toxic than ethyl alcohol and as little as 30 milligrams has caused death. Smaller amounts cause methemoglobinuria (blood cells in the urine) and kidney damage. ASP

g • Abbreviation for gram (see).

GALACTOOLIGOSACCHARIDE • Ingredient in candy bars, yogurt, frozen dairy desserts, fruit drinks and energy drinks, fitness water and thirst quenchers, fruit pie filling, fruit prep, jelly and jam, infant meal replacement drinks, baby juice, baby yogurt drink, baby dessert, baby snack, milk, milk drinks, syrup flavoring for milk, meal replacement drinks, and milk substitutes at levels ranging from 1 to 7 grams (g) per serving; and in term infant formula at a level of 8 g per liter. GRAS pending.

GALACTOOLIGOSACCHARIDES and POLYDEXTROS • Ingredients in milk-based term infant formulas, at levels not to exceed 5.0 grams per liter (g/l) and 2.5 g/l, respectively. GRAS pending.

a-GALACTOSIDASE • Derived from Mortierella vinaceae, it is an enzyme used in sugar beet production. NUL

GALANGAL GREATER • Alpinia galanga. Very popular spice in all Southeast Asia and especially typical of the cuisine of Thailand. The rhizome contains up to 1.5 percent essential oil (1,8 cineol, α-pinene, eugenol, camphor, methyl cinnamate, and sesquiterpenes). May be used fresh or dried, which makes a great difference in flavor. Fresh galangal has a pure and refreshing odor and a mildly spicy gingerlike flavor. NUL

GALANGAL ROOT • Alpinia Glanga Wild East Indian Root. Chinese Ginger. The pungent aromatic oil of the galangal root is a bitters, vermouth, spice, and ginger ale flavoring additive for beverages. The extract is a bitters, fruit, liquor, spice, and ginger ale flavoring additive for beverages, ice cream, ices, candy, baked goods, and liquors. Related to true ginger, it was formerly used in cooking and in medicine to treat colic. GRAS. ASP

GALANGA ROOT EXTRACT • Alpinia. See Galangal Root. ASP

GALANGAL ROOT OIL • Natural flavor isolated by physical method. See Galangal Root. GRAS. NIL

GALBANUM OIL• Ferula spp. A yellowish to green or brown aromatic bitter gum resin from an Asiatic plant used as incense. The oil is a fruit, nut, and spice flavoring for beverages, ice cream, ices, candy, baked goods, and condiments. Has been used medicinally to break up intestinal gas and as an expectorant. EAF

GALBANUM, RESIN • Ferula spp. See Galbanum Oil. ASP

GALLATES (DODECYL, OCTYL, and PROPYL) • These antioxidants are derived from gallic acid, obtained from tannins and molds. The JECFA (see) has held many meetings about these additives. Although the committee noted there are similarities in the metabolism of the different gallates, it concluded that there was not enough evidence to allocate a group ADI (see) for the gallates. In addition, a 150-day gavage study with dodecyl gallate revealed a no-observed-effect level (NOEL) that was tenfold lower than the dietary NOEL for propyl gallate. In the ninety-day toxicity study in rats, propyl gallate administered in the diet at 7,450 mg per kg caused changes in blood, spleen, and liver. The committee allocated an ADI of 0-1.4 mg per kg of body weight for propyl gallate. The committee concluded that neither octyl or dodecyl gallate were likely to be cancer-causing or gene-toxic. Therefore, the committee allocated temporary ADIs for these substances. With octyl gallate, a slight anemia was observed at 100 mg per kg of body weight per day in rats when it was administered for two generations. A temporary ADI of 0-.01 mg per kg of body weight was allocated for octyl gallate. With dodecyl gallate, reduction in spleen weight and pathological changes in the liver, kidney, and spleen were observed in a 150-day study in rats in which the substance was administered by gavage. A temporary ADI of 0.05 mg per kg of body weight was allocated for dodecyl gallate based on a NOEL of 10 mg per kg of body weight per day in this study and a safety factor of 200. The committee concluded that additional studies on dodecyl, octyl, and propyl gallate may help to explain the differences in toxicological potency of these compounds. If these studies do not resolve the issue, then the committee said long-term toxicity and cancer studies and gene toxicity studies “might be required.”

GALLIC ACID • See Propyl Gallate.

GALLOTANNIC ACID • See Tannic Acid.

GAMBIR GUM • Uncaria Gambir Roxb. Flavoring. EAF

GAMMA-TOCOPHEROL • See Tocopherols. E

GARDEN ROSEMARY OIL • See Rosemary Extract.

GARDENOL • See a-Methylbenzyl Acetate.

GARLIC EXTRACT • An extract from Allium sativum, a yellowish liquid with a strong odor used in fruit and garlic flavorings. Garlic is a member of the onion family and was cultivated in Egypt from earliest times and known in China more than two thousand years ago. Garlic contains lots of potassium, fluorine, sulfur, phosphorus, vitamins A and C, as well as seventy-five different sulfur compounds. In addition, it contains quercetin, cyanidin, and bioflavonoids (see all). Garlic also contains selenium, which has been found to have anticancer potential. Garlic has been used since ancient times to treat all sorts of ailments, including the Great Plague in Europe and dysentery during World War I. The herb has recently been found to contain antibiotic, antiviral, and antifungal ingredients. It has also been reported in the scientific literature that garlic may decrease nitrosamines, modulate cancer cell multiplication, increase immunity, and protect the body against ionizing radiation. Three Rutgers University researchers in 1992 reported at the American Chemical Society meeting in Washington, D.C., that chemicals in garlic may protect the liver from damage caused by large doses of the popular nonaspirin painkiller acetaminophen (in Tylenol and dozens of other painkillers and cold medications) and may prevent growth of lung tumors associated with tobacco smoke. Garlic also reportedly inhibits the production of prostaglandins (see), which may explain why allium oils have antitumor activity. Phytochemicals in garlic are under intensive study for cholesterol-lowering, immune-enhancing, and cancer-preventive activity. GRAS. ASP

GARLIC OIL • Yellow liquid with a strong odor, obtained from the crushed bulbs or cloves of the plant. Used in fruit and garlic flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. Has been used medicinally to combat intestinal worms. Reevaluated and found to be GRAS by the FDA in 1976. See Garlic Extract. ASP.

GAS • A product from the controlled combustion in air of butane, propane, or natural gas. It is used for removing or displacing oxygen in the processing, storage, or packaging of citrus products, vegetable fats, vegetable oils, coffee, and wine. No known toxicity when used in packaging. ASP

GASTROINTESTINAL TRACT • GI tract. The entire digestive canal from mouth to anus.

GASTRONOMY • The study and appreciation of good food and good eating, and a culture's culinary customs, style, and lore. Any interest or study of culinary pursuits relates essentially to the kitchen and cookery, and to the higher levels of education, training, and achievement of the professional chef and the chef apprentice.

GEL • A semisolid, apparently homogenous substance that may be elastic and jellylike (gelatin) or more or less rigid (silica gel) and that is formed in various ways such as by coagulation or evaporation.

GELATINS • Gelatin is a protein obtained by boiling skin, tendons, ligaments, or bones with water. It is colorless or slightly yellow, tasteless, and absorbs five to ten times its weight of cold water. Used as a food thickener and stabilizer and a base for fruit gelatins and puddings and sausage casings. The raw material can also be rendered into lard. In the United States and some Asian countries, pork skin is immersed, boiled, dried, and then fried to make a snack food (pork rinds). Employed medicinally to treat malnutrition and brittle fingernails. ASP

GELLAN GUM • Used as a stabilizer and thickener in various foods. ASP. E

GEMS/FOOD GLOBAL ENVIRONMENT MONITORING SYSTEM • Food Contamination Monitoring and Assessment Programme. Since 1976 the GEMS-Food Contamination Monitoring and Assessment Programme, which is commonly known as GEMS/Food, has informed governments, the Codex Alimentarius Commission, and other relevant institutions, as well as the public, on levels and trends of contaminants in food, their contribution to total human exposure, and significance with regard to public health and trade. GEMS/Food is implemented by the World Health Organization (WHO) in cooperation with a network of WHO Collaborating Centers and participating institutions located in over seventy countries around the world. The GEMS/Food international databases include data on contaminants in individual foods or food groups and on contaminants in the total diet.

GENE • The smallest genetic unit of a chromosome. It is a piece of DNA that contains the hereditary information for the production of a protein.

GENET, ABSOLUTE and EXTRACT • Spartium junceum. A natural flavoring from flowers used in fruit and honey flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. The extract is a raspberry and fruit flavoring for beverages. ASP

GENETIC TOXICOLOGY PROGRAM • The U.S. Environmental Protection Agency has certain chemicals under study to determine their effects on genes, the parts of the cell that carry inherited characteristics. Damage to the mechanisms of genes can lead to birth defects and cancer, as well as other illnesses.

GENOTOXICITY • Any toxic modification or alteration of the structure or function of genetic material. Chemicals that are capable of causing damage to DNA can potentially lead to the formation of a malignant tumor and to birth defects. DNA damage does not lead inevitably to the creation of cancerous cells.

GENTAMYCIN SULFATE • Garamycin Sulfate. An antibiotic used to treat pork and turkey. FDA residue limitations are 0.1 ppm in turkey and in swine muscle. This drug is also used to treat serious infections in humans and, theoretically, resistance to the drug could build up by eating treated pork or turkey. Allergic reactions to the drug in the meat could also occur.

GENTIAN ROOT EXTRACT • The yellow or pale bitter root of central and southern European plants used in angostura, chocolate, cola, fruit, vermouth, maple, root beer, and vanilla flavorings for beverages, ice cream, ices, candy, and liquors. It has been used as a bitter tonic. ASP

GENTIAN VIOLET • Fungicide. Banned for use in animal feed.

GERANIAL • See Citral.

GERANIOL • Oily sweet, with a rose odor, it occurs naturally in apples, bay leaves, cherries, grapefruit, ginger, lavender, and a number of other essential oils. A synthetic flavoring additive that occurs naturally in apples, bay leaves, cherries, coriander, grapefruit, oranges, tea, ginger, mace oil, and the oils of lavender, lavandin, lemon, lime, mandarin, and petitgrain. A berry, lemon, rose, apple, cherry, peach, honey, root beer, cassia, cinnamon, ginger ale, and nutmeg flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and toppings. Geraniol is omitted from hypoallergenic cosmetics. Can cause allergic reactions. Whereas no specific toxicity information is available, deaths have been reported from ingestion of unknown amounts of citronella oil (see), which is 93 percent geraniol; gastric mucosa was found to be severely damaged. GRAS. ASP

GERANIUM • An essential oil used as flavoring. There are several types of geranium oil, the main ones being Reunion or Bourbon, Algerian, Moroccan, and French. The oils are composed chiefly of geraniol, citronellol, linalool, citronellyl formate, and several other compounds. Reunion oil is very rich in citronellol and has a heavy rose and minty odor. Algerian oil has a delicate odor. Moroccan oil is similar to Algerian oil. French oil is thought to possess the finest roselike odor. The concrete and absolute of geranium are also available commercially. The oil of geranium, widely used in perfumery and cosmetics, is stable and blends well with other fragrances. Dried leaves are used in sachets and potpourris. Leaves of geranium are also used in herbal teas and the oil is used in baked goods and fruit desserts. As a medicinal plant, geranium has traditionally been considered an astringent and used as a folk remedy in the treatment of ulcers. A terpine hydrate synthesized from geraniol is known to be an effective expectorant. Leaves are reported to have antifungal activity. Scented geranium and oil of geranium are reported to cause contact dermatitis. Geranium is reported to repel insects because of its citronellol content. See Geranium Rose Oil. GRAS

GERANIUM ROSE OIL • Pelargonium graveolens. A synthetic flavoring additive that occurs naturally in geranium herbs and rose petals. Used in strawberry, lemon, cola, geranium, rose, violet, cherry, honey, rum, brandy, cognac, nut, vanilla, spice, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and jelly. A teaspoon may cause illness in an adult and less than an ounce may kill. May affect those allergic to geraniums. ASP

GERANYL ACETATE • Geraniol Acetate. Clear colorless liquid with the odor of lavender, it is a constituent of several essential oils. Used in berry, lemon, orange, floral, apple, grape, peach, pear, honey, spice, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and syrup. It is obtained from geraniol (see). GRAS. ASP

GERANYL ACETOACETATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

GERYANYL ACETONE • Flavoring with a rosy, leafy, fruity taste. See Gerianol. ASP

GERANYL BENZOATE • A synthetic flavoring additive, slightly yellowish liquid, with a floral odor. Used in floral and fruit flavorings for beverages, ice cream, ices, candy, baked goods, and candy. See Benzoate. ASP

GERANYL BUTYRATE • Geraniol Butyrate. Colorless liquid that occurs in several essential oils, it is used as a synthetic attar of roses in berry, citrus, fruit, apple, cherry, pear, and pineapple flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. See Geraniol. ASP

GERANYL FORMATE • Geraniol Formate. Colorless liquid with a roselike odor, insoluble in alcohol, it occurs in several essential oils. Used in perfumes and soaps as a synthetic neroli bigarade oil (see). A fresh, leafy, rose odor, it is used in berry, citrus, apple, apricot, and peach flavorings for beverages, ice cream, ices, candy, baked goods, gelatins, chewing gum, and puddings. See Geraniol. ASP

GERANYL HEXANOATE • A synthetic citrus and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Hexanoic Acid. ASP

GERANYL ISOBUTRATE • Salt of Isobutyric Acid (see). A synthetic floral, rose, apple, pear, and pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and puddings. ASP

GERANYL ISOVALERATE • A synthetic berry, lime, apple, peach, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

GERANYL PHENYLACETATE • A synthetic flavoring, yellow liquid with a honey-rose odor. Used in fruit flavorings for beverages, ice cream, ices,

candy, baked goods, and chewing gum. See Phenylacetic Acid. ASP

GERANYL PROPIONATE • Geraniol Propionate. Colorless liquid with a roselike odor, it is used as a synthetic flavoring in berry, geranium, apple, pear, pineapple, and honey flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

GERANYL TIGLATE • A flavoring determined GRAS by FEMA (see). See Allyl Tiglate. EAF

GERANYL VALERATE • A rose fruity flavoring. Use levels for flavoring substances on which the FEMA Expert Panel (see) based its judgments that the substance is GRAS. EAF

GERMANDER • Teucrium chamaedrys or Teucrium scorodonia. Flavoring from an American plant used in alcoholic beverages only. See Sage. NUL

GHATTI GUM • Indian Gum. The gummy exudate from the stems of a plant abundant in India and Ceylon. Used as an emulsifier and in butter, butterscotch, and fruit flavorings for beverages. Limited to 0.1 to 0.2 percent of foods in which it is used. Has caused an occasional allergy but when ingested in large amounts has not caused obvious distress. The FDA's reevaluation in 1976 found the gum was GRAS if used at the rate of 0.2 percent for alcoholic beverages and 0.1 percent for all other food categories. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amount that can be added to food. ASP

GHEE • Butter Oil. Indian clarified butter without any solid milk particles or water. Ghee is used in India and throughout South Asia in daily cooking. A good quality ghee adds a great aroma, flavor, and taste to the food. Ghee can be generally found in the ethnic section of big grocery stores or in any Indian/South Asian store. Ghee can be bought in certain stores offering cow ghee or artificial ghee made from hydrogenating vegetable oil.

GI • The abbreviation for glycemic index (see).

GIBBERELLIC ACID and ITS SALTS • Used for malt beverages and distilled spirits. A plant growth-promoting hormone synthesized in 1978. Mildly toxic by ingestion. It is limited to less than 2 ppm in malt and 0.5 ppm in finished malt beverages. Its tolerance is zero in distilled spirits. Caused tumors in experimental animals. ASP

GIGARTINA EXTRACTS • A stabilizer from red algae of the sea. See Algae.

GINGER • Zingiber officinale. Derived from the rootlike stem of plants cultivated in all tropical countries, it is used in apple, plum, sausage, eggnog, pumpkin, ginger, ginger ale, and ginger beer flavorings for beverages, ice cream, ices, baked goods (2,500 ppm), and meats. The extract is used for cola, sausage, root beer, ginger, ginger ale, and ginger beer flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, meats, and condiments. Ginger has been used to break up intestinal gas and colic. GRAS. ASP

GINGER OIL • Obtained from the dried rhizomes of Zingiber officinale, it is used in flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, meats, and condiments. It is also used in perfumes. Employed medicinally to break up intestinal gas. A skin irritant. Has been shown to be mutagenic in rabbits. GRAS. ASP

GINGER OLEORESIN • Produced by extraction of the dried and unpeeled rhizome of Zingiber officinale, ground to a moderately coarse powder. The removal of the last few percentages of solvent is a problem that has yet to be solved satisfactorily. Certain solvents can be removed almost quantitatively through the use of small amounts of ethyl alcohol as a chaser during the last stages of evaporation. Ginger oleoresin is extracted from various types of ginger, but the majority of all ginger oleoresins are derived from Nigerian and Jamaican ginger, the former being the most inexpensive material, the latter having the most refined aroma. From the southwest coast of India comes a highly appreciated quality of ginger which is preferred for the production of oleoresin for use in carbonated beverages. It is used in root beer and ginger ale for the same products. ASP

GINGKO BILOBA • Maidenhair. Discovered in northern China, it is now offered in many areas of the world. The nuts or seeds are eaten and taste like mild swiss cheese. The nuts are lower in protein and have fewer calories than most nuts but contain significant amounts of minerals and vitamins. Ginkgo leaf extract has been used to treat a variety of ailments and conditions, including asthma, bronchitis, fatigue, and tinnitus (ringing or roaring sounds in the ears). Today, people use ginkgo leaf extracts hoping to improve memory; to treat or help prevent Alzheimer's disease and other types of dementia; to decrease intermittent claudication (leg pain caused by narrowing arteries); and to treat sexual dysfunction, multiple sclerosis, tinnitus, and other health conditions. Its effect on memory is controversial. Accordining to a three-year study published in the February 27, 2008, online issue of Neurology, the medical journal of the American Academy of Neurology, involving 118 people age eighty-five and older with no memory problems, half of the participants took ginkgo biloba extract three times a day and half took a placebo Although there was a trend favoring ginkgo, the difference between those who took gingko versus the placebo was not statistically significant. The researchers made an interesting observation when they examined the data at the end of the trial. Taking into account whether people followed directions in taking the study pills, they found that people who reliably took the supplement had a 68 percent lower risk of developing mild memory problems than those who took the placebo. Without further study, it is unclear if this difference is real or just a chance occurrence. The National Center of Complementary and Alternative Medicine (NCCAM), a division of the U.S. National Institutes of Health, said side effects of ginkgo may include headache, nausea, gastrointestinal upset, diarrhea, dizziness, or allergic skin reactions. More severe allergic reactions have occasionally been reported. Some data suggest that ginkgo can increase bleeding risk, so people who take anticoagulant drugs, have bleeding disorders, or have scheduled surgery or dental procedures should use caution and talk to a health care provider if using ginkgo. Uncooked ginkgo seeds contain a chemical known as ginkgotoxin, which can cause seizures. Consuming large quantities of seeds over time can cause death. Ginkgo leaf and ginkgo leaf extracts appear to contain little ginkgotoxin.

GINSENG • Panax ginseng (Asia). Panax quinquefolius (North America). Eleutherococcus senticosus (Siberia). Ginseng is used as a flavoring additive in the United States and has a sweetish, licoricelike taste but is widely used in Asian medicines as an aromatic bitter. The Chinese esteem ginseng as an herb of many uses and have been employing it in medicine for more than five thousand years. The Chinese and Koreans also use it in combination with chicken soup. The word panax in its botanical name comes from the Greek panakos, a panacea. Among its active ingredients are amino acids, essential oils, carbohydrates, peptides, vitamins, minerals, enzymes, and sterols (see all). In Asia, it is esteemed for its abilities to preserve health, invigorate the system, and prolong life. It is taken in an herbal tea as a daily tonic. North American Indians used ginseng as a love potion. It has been found to normalize high or low blood sugar. It produces a resin, a sugar starch, glue, and volatile oil.

GLUCAMINE • An organic compound that is prepared from glucose (see).

B-GLUCANASE ENZYME PREPARATION FROM RICHODERMA HARZI-ANUM • Produced in the wine grapes by the fungus Botrytis cinérea or by yeast. The FDA has no question about it being listed as GRAS.

GLUCITOL • Sorbitol. Sorbol. White crystalline powder with a sweet taste used as an anticaking additive, curing additive, drying additive, emulsifier, firming additive, flavoring additive, formulation aid, free-flowing additive, humectant, lubricant, nutritive sweetener, pickling additive, releasing additive, sequestrant, stabilizer, surface-finishing additive, texturizing additive, and thickener. Used in baked goods, baking mixes, low-calorie beverages, hard and soft candy, chewing gum, chocolate, cough drops, frankfurters, frozen dairy desserts, jams, jellies, sausage, and shredded coconut. Limitation of 99 percent in hard candy and cough drops, 75 percent in chewing gum, 98 percent in soft candy, 30 percent in

nonstandardized jams and jellies, 30 percent in baked goods, 17 percent in frozen dairy desserts, 12 percent in all other foods. Mildly toxic by ingestion and may cause diarrhea. See Sorbitol. GRAS

GLUCOAMYLASE • An enzyme used to break down sugars in food processing. GRAS. ASP

GLUCOMANNAN • A powder extracted from the roots of the konjac plant. The promoters claim that the powder, taken in a capsule before meals, absorbs liquid and swells in the stomach to form a gel and reduces hunger. The FDA was asked to approve it as GRAS but refused to do so unless scientific data were submitted. See Konjac Flour.

GLUCONATE • Calcium and Sodium. Sequestrants (see) derived from glucose, a sugar. Odorless, tasteless. Buffer (see) for confections and a firming additive for tomatoes and apple slices. Sodium gluconate is also used as a nutrient and dietary supplement. Final report to the FDA of the Select Committee on GRAS Substances in 1980 said it should continue its GRAS status with no limitations other than good manufacturing practices.

d-GLUCONIC ACID • A light, amber liquid with the faint odor of vinegar, produced from corn. Used as a dietary supplement and as a sequestrant (see). The magnesium salt of gluconic acid has been used as an antispasmodic. GRAS. NUL. E

GLUCONO-DELTA-LACTONE • An acid with a sweet taste; fine, white, odorless. It is used as a leavening additive in jelly powders and soft drink powders where dry food acid is desired. Used also as an acidifier, binder, curing additive, leavening additive, pH control additive, pickling additive, and sequestrant (see). Used in meat mixes, dessert mixes, frankfurters, Genoa salami, and sausages. Used in the dairy industry to prevent milk stone and by breweries to prevent beer stone, and it is also a component of many cleaning compounds. Cleared by the USDA (see) for use at 8 ounces for each 100 pounds of cured, pulverized meat, or meat food product to speed up the color-fixing process and to reduce the time required for smoking. GRAS. ASP. E

GLUCOSAMINE • An amino derivative of glucose that is found especially in polysaccharides such as chitin and in cell membranes. The therapeutic use of oral glucosamine has been shown to have some benefit against cartilage degeneration, and possibly in a case of spinal disc degeneration. The FDA was asked to cease evaluating a company's request for GRAS status for glucosamine as a food additive because of changes in the manufacture of glucosamine, with the understanding that the company may, in the future, submit another GRAS notification. Most of the glucosamine additives apparently are made in China.

GLUCOSE • Occurs naturally in animal blood, grape, and corn sugars. A source of energy for plants and animals. Sweeter than sucrose (see), glucose syrup is used to flavor sausage, hamburger, meat loaf, luncheon meat, chopped or pressed ham. It is also used as an extender in maple syrup. It is used medicinally for nutritional purposes and in the treatment of diabetic coma. Candymakers who work with it sometimes lose their nails. d-GLUCOSE • Corn sugar. See Glucose.

GLUCOSE GLUTAMATE • Used as a humectant in hand creams and lotions, it occurs naturally in animal blood, grape, and corn sugars and is a source of energy for plants and animals. It is sweeter than sucrose. Glucose syrup is used to flavor sausage, hamburger, and other processed meats. Also used as an extender in maple syrup and medicinally as a nutrient. Glutamate is the salt of glutamic acid and is used to enhance natural food flavors. The FDA asked for further studies as to its potential mutagenic, teratogenic, subacute, and reproductive effects in 1980. Since then the FDA has not reported any action.

GLUCOSE ISOMERASE FROM BACILLUS COAGULANS or FROM IMMOBILIZED ARTHROBACTER GLOBIFORMS or FROM STREPTOMYCES OLIVOCHROMOGENES or FROM STREPTOMYCES RUBIGINOSUS • Immobilized glucose isomerase is used on a massive scale throughout the world in the production of high fructose syrups for the confectionery and soft-drink industries. Made from harmless bacteria and sugar. Yet, the FDA says it is NUL.

GLUCOSE OXIDASE PREPARATION • From Aspergillis niger or Penicillium notatum. Used to make sweeteners. See Glucose Isomerase. NUL

GLUCOSE PENTAACETATE • Sugar substitute used for diabetics. ASP

GLUCURONIC ACID • A carbohydrate that is widely distributed in the animal kingdom.

GLUTAMATE • Ammonium and monopotassium salt of glutamic acid (see). Used to enhance natural flavors and to improve the taste of tobacco. Used to impart meat flavor to foods, to enhance other natural food flavors, and to improve the taste of tobacco. It is used as an antioxidant in cosmetics to prevent spoilage. It is being studied by the FDA for mutagenic, teratogenic, subacute, and reproductive effects. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amount that can be added to food. The European Parliament stated in 2003 that these taste enhancers can provoke in certain cases nervous symptoms (decreased sensibility in neck, arms, and back) and irregular heartbeat. In testing, they provoked reproductive disorders in rats. They also are reported to cause problems for asthmatic persons.

GLUTAMIC ACID • L-Glutamic Acid. A white, practically odorless, free-flowing crystalline powder, a nonessential amino acid (see) usually manufactured from vegetable protein. A salt substitute, it has been used to treat epilepsy and to correct stomach acids. It is used to enhance food flavors and to add meat flavor to foods. Glutamic acid with hydrochloride (see Hydrochloric Acid) is used to improve the taste of beer. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amount that can be added to food. ASP. E

GLUTAMIC ACID HYDROCHLORIDE • Multipurpose additive. See Glutamic Acid. GRAS. ASP

GLUTAMINE • L-Glutamine. A nonessential amino acid (see) used as a medicine, dietary supplement, and as a culture medium. Mildly toxic by ingestion. Caused adverse reproductive effects in experimental animals.

GLUTARAL • See Glutaraldehyde and Glutaric Acid.

GLUTARALDEHYDE • A food flavoring. An amino acid (see) that occurs in green sugar beets. It has a faint agreeable odor and is used as a fixing additive for enzymes added to foods. It is also used as a flavor enhancer in foods. A petition to use glutaraldehyde-crosslinking additive in the manufacture of edible collagen sausage casings was put in abeyance (see) by the FDA in 2003. Glutaraldehyde has caused birth defects in experimental animals. A severe human skin irritant. See Glutaric Acid. ASP

GLUTARIC ACID • Pentanedioic Acid. A crystalline fatty acid that occurs in green sugar beets, meat, and in crude wood. Very soluble in alcohol and ether. Widely used in Asian medicine as an aromatic bitter.

GLUTATHIONE • A small molecule made up of three amino acids, which exists in almost every cell of the body. However, glutathione must be generated within the cell from its precursors before it can work effectively in the body. Used as a dietary supplement, it is being employed as an antioxidant to keep fresh cut fruit from browning.

GLUTEN FREE • Claims about gluten in foods are very important to people who have celiac disease (see). Manufacturers are not required to state on most food labels how much gluten is present in foods. But foods for people with celiac disease, and those made from ingredients such as maize, which naturally does not contain gluten, or from wheat with some of its gluten removed may claim to be gluten free. But it is almost impossible to

remove all wheat gluten. Currently there isn't a legal definition of what "gluten free" means, but there is an international standard for gluten-free products that are produced from cereals containing gluten. The standard is called Codex Alimentarius and it permits products to be called gluten free if there are less than 200 parts per million of gluten in the finished product. Many manufacturers follow this standard for products labeled gluten free. Some foods are naturally gluten free, including potatoes, maize, and rice. These are good sources of starchy carbohydrate for people who need to eat a gluten-free diet. Fruit, vegetables, and unprocessed meat and fish don't contain gluten, but some processed meats such as sausages and burgers are made with cereals that contain gluten. Since November 2005 food labeling rules require prepacked foods sold in the UK, and the rest of the EU, to show clearly on the label if they (or one of their ingredients) contain any cereal containing gluten—this applies even if the cereal has been specially treated to remove gluten. There could still be foods on the shelves that were produced before this date so read the label carefully.

GLUTEN GUM • A mixture of proteins from wheat flour, obtained as an extremely sticky, yellowish gray mass by making a dough and then washing out the starch. It consists almost entirely of two proteins, gliadin and glutelin, the exact proportions of which depend upon the variety of wheat. Contributes to the porous and spongy structure of bread. NUL

GLY- • The abbreviation for glycine (see).

GLYCEMIC INDEX • GI. A ranking system for carbohydrates based on their effect on blood sugar (glucose) levels. It compares available carbohydrates gram for gram in individual foods, providing a numerical, evidence-based glycemic index of post-meal blood sugar. The concept was invented by Dr. David J. Jenkins and colleagues in 1981 at the University of Toronto. Carbohydrates that break down rapidly during digestion have the highest glycemic indices. Carbohydrates that break down slowly, releasing glucose gradually into the bloodstream, have a low GI. A lower GI suggests slower rates of digestion and absorption of the sugars and starches in the foods and may also indicate greater extraction from the liver and periphery of the products of carbohydrate digestion. A lower glycemic response is often thought to equate to a lower insulin demand, better long-term blood glucose control, and a reduction in blood fats. The insulin index may therefore also be useful as it provides a direct measure of the insulin response to a food. By helping to moderate fluctuations in blood sugar levels, high fiber and low-GI foods can suppress hunger longer, discouraging overeating and therefore assisting with weight management. GI as a nutrition concept rose to prominence in the wake of the low-carb dieting fad that peaked and ebbed in 2002 and 2003. GI promises a more reasoned approach to carbohydrate intake, ranking foods by how quickly they release their sugars into the bloodstream. Many European countries, most notably the UK, have embraced the low-GI idea, with GI products and labeling schemes in place alerting consumers to low- and medium-GI foods. Furthermore, the company Danisco emphasizes that its product Litesse has a lower calorie count than other sweeteners of its kind, with only 1 kcal per gram.

GLYCERIDES • Monoglycerides, Diglycerides, and Monosodium Glycerides of Edible Fats and Oils. Any of a large class of compounds that are esters (see) of the sweet alcohol glycerin. They are also made synthetically. Emulsifying and defoaming additives. Used in bakery products to maintain "softness," in beverages, ice cream, ices, ice milk, milk, chewing-gum base, shortening, lard, oleomargarine, confections, sweet chocolate, chocolate, rendered animal fat, and whipped toppings. The diglycerides are on the FDA list of food additives to be studied for possible mutagenic, teratogenic, subacute, and reproductive effects. (Mono)glyceride citrate aids the action of and helps dissolve antioxidant formulations for oils and fats, such as shortenings for cooking. GRAS

GLYCERIDES and POLYGLYCERIDES OF HYDROGENATED VEGETABLE OILS • Used as a binder in dietary supplement tables, capsules and liquid formulations. See Glycerides and Hydrogenated.

GLYCERIN • Glycerol. Any by-product of soap manufacture obtained by adding alkalies (see) to fats and fixed oils. A sweet (about 0.6 times that of cane sugar), warm-tasting substance. Used as a humectant in tobacco and in marshmallows, pastilles, and jellylike candies; as a solvent for colors and flavors; as a bodying additive in combination with gelatins and edible gums; as a plasticizer in edible coatings for meat and cheese. It is also used in beverages, confectionery, baked goods, chewing gum, gelatin desserts, meat products, soda-fountain fudge. In concentrated solutions it is irritating to the mucous membranes, but as used, nontoxic, nonirritating, and nonallergenic. Contact with a strong oxidizing additive such as chromium trioxide, potassium chlorate, or potassium permanganate (see) may produce an explosion. GRAS. ASP

GLYCERIN, SYNTHETIC • Made from petroleum. ASP

GLYCEROL • See Glycerin. E

GLYCEROL ESTER OF GUM ROSIN • Turned down for GRAS because of insufficient information. See Rosin and Glycerol.

GLYCEROL ESTER OF PARTIALLY DIMERIZED ROSIN • A hard, pale, amber-colored resin produced by combining rosin with food-grade glycerin. It is used in chewing-gum bases. See Rosin.

GLYCEROL ESTER OF POLYMERIZED ROSIN • Softener for chewing gum base. See Rosin.

GLYCEROL ESTER OF TALL OIL ROSIN • A softener for chewing-gum base. See Tall Oil and Rosin.

GLYCEROL ESTERS OF WOOD ROSIN • There are three general methods of producing rosins commercially; these methods (and their products) being solvent extraction of pure stump wood (wood rosin), tapping of gum from the living tree (gum rosin), and separation from tall oil (tall oil rosin). The three rosins, freed of extraneous impurities and refined, differ somewhat quantitatively and in color but all three may be glycinerated to produce the glycerol ester. It is used as a chewing-gum base and as a beverage stabilizer. The FDA turned down its GRAS designation in 2002 on the basis of insufficient data.

GLYCEROL TRIBUTYRATE • A synthetic flavoring. There is reported use of the chemical; it has not yet been assigned for toxicology literature. EAF

GLYCERYL • Derived from glycerin (see).

GLYCERYL ABIETATE • A density adjuster for citrus oil used in the preparation of alcoholic beverages and still and carbonated fruit drinks. Also cleared as a plasti-cizing material in chewing-gum base.

GLYCERYL BEHENATE • Used to form tablets. There is no reported use of the chemical and the FDA says there is no toxicology information available. See Behenic Acid. GRAS. NUL

GLYCERYL CAPRATE • The monoester of glycerin and caprylic acid (see both).

GLYCERYL CAPRYLATE • The monoester of glycerin and caprylic acid (see both).

GLYCERYL DILAURATE • See Glycerin and Lauric Acid.

GLYCERYL DIOLEATE • The diester of glyceric and oleic acid (see both).

GLYCERYL DISTEARATE • The diester of glycerin and stearic acid (see both).

GLYCERYL HYDROSTEARATE • See Glyceryl Monostearate.

GLYCERYL 5-HYDROXYDECANOATE • Artificially synthesized flavor. NIL

GLYCERYL 5-HYDROXYDODECANOATE • Artificially synthesized flavor. NIL

GLYCERYL HYDROXYSTEARATE • The monoester of glycerin and hydroxystearic acid. See Glycerin and Stearic Acid.

GLYCERYL ISOSTEARATE • See Glyceryl Monostearate.

GLYCERYL-LACTO ESTERS OF FATTY ACIDS • Emulsifiers. See Glycerol and Fatty Acids. ASP

GLYCERYL LACTOOLEATE • Produced from glycerin, lactic acid, and fatty acids containing oleic acid derived from edible fats and oils. It is listed as NS (see) because it requires rabbinic supervision to be authorized as kosher since it may be obtained from meat, dairy, origins. GRAS. NUL

GLYCERYL LACTOPALMITATE OF FATTY ACIDS • Food emulsifiers used in shortening where free and combined lactic acid does not exceed 1.75 percent of shortening plus additive. They add calories but are considered nontoxic. GRAS. ASP

GLYCERYL LANOLATE • The monoester of glycerin and lanolin (see both).

GLYCERYL LINOLEATE • The monoester of glycerin and linoleic acid (see both).

GLYCERYL MONO- and DlESTERS • Manufactured by reacting edible glyc-erides with ethylene oxide. These are used as defoamers in yeast production. GRAS

GLYCERYL MONOOLEATE • A flavoring additive. See Glyceryl and Oleic Acid. GRAS. ASP

GLYCERYL MONOSTEARATE • Glyceryol Monostearin. An emulsifying and dispersing additive used in oleomargarine, shortenings, and other food products including noodles. Restricted to less than 2 percent of macaroni and less than 3 percent of noodle products. It is a mixture of two glyceryls. GRAS. ASP

GLYCERYL MYRISTATE • See Glycerin and Myristic Acid.

GLYCERYL OLÉATE • See Glycerin and Oleic Acid.

GLYCERYL-PABA • The ester of glycine and para-aminobenzoic acid (see both).

GLYCERYL PALMITOSTEARATE • A mixture of fatty acid glycerides, it is a fine powder or waxy solid. It is used in food processing. See Glycerides and Fatty Acids. GRAS. ASP

GLYCERYL RICINOLEATE • See Glycerin.

GLYCERYL SESQUIOLEATE • See Glycerin.

GLYCERYL STARCH • See Starch and various Glycerols.

GLYCERYL STEARATE • An emulsifier. See Glycerin.

GLYCERYL TRIACETATE • See Triacetin. GRAS. E

GLYCERYL TRIBENZOATE • Flavoring and flavor enhancer. See Glyceryl and Benzoic Acid. ASP

GLYCERYL TRIBUTYRATE • See Tributyrin.

GLYCERYL TRIMYRISTATE • See Glycerin and Myristic Acid.

GLYCERYL TRIPROPANOATE • Flavoring. See Glycerin and Proponoic Acid. ASP

GLYCERYL TRISTEARATE • Surface-finishing additive, formulation aid, lubricant, or release (see) additive. See Stearic Acid and Glycerin. ASP

GLYCERYL TRIUNDECANOATE • The triester of glycerin and undecenoic acid (see both).

GLYCINE • Aminoacetic Acid. Gly. Glycocoll. L-Glycine. An amino acid (see) classified as nonessential. Found in beans, brewer's yeast, brown rice bran, caseinate, dairy products, eggs, fish, gelatin, lactalbumin, legumes, meat, nuts, seafood, seeds, soy, sugarcane, whey, whole grains. Reaction of ammonia with chloroacetic acid. Made up of sweet-tasting crystals, it is used as a dietary supplement and as a gastric antacid. Used with saccharin to mask its aftertaste. Mildly toxic by ingestion. Restricted to less than 0.2 percent of the finished beverage or beverage base. The Food and Drug Administration has expressed the opinion in trade correspondence that glycine is GRAS for certain technical effects in human food when used in accordance with good manufacturing practice; however, reports in scientific literature indicate that adverse effects were found in cases where high levels of glycine were administered in diets of experimental animals and current usage information indicates that the daily dietary intake of glycine by humans may be substantially increasing due to changing use patterns in food technology. Therefore, the Food and Drug Administration on April 1, 2003, said that it no longer regards glycine and its salts as GRAS for use in human food and all outstanding letters expressing sanction for such use are rescinded. The FDA said producers must reformulate food products for human use to eliminate added glycine and its salts, or they must bring such products into compliance with an authorizing food additive regulation. A food additive petition supported by toxicity data is required to show that any proposed level of glycine or its salts added to foods for human consumption will be safe. The additive is considered an essential nutrient in certain animal feeds and the FDA believes it is safe for such use under conditions of good feeding practice. At the Codex (see) meeting in 2008, the committee decided this additive should be listed as a flavor enhancer. ASP. E

GLYCOCHOLIC ACID • A product of mixing cholic acid and glycine (see both).

GLYCOFUROL • See Furfural.

GLYCOGEN • Distributed throughout cell protoplasm, it is an animal starch found especially in liver and muscle. Used as a violet dye.

GLYCOLIC ACID • Contained in sugarcane juice, it is an odorless, slightly water-absorbing acid used to control the acid-alkali balance in cosmetics and whenever a cheap organic acid is needed. It is also used in copper brightening, decontamination procedures, and in dyeing. It is a mild irritant to the skin and mucous membranes. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing methods.

GLYCOL DISTEARATE • Alcohol from glycol. See Glycols.

GLYCOLS • Propylene Glycol. Glycerin. Ethylene Glycol. Carbitol. Diethylene Glycol. Glycol literally means “glycerin” plus “alcohol.” A group of syrupy alcohols derived from hydrocarbons (see) and used in foods as emulsifiers and in chewing-gum bases and in cosmetics as humectants. The FDA cautions manufacturers that glycols may cause adverse reactions in users. Propylene glycol and glycerin (see both) are considered safe. Other glycols in low concentrations may be harmless for external application but ethylene glycol, carbitol, and diethylene glycol are hazardous in concentrations exceeding 5 percent even in preparations for use on small areas of the body. Wetting additives (see) increase the absorption of glycols and therefore their toxicity.

GLYCOL STEARATE • An emulsifier. See Glycols and Stearates.

GLYCOPHEN • Promidione. Rovral. A fungicide used in animal feed, ginseng (dried), grape pomace (dried), raisin waste, raisins, and soap stock. FDA residue tolerance of 300 ppm in raisins, 4 ppm in dried ginseng, and 225 ppm in dried grape pomace and raisin waste for animal feed. Moderately toxic by ingestion.

GLYCOSIDES • Many flowering plants contain cardiac glycosides. The most well known are foxglove, lily of the valley, and squill. The cardiac

GLYCOSIDES • Many flowering plants contain cardiac glycosides. The most well-known are foxglove, lily of the valley, and squill. The cardiac glycosides have the ability to increase the force and power of the heartbeat without increasing the amount of oxygen needed by the heart muscle. Among the glycosides are cyanogens, goitrogens, estrogens, and saponins. They are found in lima beans, cassava, flax, broccoli and other brassicas, most legumes, and grasses. a-GLYCOSYL ISOQUERCITRIN • As an antioxidant in multiple food categories at 150 milligrams per kilogram (mg/kg) and in chewing gum at 1500 mg/kg. FDA has no question about the notifier's request for GRAS status.

GLYCYRRHETINIC ACID • Used as a flavoring. Prepared from licorice root, it has been used medicinally to treat a disease of the adrenal gland.

GLYCYRRHIZA • A genus of about eighteen accepted species in the family Fabaceae (Leguminosae), with a distribution in Asia, Australia, Europe, and the Americas. The genus is best known for liquorice, which is the product of G. glabra, a species native to the Mediterranean region. Very little G. glabra is grown in North America, but American licorice G lepidota is a common native species. Used as a flavoring.

GLYCYRRHIZA and GLYCYRRHIZA EXTRACT • See Glycyrrhizin, Ammoniated. GRAS

GLYCYRRHIZIC ACID • Used as a flavoring, coloring. Extracted from licorice. See Glycyrrhetinic Acid.

GLYCYRRHIZIN, AMMONIATED • Glycyrrhiza. Licorice. Product of dried root from the Mediterranean region used in licorice, anise, root beer, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, and baked goods. It is used as a sugar substitute. It is one hundred times as sweet as sugar. It is also used to flavor tobacco and pharmaceuticals, as a demulcent and expectorant, and as a drug vehicle. It doesn't have calories. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with limitations on amounts that can be added to food. Cases have been reported of avid licorice eaters who develop high blood pressure. See Licorice. ASP

GLYOXAL • Used in paper coatings, embalming fluid, and in permanent press fabrics. See Acetaldehyde.

GLYOXYLIC ACID • Used as a coloring. Syrup or crystals that occur in unripe fruit, young leaves, and baby sugar beets. Forms a thick, malodorous syrup. It absorbs water from the air and condenses with urea to form allantoin (see) and gives a nice blue color with sulfuric acid. It is a skin irritant and corrosive.

GLYPHOSATE • A broad spectrum, postemergent herbicide used in animal feed. FDA residues allowed are 0.4 ppm in dried citrus pulp, 20 ppm in soybean hulls, and 30 ppm in sugarcane molasses.

GOLD • As a food additive it is used solely for external decoration where it can be found on chocolate confectionery, in the covering of dragées (little decorative balls) and the decoration of sugar-coated flour confectionery. Chemically, gold is very inactive and therefore considered harmless. There is no dietary requirement. E

GOLDEN SYRUP • New liquid sugar product for both bakers and confectioners. Classic golden syrup was designed to reintroduce traditional golden syrup to a modern, more health-conscious, market. The product is a partially inverted syrup specifically designed for cakes, biscuits, toffee, and desserts. It contains no added flavors or colorants.

GONADORELIN • A hormone used as an injection for cattle to increase growth. In humans it can cause such side effects as nausea, headache, and flushing.

GONADOTROPIN (SERUM) and GONADOTROPIN (CHORIONIC) • A hormone isolated from the blood and urine and placenta of pregnant women. It is capable of promoting growth and function of testes and ovaries when injected into cattle. It is also used in human medicine.

GRADE • Grading and inspection assure purity, wholesomeness, and appearance. The USDA has established grades for more than three hundred food products. Grading for most products is done voluntarily at the manufacturers' request (and expense) by a USDA inspector, and a USDA grade symbol may then appear on the package; lack of a symbol does not mean substandard product. Unfortunately, these grades lack continuity among product categories (Grade AA is the highest grade for eggs; Grade A is the highest for milk). Meat and poultry, however, whether fresh or processed and packaged must be inspected and carry an inspection stamp.

GRAINS OF PARADISE • Aframomum melegueta. Pungent aromatic seeds of a tropical African plant of the ginger family. It is a natural flavoring used in fruit, ginger, ginger ale, and pepper flavorings for beverages, ice cream, ices, and candy. GRAS. EAF

GRAM (g) • A metric unit of weight—28.3 grams equals 1 ounce. There are 1,000 milligrams in a gram. Food labels list fat, protein, carbohydrates, and fibers in grams (g) per serving.

GRAMINIS • See Dog Grass Extract.

GRAM-NEGATIVE, -POSITIVE • Classification of bacteria according to whether or not they accept a stain named after Hans Gram, a Danish bacteriologist. Different life processes and vulnerabilities of germs are reflected by their gram-positive or gram-negative characteristics. An antibiotic may be effective against certain gram-positive germs and have no effect on gram-negative ones and vice versa.

GRAPE COLOR EXTRACT • Enocianina. A purple-red liquid extracted from the residue of grapes pressed for use in grape juice and wine. Used for coloring in still and carbonated drinks and ales, beverage bases, and alcoholic beverages. ASP

GRAPE ESSENCE, NATURAL • The liquid expressed from fresh grapes used as a coloring. ASP

GRAPE POMACE • Source of natural red and blue colorings. Also used as an animal feed. See Anthocyanins.

GRAPE SEED EXTRACT • A flavoring determined GRAS by FEMA (see). It is being reviewed at the request of the National Cancer Institute for subchronic, reproductive, and developmental toxicity. The FDA in 2008 said filing the notice does not provide a basis for a GRAS determination.

GRAPE SEED OIL • An ingredient in fragrances obtained by expression from the fresh peel of the grape. The yellow, sometimes reddish liquid is also used in fruit flavorings.

GRAPE SKIN EXTRACT • Enocianina. Used in still and carbonated drinks and ades, beverage bases, and alcoholic beverages. Permanently listed since 1966. Does not require certification. The FDA in 2008 said filing the notice does not provide a basis for a GRAS determination. ASP

GRAPEFRUIT ESSENCE, NATURAL • See Grapefruit Oil. ASP

GRAPEFRUIT EXTRACT • See Grapefruit Oil. EAF

GRAPEFRUIT, JUICE • Flavoring. EAF

GRAPEFRUIT OIL • The yellow, sometimes reddish liquid is an ingredient obtained by expression from the fresh peel of the grapefruit. Used for lemon, lime, orange, and peach flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum (1,500 ppm), and toppings. An experimental tumor-causing additive. Grapefruit is promoted in weight-loss diets and it has been found to interfere with the work of a liver and intestinal enzyme, CYP3A4. As a result, grapefruit can interact with a wide range of medications, including those for cholesterol-lowering, heart disease, antibiotics, and antianxiety medicines. Grapefruit oil can irritate the skin. GRAS. ASP

GRAPEFRUIT OIL, TERPENELESS (CITRUS PARADISI) • See Grapefruit Oil and Terpenes. EAF

GRAS • The Generally Recognized as Safe List was established in 1958 by Congress. Those substances that were being added to food over a long

time, which under conditions of their intended use were generally recognized as safe by qualified scientists, would be exempt from premarket clearance. Congress had acted on a very marginal response—on the basis of returns from those scientists who were sent questionnaires. Approximately 355 out of 900 responded, and only about 100 of those responses had substantive comments. Three items were removed from the originally published list. Since then developments in the scientific fields and in consumer awareness have brought to light the inadequacies of the testing of food additives and, ironically, the complete lack of testing of the Generally Recognized as Safe List. President Nixon directed the FDA to reevaluate items on the GRAS List. The reevaluation was completed and a number of items were removed from the list. Although there were a number of others on the list, some of them top priority, to be studied in 1980, nothing has been reported by the FDA on their status since then. Use of a substance can be GRAS even if it is not listed by the FDA because the use of a GRAS substance is not subject to premarket review and approval by the FDA.

The agency says it is impracticable to list all substances that are used in food on the basis of the GRAS provision. Therefore, today, use of a substance is GRAS because of widespread knowledge among the community of qualified experts, not because of a listing or other administrative activity.

GRAS is the designation given to substances that are considered safe for direct or indirect additives to foods. There are two basic ways for a substance to be designated as GRAS. Substances that were in general use as food additives prior to January 1, 1958, were given GRAS designation based on common knowledge gained through their history of use as food additives. No further safety testing was required for these substances. Substances put into use after January 1, 1958 must be recognized as safe based on scientific procedures. These procedures should be of the same quantity and quality as would be required to obtain approval as a food additive. As mentioned, general recognition of safety may be based on the views of qualified experts in the food industry, and the status does not have to be affirmed by the FDA. In order for a substance to be affirmed as GRAS by the FDA, the commissioner must either through his or her own initiative or through petition of an interested party affirm the substance as GRAS. Before this affirmation takes place all pertinent information must be put into a public file in the office of the Docket Management Branch. A period of sixty days is allowed for comments. The commissioner will then evaluate all the comments received. If he/she decides the substance is GRAS, then a notice will be published in the Federal Register listing the substance as GRAS. If there is inadequate information to show the substance is safe, then that finding will be published in the Federal Register. In general, GRAS is now a designation made by experts within industry and no longer goes through an FDA affirmation process. GRAS status requires no safety testing of a substance's effect on the skin, the respiratory system, or on the nervous system. Science has come a long way since January 1, 1958. Substances considered safe then are no longer considered so. Yet many remain on the GRAS List. So they are still widely used in food. In the case of flavors and fragrances, individual chemicals are not listed on the label—just the word flavors or fragrance.

GREEN • See FD and C Green (Nos. 1, 2, 3).

GREEN S • Coloring. E

GREEN BEAN EXTRACT • The extract of the unripe beans of domesticated species of Phaseolus.

GREEN TEA EXTRACT • A number of studies in the 1990s have suggested green tea may help prevent certain human illnesses. Green tea can boost the potential of antibiotics to battle superbugs and other bacterial strains and even make previously antibiotic-resistant bacteria susceptible to treatment, according to “surprised” Egyptian scientists. Speaking at the Society for General Microbiology's 2008 meeting in Edinburgh in Scotland, Dr. Mervat Kassem said the research she led demonstrated antibiotics were more effective when taken in conjunction with green tea in fighting more than twenty-eight disease-causing microorganisms. Green tea made 20 percent of the drug-resistant bacteria susceptible to one of the cephalosporin antibiotics used in the study. Cephalosporin is a widely used antibiotic that some strains of bacteria have evolved to resist. Other researchers earlier reported an ingredient, epigallocatechin gallate (EGCG) (see), reportedly carries twice the antioxidant power of red wine and vitamins C and E. See Antioxidants.

GROUND LIMESTONE • Used as a flavoring. GRAS. EAF

GROUNDSEL EXTRACT • Extract of Senecio vulgaris, a North American maritime shrub or tree.

GROWTH HORMONE • GH. Human Growth Hormone (HGH). This hormone stimulates growth and cell reproduction in humans and other animals. It is a 191-amino acid, single-chain polypeptide hormone that is synthesized, stored, and secreted by the somatotroph cells within the lateral wings of the anterior pituitary gland. “Somatotrophin” refers to the growth hormone produced natively in animals, the term “somatropin” refers to growth hormone produced by recombinant DNA technology and is abbreviated rhGH (see). Growth hormone has a variety of functions in the body, the most noticeable of which is the increase of height throughout childhood, and there are several diseases which can be treated through the therapeutic use of GH. Indirect effects are mediated primarily by an insulinlike growth factor-I (IGF-I), a hormone that is secreted from the liver and other tissues in response to growth hormone. Most of the growth-promoting effects of GH are actually due to IGF-I acting on its target cells. Production of GH is modulated by many factors, including stress, exercise, nutrition, sleep, and growth hormone itself. It is being used by some age-obsessed individuals to turn back the clock and by some athletes to improve performance. Growth hormone therapy can lead to fluid retention, which in turn causes swelling in the extremities, joint pain, and carpal tunnel syndrome. (Some researchers think any increase in lean body mass comes from extra water rather than muscle growth.) It can also produce the symptoms of diabetes. But all of these side effects go away when you stop using the drug. There's some evidence that HGH can cause cancer in lab rats, but no one has proven that the same risk exists for humans on hormone replacement therapy. Patients with acromegaly—giants and those with overgrowth of features—naturally produce too much growth hormone. They are at higher risk for certain types of cancer.

GROWTH REGULATOR • Pesticide that affects insect and plant growth.

GUAIAC GUM (GUAIACUM) • See Gum Guaiac. Used as a flavoring in alcoholic beverages. NUL.

GUAIAC WOOD OIL • Guaiacum. Yellow to amber, semisolid mass with a floral odor. Derived from steam distillation of guaiac wood. A gum resin used in fruit and rum flavorings for beverages, ice cream, ices, candy, and baked goods. The oil is a raspberry, strawberry, rose, fruit, honey, ginger, and ginger ale flavoring for beverages, ice cream, candy, baked goods, gelatin desserts, and chewing gum. Formerly used to treat rheumatism. See Guaiac Gum. ASP

GUAIACYL ACETATE • A synthetic berry flavoring for beverages, ice cream, ices, candy, gelatin, chewing gum, and baked goods. ASP

GUAIACYL PHENYLACETATE • A synthetic berry, coffee, honey, tobacco, and smoke flavoring additive for beverages, ice cream, ices, candy, baked goods, and toppings. ASP

GUAIENE • Natural occurrence in patchouli oil (see). It is used as balsam odorant and/or flavor in amber, guaiacwood, moss, oriental, patchouli spice, and vetiver. Skin and eye irritant. ASP

GUAIOL • An alcohol from guaiac wood oil (see). ASP

GUANIDOETHYL CELLULOSE • See Guaiac Wood Oil.

GUANYLIC ACID SODIUM SALT • Disodium Guanylate. A flavor enhancer used in canned foods, poultry, sauces, snack items, and soups. Mildly

GUANYLIC ACID SODIUM SALT • Disodium Guanylate. A flavor enhancer used in canned foods, poultry, sauces, snack items, and soups. Mildly toxic by ingestion. Has caused mutations in experimental animals. E

GUAR GUM • Cyamopsis tetragonolobus. Guar Flour. From ground nutritive seed tissue of plants cultivated in India, it has five to eight times the thickening power of starch. A free-flowing powder, it is used as a stabilizer for frozen fruit, icings, glazes, and fruit drinks, and as a thickener for hot and cold drinks. Also a binder for meats, confections, baked goods, cheese spreads, cream cheese, ice cream, ices, French dressing, and salad dressing. Keeps tablet formulations from disintegrating and is used in cosmetic emulsions, toothpastes, lotions, and creams. Employed also as a bulk laxative, appetite suppressant, and to treat peptic ulcers. The FDA's reevaluation in 1976 found guar gum to be GRAS if used as a stabilizer, thickener, and firming additive at 0.35 percent in baked goods, 1.2 percent in breakfast cereals, 2 percent in fats and oils, 1.2 percent in gravies, 1 percent in sweet sauces, toppings, and syrups, and 2 percent in processed vegetables and vegetable juices. In large amounts, it may cause nausea, flatulence, or abdominal cramps. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. In 1997, however, the FDA banned it from use as an active ingredient in drugs because it swells when wet and had been used in weight-loss products to produce a feeling of fullness. One brand resulted in hospitalization of at least ten patients and one death from a blood clot after surgery to remove a throat blockage. GRAS. ASP. E

GUARANA GUM • Paullina cupana. The dried paste consisting mainly of crushed seed from a plant grown in Brazil. Contains about 4 percent caffeine. Used in cola flavorings for beverages and candy. See Caffeine for toxicity. There is reported use of the chemical; it has not yet been assigned for toxicology literature. EAF

GUARANA SEED, EXTRACT • From an evergreen vine found growing in the wild basins of the Amazon rain forests, it is a stimulant. The guarana fruit's color ranges from orange to red, and it contains black seeds. The indigenous people of the Amazon rain forest have used crushed guarana seed as a beverage and a medicine. It is increasingly popular in energy drinks. Guarana was used to treat diarrhea, decrease fatigue, reduce hunger, and to help arthritis. Guarana's active components are guaranine and the alkaloids theobromine and theophylline (see all). Guaranine is almost identical in chemical structure to caffeine and has many of the same effects. Guarana also contains tannins (see). Guarana, in combination with Asian ginseng and Siberian ginseng, is often used by athletes in an attempt to produce an energizing effect. However, there are not any clinical studies conclusively substantiating the benefit of guarana for this purpose. EAF

GUARANINE • See Caffeine.

GUAVA • Psidium guajava. Extracted from the fruit of a small shrubby American tree widely cultivated in warm regions. The fruit is sweet, sometimes acid, globular, and yellow. It is used to flavor jelly. The leaf is used in folk medicine to treat gastrointestinal and respiratory disturbances and is used as an antiinflammatory medicine. May alter blood tests using radioactive materials for diagnosis. This is believed to result from guava's antioxidant properties. GRAS. ASP

GUINEA GREEN B • See FD and C Green No. 1.

GUM • True plant gums are the dried exudates from various plants obtained when the bark is cut or other injury is suffered. Gums are soluble in hot or cold water and sticky. Today the term “gum,” both for natural and synthetic sources, usually refers to resins. Gums are also used as emulsifiers, stabilizers, and suspending additives.

GUM ACACIA • See Gum Arabic.

GUM ARABIC • Acacia Gum. The exudate from acacia trees grown in the Sudan. Used in face masks, hairsprays, setting lotions, rouge, and powders for compacts. Serves as an emulsifier, stabilizer, and gelling additive. Used in ice cream and vanilla powder. It may cause allergic reactions such as hay fever, dermatitis, gastrointestinal distress, and asthma. GRAS. EAF

GUM BENJAMIN • See Benzoin.

GUM BENZOIN • It is the balsamic resin from benzoin grown in Thailand, Cambodia, Sumatra, and Vietnam. Used to glaze and polish confections.

GUM DAMMAR • See Damar.

GUM GHATTI • See Ghatti Gum.

GUM GLUTEN • Used as a stabilizer in macaroni products. See Gluten.

GUM GUAIAC • Resin from the wood of the guaiacum used widely as an antioxidant in edible fats or oils, beverages, rendered animal fat, or a combination of such fats and vegetable fats. Also used as a flavoring. According to the JECFA (see), very little is absorbed. Formerly used in treatment of rheumatism. The FDA of the Select Committee on GRAS Substances stated in 2003 that it should continue its GRAS with tolerance of 0.01 percent antioxidant activity.

GUM KARAYA • Sterculia Gum. It is the dried exudate of a tree native to India. Karaya came into wide use during World War I as a cheaper substitute for gum tragacanth (see). Karaya swells in water and alcohol but does not dissolve. It is used as a stabilizer in cheese, dressings for foods, ice cream, and fruit jelly and jam. Because of its high viscosity at low concentrations, its ability to produce highly stable emulsions, and its resistance to acids, it is widely used in frozen food products. In 1971, however, the FDA put this additive on the list of chemicals to be studied for teratogenic, mutagenic, subacute, and reproductive effects. It can cause allergic reactions such as hay fever, dermatitis, gastrointestinal diseases, and asthma. GRAS

GUM ROSIN • See Rosins.

GUM SUMATRA • See Gum Benzoin.

GUM TRAGACANTH • The dried gummy exudate from plants found in Iran, Asia Minor, and Syria. A thickener and stabilizer, odorless, and with a gluelike taste. Used in fruit jelly, ornamental icings, fruit, sherbets, water ices, salad dressing, French dressing, confections, and candy. One of the oldest known natural emulsifiers, its history predates the Christian era by hundreds of years; it has been recognized in the U.S. Pharmacopoeia since 1829. It has a long shelf life and is resistant to acids. Aside from occasional allergic reactions, it can be ingested in large amounts with little harm except for diarrhea, gas, or constipation. When reevaluated, it was found to be GRAS in the following percentages: 0.2 percent for baked goods; 0.7 percent in condiments and relishes; 1.3 percent in fats and oils; 0.8 percent in gravies and sauces; 0.2 percent in meat products; 0.2 percent in processed fruits; and 0.1 percent in all other categories.

GUTHION • Azinphos-Methyl. An organophosphorous (see) pesticide that was used on many crops, especially apples, pears, cherries, peaches, almonds, and cotton. As of September 2008, its use was canceled by the EPA. Guthion interferes with nerve and brain function. Exposure to very high levels of guthion for a short period in air, water, or food may cause difficulty breathing, chest tightness, vomiting, cramps, diarrhea, blurred vision, sweating, headaches, dizziness, loss of consciousness, and death. If persons who are exposed to high amounts of guthion are rapidly given appropriate treatment, there may be no long-term harmful effects. If people are exposed to levels of guthion below those that affect nerve function, few or no health problems seem to occur. BAN

GUTTA HANG KANG • Palaquium leiocarpum. A chewing-gum base. Natural masticatory substances of vegetable origin. ASP

HAEMATOCOCCUS ALGAE MEAL • The dried cells of the algae Haematococcus pluvialis consisting of proteins, carbohydrates, and lipids produced by the alga cells. The primary coloring substance in haematococcus algae meal is astaxanthin (see), which enhances the pink to orange-red color of salmon when given in feed. The meal must have the following restrictions: lead, not more than 5 parts per million; arsenic, not more than 2 ppm; mercury, not more than 1 ppm; heavy metals (as lead), not more than 10 ppm; astaxanthin, not less than 1.5 percent pluvials. Labeling on any salmonid fish containing haematococcus algae meal is required to declare the presence of the color additive or color additive mixture to ensure that, at the retail level, the presence of haematococcus algae meal as a color additive in the fish will be declared, and that the labeling of the bulk fish container, including a list of ingredients, will be displayed on the container or on a counter card with similar information. In the future, the agency also intends to propose to amend rules to include references based on the data in the petition and other relevant material. The FDA concludes that the petitioned use of haematococcus algae meal as a color additive in fish feed to color the flesh of salmonid fish is safe, that the additive will achieve its intended technical effect, and that, therefore, there is no need for certification for public health. EAF

HALOFUGINONE HYDROBROMIDE • Used in broiler chicken and turkey feed to prevent coccidial parasitic disease. Many animals, including cattle, swine, sheep, dogs, cats, and poultry, but rarely humans, may have infestations of the alimentary canal by protozoans of the order Coccidi. The additive belongs to the family of quinazolinones—substances being studied for their ability to slow the growth of connective tissue and prevent the growth of new blood vessels to a solid tumor and as an antiinflammatory, an anticonvulsant, and an antidiuretic. The EU (see) says halofuginone must be withdrawn within five days before poultry is sent to market.

HALOGENATED HYDROCARBONS • Derivatives of organic compounds that only contain carbon and hydrogen atoms, which include some halogen atoms within their chemical structure. The most commonly encountered halogens in halogenated hydrocarbons are fluorine and chlorine, but sometimes bromine or iodine occur, or combinations of any of these. Some halogenated hydrocarbons occur naturally, often in fires. However, most are synthetic and are manufactured by humans as industrially useful materials, or they are incidentally produced as a by-product during industrial chemical reactions or during the incineration of municipal waste. Chlorinated hydrocarbons include insecticides such as DDT, DDD, Lindane, chlordane, aldrin, and dieldrin (see all). Others have been used as herbicides, especially 2,4-D and 2,4,5-T. Polychlorinated biphenyls or PCBs have been widely used as dielectric fluids in electrical transformers and for other purposes. Dioxins, including the deadly TCDD, are trace contaminants synthesized during the manufacture of other chlorinated hydrocarbons and in spontaneous chlorination reactions in incinerators and pulp mills. Chlorinated hydrocarbons are associated with some well-known environmental problems. Most of these chemicals are persistent in the environment and accumulate in organisms, sometimes causing toxicity. Chlorofluorocarbons or freons are another group of halogenated hydrocarbons that have been used extensively in refrigeration, in air conditioning, and for cleaning electrons. After their use these chemicals are often discharged to the atmosphere where they are very persistent and appear to be involved in ozone-destroying reactions occurring in the stratosphere. In recognition of the environmental problems associated with these chemicals, the manufacturing and use of chlorofluorocarbons are rapidly being curtailed through international agreements.

HALOXON • Galloxon. An antiworm medicine for animals. The FDA residue tolerance is 0.1 ppm in edible tissues of cattle, sheep, and goats.

HALSOSALT • Made from cornstarch that is fermented to produce lysine, a salty amino acid, it is being proposed as a salt substitute.

HAW BARK • Black Extract. Extract of the fruit of a hawthorn shrub or tree. Used in butter, caramel, cola, maple, and walnut flavorings for beverages, ice cream, ices, candy, and baked goods. Has been used as a uterine antispasmodic. ASP

HAWTHORN BERRY • Crataegus oxyacantha. A spring-flowering shrub or tree. A number of scientific studies in Central Europe and in the United States have found that hawthorn berries can dilate the blood vessels and lower blood pressure. The berries reportedly also can increase the enzyme metabolism of the heart and make the heart's use of oxygen during exercise more efficient. Hawthorn extracts are also believed to have some diuretic properties. In the 1800s, the berries were used to treat digestive problems and insomnia. They contain bioflavonoids, compounds that are necessary for vitamin C function and also help strengthen blood vessels. In Germany, this herb is used to treat early-stage congestive heart failure and in the United States, it is used by health practitioners to lower blood pressure. See Haw Bark.

HAZELNUT OIL • The oil obtained from the various species of the hazelnut tree, genus Corylus.

HCA • Abbreviation for heterocyclic amines. Heterocyclic compounds are organic compounds that contain a ring structure containing atoms in addition to carbon, such as sulfur, oxygen, or nitrogen, as part of the ring. Some are useful and some are not. A number of antidepressant medications are HCAs and so are benzene and furans (see all). Some HCAs found in cooked meat are known carcinogens. Research has shown that cooking certain meats at high temperatures creates chemicals that are not present in uncooked meats. For example, heterocyclic amines are the carcinogenic chemicals formed from the cooking of muscle meats such as beef, pork, fowl, and fish. HCAs form when amino acids and creatine (a chemical found in muscles) react at high cooking temperatures. Researchers have identified seventeen different HCAs resulting from the cooking of muscle meats that may pose a human cancer risk. The National Cancer Institute's Division of Cancer Epidemiology and Genetics found a link between individuals with stomach cancer and the consumption of cooked meat, and other studies found colorectal, pancreatic, and breast cancers are associated with high intakes of well-done, fried, or barbecued meats. Other sources of protein (milk, eggs, tofu, and organ meats such as liver) have very little or no HCA content naturally or when cooked. Previous studies showed that meat products cooked below 352° F for less than four minutes had low or undetectable levels of HCAs. The HCAs would increase as temperature and cooking time increased. Although lower temperatures and shorter cooking times can reduce the risk of HCA formation, those alternatives have their own problems. Lower temperatures can affect the taste adversely, Professor J. Scott Smith has explained, noting that commercial steak houses cook at temperatures above 400° F. “Some use real high temperatures quick on the surface, then they pull it out and put it in an oven to finish it.” See Rosemary.

HCFC-123 • A fluorocarbon (see) once considered as an alternative to CFC-11 in refrigeration.

HCL • The abbreviation for hydrochloride.

HDM • The abbreviation for human dose metric.

HDPE • The abbreviation for high density polyethylene film (see).

HEATHER EXTRACT • An extract of Calluna vulgaris, also called ling, is an evergreen shrub that grows in sandy, slightly acidic grasslands and woodlands. Heather is a multifunctional plant, serving as a food source for several mammals, reptiles, and insects; people have also used it in folk remedies. Heather contains antiinflam-matory, antioxidant, and antimicrobial materials. Traditionally, heather has been used to treat bronchitis, circulatory disorders, bile deficiency, open wounds, insomnia, hypotension, and many other ailments. The flowers and stems of heather are often dried and used in teas. The dried herb is also used in aromatherapies and hot baths for soaking sore feet or aching muscles. Scientific research has even demonstrated that components of the heather plant have antiproliferative effects on HL60 (human leukemia) cancer cells. It is also being promoted as an “antiaging” compound in cosmetics.

HECTORITE • An emulsifier and extender. A clay consisting of silicate of magnesium and lithium, it is used in the chill proofing of beer. The dust can be irritating to the lungs.

HEDEOMA OIL • See Pennyroyal Oil.

HEDP • The abbreviation for 1-hydroxyethylidene-1,1-diphosphonic acid. A stabilizer used in chicken carcass washing. The JCFA (see) found no concern at the concentrations of residue that are expected to remain on foods. See Peroxyacid. HELIOPSIS LONGPIPES EXTRACT • Liquid Gold Root Extract (LGRE). Liquid extract of the root of this Mexican plant. Compositions based on the Heliopsis longpipes root are used orally to increase salivation, alleviating dry mouth, and as local contact anesthetics and cough suppressants. It is used as a flavoring because it produces desirable sensations in the throat. Extracts are from about 0.01 to about 10 weight percent of the overall composition. A variety of compositions are available including a gum with a solid exterior and a liquid center, both the exterior and center containing an effective amount of the extract composition; a solid gum; lozenges; candies, confections, and flavored liquid sprays and drops; and mouthwashes. The extract is reputedly an enhancer and potentiator of flavor. The FDA informed the appliers for this ingredient that, despite the claim that the herb has been used in Mexico for centuries, there is not enough information yet about its use as a food additive to approve its safety as GRAS. EAF

HELIOTROPIN • Piperonal. Used in cherry and vanilla flavors. A purple diazo dye (see).

HELIOTROPINE • See Heliotropin.

HELIOTROPYL ACETATE • See Piperonyl Acetate.

HELIUM • This colorless, odorless, tasteless gas is used as a propellant for foods packed in pressurized containers. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. NUL. E

HEMICELLULOSE EXTRACT • Used in feed as a source of metabolizable energy. It is in the cell walls of all plants and some seaweeds and contains a variety of sugars. Nontoxic.

HEMLOCK NEEDLES AND TWIGS OIL • Tsuga. Spruce Oil. A natural flavoring extract from North American or Asian nonpoisonous hemlock. Used in fruit, root beer, and spice flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, and chewing gum. NUL

HEMOTOXICITY • A toxic effect on blood components or properties such as changes in hemoglobin, pH, electrolytes, or protein of the plasma.

HENDECANAL • See Undecanal.

HENDECEN-9-OL • See 9-Undecanal.

HEPTACHLOR • Between the 1960s and 1970s heptachlor was used to kill termites found in the home, and farmers used it to kill insects found on farm crops, especially corn crops. In the late 1970s, the use of heptachlor was phased out. By 1988, the commercial sale of heptachlor was banned in the United States. The use of heptachlor is restricted to controlling fire ants in power transformers. Heptachlor can get into the body by breathing contaminated air over a long period of time. It can also enter the body by food, water, or even milk that is contaminated with heptachlor. Once in the body, heptachlor mixes with oxygen and changes to heptachlor epoxide. Nursing mothers who are exposed to heptachlor may pass the substance on to their babies while breastfeeding. Heptachlor can enter the body through skin contact. Because heptachlor is no longer commercially available, exposure through skin contact is very limited. If you had your home treated with it years ago, it can still be present. Growing vegetables in ground that has been treated with it may still contaminate them. The health effects from exposure to heptachlor will vary depending on how much you are exposed to and the length of time. There is very little information available about the short-term exposure to high doses of heptachlor to humans. But animal studies show that heptachlor can be very toxic to humans and animals. Animals that were fed high levels of heptachlor during a short period of time experienced tremors and convulsions. Little information is available about its long-term health effects. Heptachlor is on the EPA's Top Seven Priority List for study. g-HEPTALACTONE • A synthetic coconut, nut, and vanilla flavoring for beverages, ice cream, ices, candy, and baked goods. ASP. E

HEPTALDEHYDE • See Heptanal.

HEPTANAL • Heptaldehyde. Oily, colorless liquid with a penetrating fruit odor made from castor oil. A synthetic flavoring additive used in citrus, apple, melon, cognac, rum, and almond flavorings for beverages, ice cream, ices, candy, baked goods, and liqueurs. Mildly toxic by ingestion. ASP

HEPTANAL DIMETHYL ACETAL • A synthetic fruit, melon, and mushroom flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. ASP

HEPTANAL GLYCERYL ACETAL • A synthetic mushroom flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

2,3-HEPTANEDIONE • A synthetic raspberry, strawberry, butter, fruit, rum, nut, and cheese flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

HEPTANOIC ACID • Enanthic Acid. Found in various fusel oils and in rancid oils, it has the faint odor of tallow. It is made from grapes and is a fatty acid used chiefly in making esters (see) for flavoring materials. ASP

(E)-2-HEPTENOIC ACID • Flavoring declared GRAS by FEMA (see). EAF

2-HEPTANOL • A synthetic flavoring additive, liquid, and miscible with alcohol and ether. See Heptyl Alcohol for use. ASP

2-HEPTANONE • A synthetic flavoring additive, liquid, with a penetrating odor, used to give a “peppery” smell to such cheeses as Roquefort. Found in oil of cloves and in cinnamon bark oil. Used in berry, butter, fruit, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments (25 ppm). Found naturally in oil of cloves and in cinnamon bark oil. The lethal concentration in air for rats is 4,000 ppm. In high doses it is a narcotic, and it is a suspected irritant to human mucous membranes. ASP

3-HEPTANONE • A synthetic melon flavoring additive for beverages, ice cream, ices, candy, and baked goods. See 2-Heptanone, which is a similar compound.

4-HEPTANONE • A synthetic strawberry and fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. See 2-Heptanone, which is a similar compound. ASP

4-HEPTENAL • Synthetic mushroom flavoring. ASP

2-HEPTENAL • Green, grassy, herbaceous, spicy, fruity esterlike synthetic flavoring. Suggested use in apple, fruit, cucumber, pear, grape flavorings; also used in fragrances for fruity top notes; also geranium and galbanum. ASP

4 HEPTENAL DIETHYL ACETAL • Synthetic flavoring. The JECFA (see) has no safety concern at current levels of intake. NIL

(Z)-4-HEPTEN-1-OL • Synthetic flavoring that is described as creamy grass or banana. EAF

2-HEPTEN-4-ONE • Synthetic flavoring derived from hazelnuts. ASP

3-HEPTEN-2-ONE • Synthetic flavoring derived from peppers. The JECFA (see) says there is no safety concern. ASP

3-HEPTENYL ACETATE • Synthetic flavoring. The JECFA says there is no safety concern. EAF

3-HEPTENYL-2-METHYLPROPANOATE • Synthetic flavoring. The JECFA says there is no safety concern. ASP

HEPTYL ACETATE • A synthetic berry, banana, melon, pear, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. See 2-Heptanone. ASP

3-HEPTYL ACETATE • Synthetic flavoring. The JECFA says there is no safety concern. ASP

HEPTYL ALCOHOL • 1-Heptanol. Colorless, fragrant liquid miscible with alcohol. A synthetic flavoring additive with a fatty, citrus odor, used in fruit flavorings for beverages, ice cream, ices, candy, and baked goods. Moderately toxic by ingestion and skin contact. See 2-Heptanone. ASP

HEPTYL ALDEHYDE • See Heptanal.

HEPTYL BUTYRATE • Butyric Acid. A synthetic raspberry, floral, violet, apricot, melon, and plum flavoring additive for beverages, ice cream, ices, candy, baked goods. ASP

2-HEPTYL BUTYRATE • Synthetic flavoring. The JECFA says there is no safety concern. EAF

HEPTYL BUTYROLACTONE • Synthetic flavoring. See Undecalactone and Butyrolactone.

HEPTYL CINNAMATE • A synthetic cinnamon flavoring. ASP

3-HEPTYLDIHYDRO-5-METHYL-2(3H)-FURANONE • Synthetic flavoring. The JECFA (see) has no safety concern. ASP

HEPTYL FORMATE • Used in artificial fruit essences. A skin irritant. See 2-Heptanone. ASP

2-HEPTYL FURAN • Synthetic flavoring. See Furans. NIL

HEPTYL HEPTANOATE • Colorless liquid with fruity odor used in artificial fruit essences. See 2-Heptanone.

HEPTYL ISOBUTYRATE • A synthetic coconut, apricot, peach, pineapple, and plum flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

HEPTYL OCTANOATE • Synthetic flavoring. NIL

HEPTYL PELARGONATE • Liquid with pleasant odor used in flavors and perfumes. See 2-Heptanone. n-HEPTYLIC ACID • See Heptanoic Acid.

HEPTYLPARABEN • A preservative used in fermented malt beverages to inhibit microbiological spoilage. It is also used in noncarbonated soft drinks and fruit-based beverages when allowed by established standards of identity. FDA tolerance is 12 ppm. See Parabens. ASP

HERB • Botanists define an herb as being a soft-stemmed plant, which dies after flowering, while herbalists define an herb as any part of a plant that can be used for medicine, cooking, and cosmetic uses and as a scent or dye. Herbalism is the oldest-known method of healing, being used to some degree by all ancient cultures. Many herbs that were used for healing thousands of years ago are still in use today. Many are flowering garden plants or pot herbs today. Many food additives are based on herbs such as yarrow, which is known to have been used at least six thousand years ago. Some herbs do have medicinal properties and others are pests.

HERB • FDA abbreviation for herbicide.

HERBICIDE • A pesticide used for killing or inhibiting plant growth. A weed or grass killer.

HERB ROBERT EXTRACT • Extract of the entire plant, Geranium robertianum. See Geranium Oil.

HESPERIDIN • A natural bioflavonoid (see). Fine needles from citrus fruit peel. Used as a synthetic sweetener. EAF

HETEROCYCLIC AMINES • See HCA.

HEXACHLOROBENZENE • Hexachlorobenzene, also known as HCB, is a white crystal-looking solid. It is not found naturally in the environment but is developed during the production of other chemicals. Until 1965, HCB was mostly used as a pesticide to protect against fungus. Using and intentionally making HCB is no longer allowed in the United States. HCB, however, can enter the body after you eat or drink HCB-contaminated food such as fish, meat, poultry or milk. Within just a few hours of entering the body, HCB can spread to other tissues. HCB will stay in the body for years, especially in fat tissues. When it does leave the body, it has been found in feces and in urine. Babies who are nursing can be exposed to HCB through their mother's breast milk. Animal studies show that eating HCB-contaminated food over a long period of time can harm the liver, immune system, kidneys, and blood. It can cause the skin to break and change in color. The U.S. Department of Health and Human Services determined that HCB is a probable human cancer-causing agent. No information is available on short-term exposure. HCB is one of the EPA's seven high priority toxic chemicals for reduction. Identified as a priority hazardous substance by the EU.

HEXACHLOROBUTADIENE • A colorless liquid that smells like turpentine. It is formed when making other chemicals. It is used as a solvent. Most of the hexachlorobutadiene in the United States is imported from Germany. It has a number of uses. Individuals can be exposed to hexachlorobutadiene by eating contaminated food like fish or by drinking contaminated water. No studies have looked at the health effects of hexachlorobutadiene in humans. But animal studies show that mice that breathed large doses of hexachlorobutadiene for a short period of time experienced nose irritation. None of the studies looked at the effects of breathing low doses over a long period of time. Rats and mice that drank low doses of hexachlorobutadiene over the short and long term showed kidney damage and liver damage. The U.S. Environmental Protection Agency (EPA) believes hexachlorobutadiene can possibly cause cancer. One animal study showed that rats exposed to low doses of hexachlorobutadiene developed kidney tumors. However, it is not known if this exposure will cause cancer in humans. It is on the EPA's Toxic Chemicals Priority List for evaluation. Identified as priority hazardous substance by the EU. It is number twenty-two on the CERCLA Priority List of Hazardous Substances (see).

HEXACHLOROCYCLOHEXANE, gamma • HCH gamma. Lindane. A white solid that turns into a vapor when released into the air. Once released, it looks colorless but has a musty odor. HCH gamma is a man-made chemical and it exists in eight different forms. HCH gamma was mostly used on fruit and vegetable crops to kill insects. HCH gamma hasn't been made in the United States since 1977, but it is still brought into the country and formulated. The U.S. EPA has placed limits on what it can be used for. Only individuals who are certified can handle it. In homes, it is found in products like house sprays, shelf paper, and dog dips. People can be exposed to it by eating HCH gamma-contaminated food like plants, meat, or dairy products. Nursing mothers who have been exposed to HCH gamma can pass it onto their babies in breast milk. HCH gamma tends to leave the body very quickly through urine. Small amounts leave the body in feces and exhalation. HCH gamma has been found in soil and surface water at hazardous waste sites. Workers exposed to HCH gamma while making pesticides showed signs of lung irritation, heart disorders, blood disorders, headache, convulsions, and changes in sex hormones. Humans and animals exposed to large amounts of HCH gamma died. Others exposed to very large doses developed blood disorders and had seizures. People who breathed HCH gamma in the workplace developed blood disorders, experienced dizziness, headaches, and showed changes in the levels of sex hormones. No information on the short and long term effects of drinking HCH gamma is known. It is on the EPA Toxic Chemicals Priority List for study. Identified as priority hazardous substance by the EU. Do not use a product containing it. It is also commonly listed as lindane.

HEXACHLOROETHANE • Colorless and solid in appearance, hexachloroethane slowly turns into a vapor when it is exposed to the air, and it smells

like mothballs. Hexachloroethane is not found naturally in the environment. It is mostly used by the military to make weapons that produce smoke, like smoke pots and grenades used during training. It is also present as an ingredient in fungicides, insecticides, lubricants, and plastics. Although hexachloroethane is no longer made in the United States, it can be created while producing some other chemicals, such as when products that contain chlorinated hydrocarbons are burned. Hexachloroethane can enter the body by breathing contaminated air, by drinking contaminated water, and by skin contact with the chemical. When it is released to soils, it will evaporate (turn into a vapor) into the air. This is also true when it is released in lakes or streams. You could be exposed if your workplace makes or uses hexachloroethane or you dig in contaminated soil while planting. Although hexachloroethane is not very toxic, your liver could be affected if you are exposed to it for a long period of time. Exposure might cause some damage to the kidneys. Animal studies don't indicate that exposure to hexachloroethane could cause birth defects or infertility. It is on the EPA's Priority Toxic Chemicals List for study and reduction.

HEXACHLOROPHENE • An antibacterial used in animal products, but the FDA restricts its use. In 1969, scientists reported microscopically visible brain damage in rats from small concentrations of this chemical. The company that had the patent on hexachlorophene, the Swiss-based Givaudan Corporation, sold the chemical only to those companies that could demonstrate a safe and effective use for it. However, when the patent ran out, it was sold for many purposes. It is still used in small amounts in some cosmetic products for humans.

1-HEXADECANOIC ACID • See Palmitic Acid.

1-HEXADECANOL • Cetyl Alcohol. A synthetic chocolate flavoring additive for ice cream, ices, and candy. Moderately toxic by ingestion. An eye and human skin irritant.

o-6-HEXADECENLACTONE • Ambrettolide. 6-Hexadecenolide. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

6-HEXADECENOLIDE • See Omega-6-Hexadecenlactone.

HEXADECYLIC ACID • See Palmitic Acid.

2-4-HEXADIENAL • Hexa-2,4-Dienal. 2,4-Hexadienal. 2,4-Hexadien-1-ol. 2,4-Hx. 1,3-Pentadiene-1-Carboxaldehyde. 2-Propylene Acrolein. Sorbaldehyde. Sorbic Aldehyde 2,4-Hexadienal. A colorless to yellow liquid with a pungent “green” or citrus odor, it is used as a food additive for flavor enhancement, as a fragrance agent, as a starting material or intermediate in reactions in the chemical and pharmaceutical industries, as a fumigant, and as a corrosion inhibitor for steel. 2,4-hexadienal was selected for study by the National Cancer Institute because of the potential for carcinogenicity based on its structure and the potential link between exposure to lipid peroxidation (see) products in the diet and human malignancies. Male and female rats and mice received 2,4-hexadienal in corn oil by stomach tube for sixteen days, fourteen weeks, or two years. Under the conditions of these two-year stomach tube studies, there was clear evidence of cancer activity of 2,4-hexadienal in rats and mice based on increased incidences of squamous cell neoplasms of the forestomach. The occurrence of squamous cell carcinoma of the tongue in male mice may have been related to the administration of 2,4-hexadienal. The NTP (see) Board of Scientific Counselors Technical Reports Review Subcommittee, October 18, 2001, accepted the toxicology findings. This additive, of course, should be banned. ASP

2,4 HEXADIENAL-1-OL • It occurs naturally in many foods including kiwi, mango, peanuts, clams, and beer. In concentrated form, it exhibits a powerful irritating odor but at concentrations used in flavorings (less than 1 ppm) it provides a sweet green aroma. Based on 1999 reports, the daily per capita intake for “eaters only” is estimated at 0.003 mg/kg body weight per day as a flavoring. After two years of stomach tube studies, there was clear evidence of cancer-causing activity in rats and mice. The NTP (see) concluded that the high doses given the rodents caused chronic irritation. Stomach tube administration provides a bolus dose that exerts traumatic effect on the lining of the rodents' forestomach. Thus, the experts concluded, it would not be expected in the diet and concluded it was safe as a flavoring. EAF

2,4-HEXADIENOATE • See Allyl Sorbate.

HEXAHYDROPYRIDENE • See Piperidine.

HEXAHYDROTHYMOL • See Menthol.

HEXAKIS • A pesticide to kill mites in animal feeds. The residue tolerance set by the FDA ranges from 20 ppm in raisin waste to 100 ppm in dried grape pomace. A corrosive skin and eye irritant.

HEXALACTONE (d, g, or y) • Synthetic butter, fruit, honey, and vanilla flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

HEXALDEHYDE • See Hexanal.

HEXAMETHYLENETETRAMINE (HMT) • Methenamine. Odorless powder or crystals used in adhesives, coatings, as a stabilizers for lubricating and insulating oils, as a urinary antibacterial, and as a urinary antiseptic for animals. It is used in production of Provolone cheese. Studies at Italy's University of Milan concluded there was no appreciable health risk from ingestion of cheese made with this additive. E

HEXANAL • Hexaldehyde. Hexoic Aldehyde. A synthetic flavoring additive occurring naturally in apples, coffee, cooked chicken, strawberries, tea, and tobacco leaves (oils). Used in butter, fruit, honey, and rum flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

1-HEXANAL • See Hexyl Alcohol. ASP

HEXANE • Made from crude oil. Pure n-hexane is a colorless liquid with a slightly disagreeable odor The major use for solvents containing hexane is to extract vegetable oils from crops such as soybeans. Inhaling n-hexane causes nerve damage and paralysis of the arms and legs. Some people abuse products containing n-hexane by inhaling it to get “high.” If hexane is spilled on the ground, most of it evaporates before it can soak into the soil. Hexane is not concentrated by plants, fish, or animals. The most likely exposure to hexane is by breathing in air contaminated with it. Since it is in gasoline, nearly everyone is exposed to very small amounts of hexane in the air. Exposure can occur at work and at home from using products containing hexane without proper ventilation. ASP

HEXANEDIOIC ACID • See Adipic Acid.

2,3,HEXANEDIONE • Synthetic flavoring. ASP

1,6-HEXANEDITHIOL • Synthetic flavoring. See Hexane. ASP

1-HEXANETHIOL • Synthetic Flavoring. See Hexane. EAF

1,2,6-HEXANETRIOL • An alcohol used as a solvent. No known skin toxicity.

HEXANOIC ACID • A synthetic flavoring additive that occurs naturally in apples, butter acids, cocoa, grapes, oil of lavender, oil of lavandin, raspberries, strawberries, and tea. Used in butter, butterscotch, chocolate, berries, strawberries, and tea. Used in butter, butterscotch, chocolate, berry, fruit, rum, pecan, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. Moderately toxic by ingestion and skin contact. Severe eye irritant. Has caused mutations in laboratory animals. ASP

HEXANOL • Hexyl Alcohol. Used as an antiseptic and preservative, it occurs as the acetate (see) in seeds and fruits of Hercleum sphondylium and Umbelliferae. See Hexyl Alcohol. ASP

3-HEXANOL • See Hexyl Alcohol.

3-HEXANONE • A solvent. Toxic by ingestion. ASP

HEXAZINONE • A weed killer used in various plant products. Moderately toxic by ingestion and by skin contact. Has caused adverse reproductive effects in laboratory animals.

3-HEXENAL • Synthetic flavoring. It is a spoilage protectant in potatoes and has a pineapple taste. ASP

2-HEXENAL • A synthetic berry and fruit flavoring additive that occurs naturally in apples and strawberries and is used for beverages, ice cream, ices, candy, and baked goods. ASP

3-HEXENAL • A synthetic fruit flavoring additive for beverages, ice cream, ices, and candy. EAF

4-HEXANAL • A flavoring determined GRAS by FEMA (see). EAF

(Z)-2-HEXEN-1-OL • Synthetic flavoring. FEMA (see) declared it GRAS. See Aldehyde. EAF

(E)-2-HEXENAL DIETHYL ACETAL • A flavoring determined GRAS by FEMA (see). EAF

3-HEXENOIC ACID • See Methyl Hexenoate. ASP

1-HEXEN-3-OL • Artificial odorant with a green smell. See 2-Hexen-1-ol. ASP

2-HEXEN-1-OL • A synthetic flavoring that is a colorless liquid with a fruity odor. It occurs naturally in grapes; similar in compound to 3-Hexen-1-ol. Used in fruit and mint flavorings for beverages, ice cream, ices, candy, and baked goods. Moderately toxic by ingestion and mildly toxic by skin contact. ASP

2-HEXEN-1-YL ACETATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-HEXEN-1-YL ACETATE • Green grassy, herbaceous, fruity odor. Used in pear, apple, strawberry, melon, and peach flavorings. ASP

2-HEXEN-1-YL ACETATE • Green grassy, spicy, fruitlike flavoring used in soft fruits, apple, pear, melon, honeydew, wintergreen, and tea. ASP

(Z)-3-HEXENYL ANTHRANILATE • Synthetic flavoring with a sweet, fruity odor. FEMA (see) has declared it GRAS. EAF

3-HEXENYL BENZOATE • Synthetic flavor with a sweet fruity odor and a taste of grapes. ASP

(E)-2-HEXENYL BUTYRATE • Flavoring with an intense fruity green leafy odor. Declared GRAS by FEMA (see). EAF

3-HEXENYL CROTONATE • Green rosy, floral odor. EAF

3-HEXENYL FORMATE • Used to add green and vegetable notes to broccoli and asparagus flavors. Declared GRAS by FEMA (see). ASP

2- and 3-HEXENYL HEXANOATE • Flavorings with a taste of red fruits, peach, passionfruit. ASP

(Z)-3-HEXENYL (E)-2-HEXENOATE • Synthetic plumlike odor. Declared GRAS by FEMA. EAF

(Z)-3-HEXENYL ISOBUTYRATE • Synthetic flavoring declared GRAS by FEMA (see) and of no safety concern to the JECFA (see). EAF

(E)-2-HEXENYL ISOVALERATE • Mixture of alcohol and salt of isovaleric acid (see). Used as a flavoring in apple and butter products. Declared GRAS by FEMA (see). EAF

3-HEXENYL LACTATE • Flavoring with a fruity note used for berries. ASP

(Z)-3-HEXENYL(E)-2-METHYL-2-BUTENOATE • Synthetic flavoring declared GRAS by FEMA (see) and said to be of no safety concern to the JECFA (see). EAF

3-HEXENYL 2-METHYL BUTYRATE • Colorless liquid with a strong fruity odor used as a flavoring in various foods. ASP

3-HEXENYL PHENYLACETATE • Honey, apricot, cherry, peach, butter, tobacco flavoring. ASP

HEXENYL PROPIONATE • Flavoring with a fresh, green, fruity, slightly waxy and vegetablelike character. Used in apple, strawberry, guava and other tropical fruit flavorings. Declared GRAS by FEMA (see). ASP

(Z)-3-HEXENYL PYRUVATE • Synthetic flavoring declared GRAS by FEMA (see) and of no safety concern to the JECFA (see). EAF

(Z)-3-HEXENYL VALERATE and (E)-2-HEXENYL VALERATE • Synthetic flavorings declared GRAS by FEMA (see). EAF

HEXITOL OLÉATE • An emulsifier that was used in ice cream but has been banned by the FDA.

HEXOIC ACID • See Caproic Acid.

HEXOIC ALDEHYDE • A synthetic berry, apple, pear, and pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum.

HEXONE • Colorless liquid with a fruity odor used as a flavoring additive in various foods. Moderately toxic by ingestion. Mildly toxic by inhalation. Very irritating to the skin, eyes, and mucous membranes. A human systemic irritant by inhalation. Narcotic in high concentration.

HEXOSE OXIDASE FROM CHONDRUS CRISPIUS EXPRESSED IN HANSENULA POLYMORPHA • An enzyme preparation that processes sugars to lactones, with the concomitant of hydrogen peroxide (see). Derived from red alga, which is not known to be pathogenic, allergenic, or toxic; red alga has a long history of use in food and is one of the sources of carrageenan (see).

HEXYL- • Mostly residue of hexane made from crude oil. Hexyl compounds have similar structures to sugars and are widely used to make synthetic flavorings. See Hexane.

HEXYL ACETATE • Acetic Acid. Hexyl Ester. A synthetic berry, apple, pear, and pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. Mildly toxic by ingestion. ASP

2-HEXYL-4-ACETOXYTETRAHYDROFURAN • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

HEXYL ALCOHOL • 1-Hexanol. A synthetic flavoring additive that occurs naturally in apples, oil of lavender, strawberries, and tea. Used in berry, coconut, and fruit flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. See 3-Hexanol and Fatty Alcohols. ASP

HEXYL-2-BUTENOATE • Colorless liquid with a fruity odor used as a flavoring in various foods. GRAS. ASP

HEXYL BUTYRATE • Fruity flavoring. ASP

a-HEXYLCINNAMALDEHYDE • See Hexyl Cinnamaldehyde. ASP

HEXYL CINNAMALDEHYDE • A synthetic flavoring, pale yellow liquid with a jasminelike odor. Used in berry, fruit, and honey flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Moderately toxic by ingestion. A skin irritant. ASP

2-HEXYL-4,5-DIMETHYL-1,3-DIXOLANE • A flavoring determined GRAS by FEMA (see). See Heptanal. EAF

HEXYL ESTER • See Hexyl Acetate.

HEXYL FORMATE • Formic Acid. A synthetic raspberry and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

HEXYL 2-FUROATE • A synthetic coffee, maple, and mushroom flavoring additive for candy and condiments. ASP

HEXYL HEXANOATE • Hexanoic Acid. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

2-HEXYLIDENE CYCLOPENTANONE • Synthetic flavoring approved by the FDA. ASP

HEXYL ISOBUTYRATE • Fruity, esterlike, tropical flavoring used in tropical fruit and fresh flavors. ASP

HEXYL ISOVALERATE • A colorless liquid with a fruity odor used as a flavoring in various foods. ASP

2-HEXYL-5 (or 6)-KETO-1,4-DIOXANE • A synthetic cream flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

HEXYL LAURATE • See Lauric Acid.

HEXYL 2-METHYL BUTYRATE • Colorless liquid; strong, fresh, green fruity odor used as a flavoring additive. ASP

HEXYL OCTANOATE • Octanoic Acid. A synthetic fruit flavoring additive for beverages and puddings. ASP

HEXYL PHENYLACETATE • Green grassy, fruity, esterlike, tropical flavoring used in tropical fruits and fresh green flavors. ASP

HEXYL PROPIONATE • Propionic Acid. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

HEXYLENE GLYCOL DIACETATE • See 1,3-Nonanediol Acetate.

2-HEXYLIDENE CYCLOPENTANONE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods.

HEXYLRESORCINOL • A compound with anaesthetic and antiseptic properties, commonly used as an ingredient in throat lozenges. It has a pungent odor and a sharp astringent taste and has been used medicinally as an antiworm medicine. In foods, it is used as a color stabilizer, enzyme browning inhibitor, and a processing aid. It can cause severe gastrointestinal irritation; bowel, liver, and heart damage has been reported. Concentrated solutions can cause burns of the skin and mucous membranes. It is, at this writing, being promoted as an antibrowning agent for fresh cut fruit. E

2-HEXYLTHIOPHENE • Meatlike artificial flavoring. EAF

HEXYTHIAZOX • A white, odorless, crystalline pesticide used to kill mites on pears. FDA residue tolerance is 0.3 ppm.

HFCS • The abbreviation for high fructose corn syrup (see).

HICKORY BARK EXTRACT • Carya spp. A natural flavoring extract from the hickory nut tree and used in butter, caramel, rum, maple, nut, spice, tobacco, and smoke flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and liquors. GRAS. NIL

HICKORY SMOKE COMPENSATE • HSC. A food flavoring popular in the United States. Available data have suggested that this additive has tumor-initiating and -promoting potential. Researchers at Japan's Nagoya City University Medical School gave rats a diet containing 5 percent HSC and the animals developed pre-cancerous lesions. No effect was observed at lower doses. ASP

HIGH AMYLOSE CORNSTARCH • Cornstarch that has been treated with enzymes to make it sweeter.

HIGH DENSITY POLYETHYLENE FILM • HDPE. A new resin for use in high density polyethylene film packaging applications that provides cost savings through higher moisture resistance and stiffness while using less film. Used in multilayer film packaging for cereals, meats, cheeses, ready-to-eat meals, and pet foods. The company producing it claims that the resin provides 50 percent improved moisture resistance and 20 percent superior stiffness over existing polyethylene barrier resins.

HIGH FRUCTOSE • High fructose syrups are sweeteners produced from starches such as corn, rice, and wheat. They can be found in a variety of food products, including breakfast cereals, soft drinks, and breads. Currently, there are few available studies on the health effects of high fructose syrup, and most are focused on the short-term effects. The American Medical Association, at an annual policy-making meeting in Chicago, June 17, 2008, concluded after studying current research that high fructose syrup does not appear to contribute more to obesity than other caloric sweeteners, but called for further independent research to be done on the health effects of high fructose syrup and other sweeteners. “At this time there is insufficient evidence to restrict the use of high fructose syrup or label products that contain it with a warning,” said AMA board member William Dolan, M.D. “We do recommend consumers limit the amount of all added caloric sweeteners to no more than 32 grams of sugar daily based on a 2,000 calorie diet in accordance with the Dietary Guidelines for Americans.”

HIGH FRUCTOSE CORN SYRUP • HFCS. Corn syrup (see) that has been treated with enzymes to make it sweeter. It is about one and a half times sweeter than sugar. It does have calories. Used in beverages, candy, frozen desserts, dairy drinks, canned fruits, processed ham, hamburger, ice cream, luncheon meat, meat loaf, poultry, and sausage. A combination of fructose and dextrose (see both), it is a low-cost addition to pickles, ketchup, and syrups. Products containing HFCS cannot be considered “natural” and should not be labeled as such, the U.S. Food and Drug Administration (FDA) has said. The 2008 decision caused a massive stir in the food and beverage industry, where a discreet battle has been raging over the status of the controversial sweetener. High fructose corn syrup is derived from corn, and used primarily to sweeten beverages. The trade group Corn Refiners Association and numerous industry members have long maintained that HFCS is a natural sweetener. There is reported use of the chemical; it has not yet been assigned for toxicology literature. GRAS. ASP

HIGH POTENCY• A nutrient in a food that is 100 percent or more of the RDI (see) established for that product. The term may also be used with multiingredient products if two-thirds of the nutrients are present at 100 percent of the RDI.

HINOKITIOL • The organic compound distilled from the leaves of arborvitae, it is a pale yellow oil with a camphor smell and is used in perfumery and flavoring. Low toxicity.

HIP BERRY EXTRACT • See Rose Hips Extract.

HISTAMINE • A chemical released by mast cells and considered responsible for much of the swelling and itching characteristics of hay fever and other allergies.

HISTIDINE • L forms only (L-histidine is the natural form). A basic essential amino acid (see) used as a nutrient. It is a building block of protein, used as a nutrient. Soluble in water. It is used in cosmetic creams. GRAS. ASP

HOMEOSTASIS • Maintenance of a constant internal environment in the body.

HOMOCYSTEINE • An amino acid found in high concentrations in blood when there is a risk of a heart attack in young women. Women who have high homocysteine levels tend to have low folate levels.

HOMOERIODICTYOL, SODIUM SALT • A bitter-masking flavanone extracted from Yerba santa (see), a plant growing in America. Has been used in pharmaceuticals and is used to take the bitter taste out of caffeine. EAF

HONEY • The common, sweet, viscous material taken from the nectar of flowers and manufactured in the sacs of various kinds of bees. The flavor and color depend on the plants from which it was taken. Honey has been used to cure meat for thousands of years. Researchers at Clemson University in South Carolina rediscovered that this natural preservative confers excellent protection against oxidation and boosts shelf life in popular processed meats.

HONEYDEW MELON JUICE • Liquid expressed from fresh honeydew. Melons are reputedly diuretics and thirst quenchers. Since melons contain predigested sugar, they also provide quick nourishment.

HONEYSUCKLE • The common fragrant tubular flowers filled with honey, which are used in perfumes and flavorings.

HOPS • Humulus lupulus. Used in beer brewing and in fruit and root beer flavorings for beverages. Derived from the carefully dried pineconelike fruit of the hop plant grown in Europe, Asia, and North America. Light yellow or greenish, it is an oily liquid with a bitter taste and aromatic odor. A solid extract is used in bitters, fruit, and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. Hops oil is used in raspberry, grape, whiskey, and spice flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. Hops at one time were thought to be a sedative. GRAS. ASP

HOPS OIL • See Hops. ASP

HOR • FDA abbreviation for hormone.

HOREHOUND EXTRACT • Marrubium vulgare. Hoarhound. A flavoring extracted from a mintlike plant cultivated in Europe, Asia, and the United States. It has a very bitter taste and is used in maple, nut, and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. It is also a bitter tonic and expectorant. GRAS. ASP

HORMESIS • A phenomenon in which it is assumed low doses are beneficial and high doses are toxic.

HORMONES • A hormone is a chemical produced by a gland and secreted into the bloodstream, affecting the function of distant cells or organs. U.S. beef producers have been using growth hormones, a very powerful chemical from the pituitary gland at the base of the brain, to increase the weight of cattle by from 10 to 20 percent for the same amount of feed. Diethylstilbestrol, another hormone, an estrogen, was used by beef and poultry producers to increase the weight of meat for which they are paid by the pound. The FDA has tried to ban diethylstilbestrol for that purpose because it has been shown to be carcinogenic, but spot checks have shown that it is still present in some meat and poultry products. In 1988, the twelve-nation European Community put a ban on U.S. beef because of the use of growth hormones in raising cattle for meat. The U.S. position is that the growth hormones approved for cattle by the Department of Agriculture are not harmful to humans. Environmentalists who testified in favor of the European legislators have maintained that such hormones create tumors and genetic deformities in children. Hormones are still being used in feed and by implantation in cattle, chickens, and turkeys, as you can determine by checking listings, including those for estradiol, mibolerone, testosterone propionate, and trenbolone.

HORSE CHESTNUT • The seeds of Aeschulus hippocastanum. A tonic, natural astringent for skin, and fever-reducing substance that contains tannic acid (see).

HORSEMINT LEAVES EXTRACT • Monarda spp. A flavoring extract from any of several coarse, aromatic plants, grown from New York to Florida and from Texas to Wisconsin. Used in fruit flavorings for beverages (600 ppm). Formerly used as an aromatic stimulant and to break up intestinal gas. GRAS. NIL

HORSE NETTLE • Solanum. Bull Nettle. Radical Weed. Air-dried ripe fruit of Solarium carolinense, a South American nightshade plant. It is also grown in Florida. It is used as a sedative and as an anticonvulsant.

HORSERADISH EXTRACT • Scurvy Grass. Armoracia lapathifolia. A condiment ingredient utilizing the grated root from the tall, coarse, white-flowered herb native to Europe. Often combined with vinegar or other ingredients. Contains ascorbic acid (see) and acts as an antiseptic in cosmetics. It contains vitamin C and is used by herbalists to treat arthritis pain by stimulating blood flow to inflamed joints. Potential adverse reactions include diarrhea and sweating if taken internally in large amounts. GRAS. ASP

HOUSELEEK EXTRACT • Extract of the common houseleek Sempervivum tecto-rum native to the mountains of Europe and to the Greek Islands. Its longevity led to its being named sempervivum, which means “ever alive.” It has been used to treat shingles and gout and to get rid of bugs. Its pulp was applied to the skin for rashes and inflammation and to remove warts and calluses. The juice was used to reduce fever and to treat insect stings. Houseleek juice mixed with honey was prescribed for thrush, and an ointment made from the plant was used to treat ulcers, burns, scalds, and inflammation.

HPP • Hydrolyzed plant protein. See Hydrolyzed Vegetable Protein.

HR • The abbreviation for hour.

HUMAN EQUIVALENT DOSE • A dose that, when administered to humans, produces an effect equal to that produced by a dose in animals.

HUMECTANT • A substance used to preserve the moisture content of materials and used to preserve moisture in confections and tobacco. Glycerin, propylene, glycol, and sorbitol (see all) are widely used humectants. See individual substances for toxicity.

HUMULUS • A hop plant, a herbaceous vine with palmate leaves and pistillate flowers. See Hops.

HVP • See Hydrolyzed Vegetable Protein.

HYACINTH, ABSOLUTE • Hyacinthus orientalis. The extract of the common fragrant flower. Once used as a flavoring for chewing gum and in perfumes and soaps, it is now permitted only for alcoholic beverage flavoring. Dark green liquid with a penetrating odor, the juice of hyacinth is very irritating to the skin and can cause allergic reactions. The bulb can cause severe gastrointestinal symptoms. There is reported use of the chemical; it has not yet been assigned for toxicology literature. EAF

HYACINTHIN • See Phenylacetaldehyde.

HYBRID SAFFLOWER OIL • The oil derived from the seeds of a genetic strain that contains mostly oleic acid triglyceride, as distinct from safflower oil.

HYDRATED • Combined with water.

HYDRATED ALUMINA • See Aluminum Hydroxide.

HYDRATED SILICA • An anticaking additive used to keep loose powders free-flowing. See Silica and Hydrated.

HYDRATROPALDEHYDE • See Phenylpropionaldehyde.

HYDRATROPIC ALDEHYDE PROPLYENE GLYCOL ACETAL • Synthetic flavoring. ASP

HYDRATROPALDEHYDE DIMETHYL ACETAL • See Phenylpropionaldehyde Dimethyl Acetal.

HYDRAZINE • Colorless fuming liquid used as a solvent and catalyst for inorganic materials. Used in steam in contact with food. The FDA allows

zero residue. A reducing additive (see) and chlorine scavenger, it is a highly toxic chemical. It is a cancer-causing additive and direct liquid contact with skin or eyes may produce severe burns. Vapors are highly irritating to the nose and throat and may cause injury to the lungs, liver, and kidneys. The FDA has zero tolerance for residue on food. NASA has requested studies because it has been shown to cause nasal cancers in animals. NUL

a-HYDRO-OMEGA-HYDROXY-POLY(OXYETHYLENE)POLY(OXYPROPYLENE) (51–57 MOLES)POLY (OXYETHYLENE)BLOCK COPOLYMERS (MOL WT. 14,000) • Dough conditioner. FDA tolerance, 0.5 percent of flour used. See Copolymer Condensates of Ethylene Oxide and Propylene Oxide.

a-HYDRO-OMEGA-HYDROXY-POLY(OXYETHYLENE)POLY(OXYPROPYLENE) (55–61 MOLES)POLY(OXYETHYLENE)BLOCK COPOLYMERS (MOL WT. 9,760-13,200) • Solubilizer and stabilizer in flavor concentrations. The FDA permits use according to general manufacturing principles. See Copolymer Condensates of Ethylene Oxide and Propylene Oxide.

a-HYDRO-OMEGA-HYDROXY-POLY(OXYETHYLENE)POLY(OXYPROPYLENE) (53–59 MOLES)POLY(OXYETHYLENE)(14–16 MOLES) BLOCK COPOLYMER (MOL WT. 3,500-4,125) • A solubilizing and dispersing additive in combination with dioctyl sodium sulfosuccinate (see). FDA tolerance is 10 ppm total in finished beverages or fruit drinks. See Copolymer Condensates of Ethylene Oxide and Propylene Oxide.

HYDROBIOTIC FEED • See Verxite Granules and Flakes.

HYDROCARBONS • A large class of organic compounds containing only carbon and hydrogen. Petroleum, natural gas, coal, and bitumens are common hydrocarbon products. Hydrocarbons also include mineral oils, paraffin wax, and ozokerite (see all).

HYDROCHLORIC ACID • An acid used as a modifier for food starch, in the manufacture of sodium glutamate (see), and gelatin, for the conversion of cornstarch to syrup (0.012 percent), and to adjust the pH (acidity-alkalinity balance) in the brewing industry (0.02 percent). Also used as a solvent. A clear, colorless, or slightly yellowish corrosive liquid, it is a water solution of hydrogen chloride of varying concentrations. Used in hair bleaches to speed up oxidation in rinses and to remove color. Inhalation of fumes causes choking and inflammation of the respiratory tract. Ingestion may corrode the mucous membranes, esophagus, and stomach, and cause diarrhea. Circulatory collapse and death can occur. GRAS. ASP. E

HYDROCHLOROFLUOROCARBON, 22,142b, 152a • Propellants and refrigerants derived from chlorofluorocarbon, any of several compounds composed of carbon, fluorine, chlorine, and hydrogen. Though safer than many propellant gases, their use has diminished because of suspected effects on stratospheric ozone.

HYDROCINNAMALDEHYDE • Colorless to slightly yellow liquid with a strong hyacinth odor used as a flavoring additive in various foods. A human skin irritant.

HYDROCINNAMIC ALCOHOL • Colorless, thick liquid with a sweet hyacinth odor used as a flavoring additive in various foods. Moderately toxic by ingestion. Mildly toxic by skin contact.

HYDROCINNAMYL ACETATE • Colorless liquid with a spicy, floral odor used as a flavoring additive in various foods. Mildly toxic by ingestion.

HYDROCOLLOIDS • Substances such as gum arabic or agar that form gels with water and are mostly used to thicken or smooth food products. Jell-O is an example. The world food hydrocolloid market is valued at $4.2 billion at this writing, with pectin at $443 million and xanthan at $225 million (see both). The market for hydrocolloids is predicted to have one of the fastest growth rates of any food additive over the next five years. Emulsion stabilizers, suspending agents, gelling agents, thickeners, fiber sources, mouthfeel improvers, fat replacers, and processing aids come under the umbrella of hydrocolloids. The food industry's most frequently used hydrocolloids include: agar, alginates, arabic, carrageenan, carboxy methyl cellulose (CMC), gelatin, konjac flour, locust bean gum (LBG), methyl cellulose and hydroxypropyl methyl cellulose (MC/HPMC), microcrystalline cellulose (MCC), pectin, starch, and xanthan. A potential useful new hydrocolloid is mulberry leaves (see). This market has grown significantly in the past twenty years in parallel to an increasingly complex food-processing industry.

HYDROCORTISONE SODIUM SUCCINATE • A-Hydrocort. Solu-Cortef. An adrenal gland hormone used to decrease severe inflammation. Used to treat cows, and the FDA permits up to 10 ppb in milk. The drug also suppresses the immune response. Has caused adverse reproductive effects in laboratory animals.

HYDROFLUOROALKANES • HFA. Substitute for chlorofluorocarbons (CFCs). They're more ozone-friendly than CFCs. Efficacy and safety of HFAs as propellants of bronchodilators and inhaled corticosteroids in adults is accepted. In general, there is better pulmonary deposition of particles. However, literature data on the use of HFA in the pediatric age group are still scarce, and further studies with children and adolescents would be of great importance. The haloalkanes (also known as halo-genalkanes or alkyl halides) are a group of chemical compounds, consisting of alkanes (see), such as methane or ethane, with one or more halogens linked, such as chlorine or fluorine. They are known under many chemical and commercial names. As fire extinguishers, propellants, and solvents they have or had wide use. Some haloalkanes (those containing chlorine or bromine) have been shown to have negative effects on the environment such as ozone depletion. The most widely known family within this group are the CFCs. Use of certain chloroalkanes as solvents for large-scale application, such as dry cleaning, have been phased out, for example, by the IPPC directive on greenhouse gases in 1994 and by the Volatile Organic Compounds (VOC) directive of the EU in 1997. Permitted chlorofluoroalkane uses are medicinal only.

HYDROGEN • The lightest of all gases, occurring chiefly in combination with oxygen in water; exists also in acids, bases, alcohols, petroleum, and other hydrocarbons. Hydrogen can be combusted directly, added to natural gas or gasoline to reduce emissions, or stored for use in fuel cells. Hydrogen fuel cells are currently used aboard the U.S. space shuttle to run all the electrical systems, and crew members are able to drink the sterile water that is a by-product of fuel cell use. It is the most abundant element in the universe. At present, NASA is the largest user of hydrogen power in the United States; other common venues for hydrogen use at present are chemical production, petroleum refining, metals treating, and electrical applications. Hydrogen is added to liquids such as oils to make them thick. E

HYDROGEN CYANIDE • A colorless gas or liquid with a characteristic odor. In veterinary preparations used to treat mastitis, inflammation of the udders. As a fumigant, the FDA tolerances are 200 ppm in cocoa, 125 ppm in cereal flours, 90 ppm in cereals cooked before eaten, and 50 ppm in uncooked ham, bacon, and sausage. In humans, high concentrations may cause shortness of breath, paralysis, unconsciousness, convulsions, and respiratory arrest. Chronic exposure over long periods may cause fatigue and weakness. Exposure to 150 ppm from thirty minutes to an hour may endanger life. Death may result from a few minutes' exposure to 300 ppm. Average fatal dose is 50 to 60 mg. The compressed gas is used for exterminating rodents and insects. Must be handled by specially trained experts.

HYDROGEN PEROXIDE • A bleaching and oxidizing additive, a detergent, and antiseptic. An unstable compound readily broken down into water and oxygen. It is made from barium peroxide and diluted phosphoric acid. Generally recognized as safe as a preservative and germ killer in milk and cheese, bleaches, tripe and butter; used in the treatment of eggs before drying and in cheddar and swiss cheeses. A 3 percent solution is used medicinally as an antiseptic and germicide. A strong oxi-dizer, undiluted it can cause burns of the skin and mucous membranes. In 1980, the Japanese notified the WHO that hydrogen peroxide was suspect as a cancer-causing additive. It was widely used in Japanese fish cakes. The noodles were dipped in diluted hydrogen peroxide for disinfection. The fish meat and raw flour were also mixed with hydrogen peroxide. In

laboratory rats, it was discovered that in the sixty-fifth week, the lining of the duodenum was thickened but no cancers occurred. The Japanese Welfare Ministry decided that hydrogen peroxide is safe for food when it is entirely decomposed and that the food should not contain any residual. GRAS. ASP

HYDROGEN SULFIDE • Colorless gas with a terrible odor. It is derived from sulfuric acid and as a by-product of petroleum refining. Highly flammable. Toxic by inhalation. Strong irritant to the eyes. Used as a source of sulfur and hydrogen in the manufacture of food additives. ASP

HYDROGENATED • The addition of hydrogen (see) to a chemical.

HYDROGENATED CORN SYRUP • Used in cat and dog food as a humectant (see). See also Corn Syrup.

HYDROGENATED HONEY • Controlled hydrogenation (see) of honey.

HYDROGENATED MENHADEN OIL • Obtained along the west coast of North America from the menhaden fish, somewhat larger than herring. The oil contains myristic acid, palmitic acid, and linoleic acid (see all). Used as a substitute for linseed oil. Hydrogenated menhaden oil is used as a substitute for tallow. GRAS

HYDROGENATED OIL • Oil that is partially converted from naturally polyunsaturated fats to saturated. Makes liquid oils partially solid. May adversely affect the levels of fat in the blood and has been linked to colon cancer in some reports. See Hydrogenation.

HYDROGENATED PEANUT OIL • See Hydrogenation and Peanut Oil.

HYDROGENATED POLY-1-DECENE • Used as a glazing agent in products like candy. In 2003, the European Parliament said that its use must be revised especially with respect to children. E

HYDROGENATED SOYBEAN OIL • See Soybean Oil and Hydrogenation.

HYDROGENATED SOY GLYCERIDE • See Soybean Oil and Hydrogenation.

HYDROGENATED SPERM OIL • Used to coat bakery pans so products will not stick.

HYDROGENATED STARCH HYDROLYSATE • The end product of the hydrogenation of corn syrup. See Hydrogenation and Corn Syrup.

HYDROGENATED TALLOW • A component used in the production of beet sugar and yeast in amounts to inhibit foaming. See Hydrogenation. No known toxicity. GRAS

HYDROGENATED TALLOW ACID • See Hydrogenated Tallow.

HYDROGENATED TALLOW ALCOHOL • See Hydrogenated Tallow, which has the same uses. GRAS

HYDROGENATED TALLOW BETAINE • See Hydrogenated Tallow and Betaine.

HYDROGENATED TALLOW GLYCERIDE • See Hydrogenated Tallow and Glycerides.

HYDROGENATED TALLOWTRIMONIUM CHLORIDE • See Quaternary Ammonium Compounds.

HYDROGENATED VEGETABLE GLYCERIDE • An emollient to prevent the skin from losing moisture. See Vegetable Oils and Hydrogenation.

HYDROGENATED VEGETABLE OIL • HVP. Used in instant soups, frankfurters, sauces, and beef stew. Consists of vegetable—usually soybean—protein that has been chemically broken down to its amino acids that built it. HVP is a “flavor enhancer.” It contains MSG (see). See also Partially Hydrogenated Vegetable Oil.

HYDROGENATION • The process of adding hydrogen gas under high pressure to liquid oils. It is the most widely used chemical process in the edible fat industry. Used in the manufacture of petrol from coal and in the manufacture of margarine and shortening. Used primarily in the cosmetic and food industries to convert liquid oils to semisolid fats (e.g., Crisco and margarine) at room temperature. Reduces the amount of acid in the compound and improves color. Usually the higher the amount of hydrogenation, the lower the unsaturation in the fat and the less possibility of flavor degradation or spoilage due to oxidation. Hydrogenated oils still contain some unsaturated components that are susceptible to rancidity. Therefore, the addition of antioxidants is still necessary. Hydrogenation leads to trans fats, which have been found to contribute to fat-clogged arteries. See Trans Fats.

HYDROLYSIS • Decomposition that changes a compound into other compounds by taking up the elements of water. For example, hydrolysis of salt into an acid and a base or hydrolysis of an ester into an alcohol and an acid. See Hydrolyzed.

HYDROLYZED • Subject to hydrolysis or turned partly into water. Hydrolysis is derived from the Greek hydro, meaning “water,” and lysis, meaning “a setting free.” It occurs as a chemical process in which the decomposition of a compound is brought about by water, resolving into a simpler compound. Hydrolysis also occurs in the digestion of foods. The proteins in the stomach react with water in an enzyme reaction to form peptones and amino acids (see).

HYDROLYZED ANIMAL PROTEIN • Protein from animals that has been split into smaller units by acids, alkalis, or enzymes.

HYDROLYZED CASEIN • See Casein and Hydrolyzed.

HYDROLYZED KERATIN • The widely used hydrolysate of keratin, a protein obtained from hair, wool, horns, nails, claws, beaks, membranes of eggshells, and nerve tissues. Acid, enzyme, or other forms of hydrolysis derive the hydrolysate. The word animal was removed from this ingredient name. Used in dietary protein supplements.

HYDROLYZED LEATHER MEAL • Used in swine feed up to 1 percent of weight.

HYDROLYZED MILK PROTEIN • See Acid Hydrolyzed Proteins.

HYDROLYZED PLANT PROTEIN • HHP. A protein obtained from various foods such as soybeans, corn, or wheat and then broken down into amino acids by a chemical process, acid hydrolysis. Hydrolyzed plant or vegetable protein is used as a flavor enhancer in numerous processed foods like soups, chilies, sauces, and some meat products like frankfurters. See Hydrolyzed Vegetable Protein.

HYDROLYZED PROTEIN • Used as a flavoring and flavor enhancer. The word animal was removed from this ingredient's name. Also used in gels and in animal feed. See Acid Hydrolysates of Protein and Hydrolyzed.

HYDROLYZED (SOURCE) PROTEIN EXTRACT • Composed mainly of amino acids, small peptides, and salts resulting from almost complete hydrolysis (see) of peptide bones in edible protein materials treated with heat or food-grade acids. The edible proteins used as raw materials are derived from corn, soy, wheat, yeast, peanuts, rice, or other suitable vegetable or plant sources, or from milk. Products may be in liquid, paste, powder, or granular form. Used as a flavoring additive or flavor enhancer in bologna, salami, sauces, and stuffing. Use at level not in excess of the amount reasonably required to accomplish the intended effect. When heated to decomposition, it emits acrid smoke and irritating fumes.

HYDROLYZED SOY PROTEIN • See Soybean and Hydrolyzed.

HYDROLYZED VEGETABLE PROTEIN • HPP. HVP. The hydrolysate (liquefaction) of vegetable protein derived by acid, enzyme, or other methods of hydrolysis. A flavor enhancer used in soup, beef, and stew. High salt and glutamate content with low-quality protein. On the GRAS list, but the Select Committee of the Federation of American Societies for Experimental Biology (FASEB) advised the FDA that HVP contains dicarboxylic amino

Select Committee of the Federation of American Societies for Experimental Biology (FASEB) advised the FDA that HVP contains dicarboxylic amino acid (a building block of the protein that affects growth) when used at present levels in strained and junior baby foods. They said that the effects of this substance on children should be studied further. The effects on adults of vegetable and animal protein hydroxylates demonstrate "no current hazard," but the FASEB voiced uncertainties about future consumption levels for those products and recommended further studies. The source of HVP must now be listed on the label. When the product says "No MSG," it may contain HVP, which can cause effects similar to the former in susceptible people. See Acid Hydrolysates of Protein.

HYDROLYZED WHEAT GLUTEN ISOLATE; PEA PROTEIN ISOLATE • See Wheat Gluten Isolate.

HYDROLYZED YEAST • The hydrolysate of yeast (liquefaction) derived from acid, enzyme, or other method of hydrolysis. See MSG.

HYDROLYZED YEAST PROTEIN • See Hydrolyzed Yeast.

HYDROQUINONE MONOETHYL ETHER • White flakes with sweet clover odor used as a fixative in foods, perfumes, dyes, cosmetics, and especially in suntan preparations. ASP

HYDROXY PROPYLMETHYL CELLULOSE CARBONATE • Prepared from wood pulp or cotton by treatment with methyl chloride. Used as a substitute for water-soluble gums, to render paper greaseproof, and as a thickener. GRAS.

2-HYDROXYACETOPHENONE • Flavoring additive. The JECFA said in 2000 that there was no safety concern at current levels of intake when used as a flavoring additive. NIL

p-HYDROXYANISOLE • See Guaiacol.

0-HYDROXYBENZALDEHYDE • See Benzyl Acetate.

4-HYDROXYBENZALDEHYDE • Flavoring evaluated by the JECFA (see), which in 2001 said there was no safety concern at current levels of intake when used as a flavoring additive. EAF

p-HYDROXYBENZOATE • See Propylparaben.

p-HYDROXYBENZOIC ACID • Prepared from p-bromophenol. Used as a preservative and fungicide. See Benzoic Acid for toxicity.

4-HYDROXYBENZOIC ACID • Flavoring additive. The JECFA said in 2001 that there was no safety concern at current levels of intake when used as a flavoring additive. However, other institutions say that ingestion of this chemical can be irritating. Declared GRAS by FEMA (see). EAF

4-HYDROXYBENZYL ALCOHOL • See Benzylaldehyde. EAF p-HYDROXYBENZYL ISOTHIOCYANATE • A derivative of mustard oil used in flavoring. GRAS

4-HYDROXYBUTANOIC ACID LACTONE • See Butanoic Acid and Lactic Acid. ASP

1-HYDROXY-2-BUTANONE • See Acetoin. ASP

2-HYDROXYCAMPHANE • See Borneol.

HYDROXYCITRONELLAL • Colorless liquid obtained by the addition of citronel-lol. Used as a fixative and a fragrance in perfumery for its sweet lilylike odor. It can cause allergic reactions. ASP

HYDROXYCITRONELLAL DlETHYL ACETAL • A synthetic citrus and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

HYDROXYCITRONELLAL DIMETHYL ACETAL • A synthetic flavoring additive and colorless liquid, with a light floral odor. Used in fruit and cherry flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

HYDROXYCITRONELLOL • A synthetic lemon, floral, and cherry flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

2-HYDROXY-2-CYCLOHEXEN-1-ONE • Flavoring. ASP

2-HYDROXY-p-CYMENE • See Carvacrol.

5-HYDROXY-2,4-DECADIENOIC ACID DELTA-LACTONE • Flavoring. EAF

HYDROXY DECENOIC ACID DELTA-LACTONE • Flavoring. EAF

4-HYDROXY-3,5-DIMETHOXYBENZALDEHYDE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. See Benzaldehyde.

4-HYDROXY-2,5-DIMETHYL-3(2H)-FURANONE • Flavoring. See Furans. ASP

4-HYDROXY-2,3-DIMETHYL-2-4 NONADIENOIC ACID GAMMA LACTONE • A flavoring determined GRAS by FEMA (see). ASP

6-HYDROXY-3,7-DIMETHYLOCTANOIC ACID LACTONE • Flavoring. See Octanoic Acid.

(Z)-4-HYDROXY-6-DODECENOIC ACID LACTONE • One of the newer synthetic flavorings. See Dodecenoic Acid and Lactic Acid. EAF

5-HYDROXY-6-DODECENOIC ACID LACTONE • Flavoring. EAF

1-HYDROXYETHYLIDENE-1,1-DIPHOSPHONIC ACID • Flavoring. ASP

HYDROXYLAMINE HCL • An antioxidant for fatty acids (see). May be slightly irritating to skin, eyes, and mucous membranes and may cause a depletion of oxygen in the blood when ingested. In the body it is reported to decompose to sodium nitrite.

HYDROXYLATE • The process in which an atom of hydrogen and an atom of oxygen are introduced into a compound to make the compound more soluble.

HYDROXYLATED LECITHIN • An emulsifier and antioxidant used in baked goods, ice cream, and margarine. It is also used as a defoaming additive for processing beet sugar and yeast. According to the JECFA (see), the safety of hydroxy-lated lecithin (see Lecithin) has not been adequately established. It has been cleared by the FDA for use as a food emulsifier. ASP

HYDROXYLATION • The process in which an atom of hydrogen and an atom of oxygen are introduced into a compound to make that compound more soluble.

N-(4-HYDROXY-3-METHOXYBENZYL)-8-METHYL-6-NONENAMIDE • Flavoring. ASP

2-HYDROXY-4-METHYLBENZALDEHYDE • Flavoring. EAF

HYDROXYMETHYLCELLULOSE • Thickener and bodying additive derived from plants. Used as a thickener. See Carboxymethyl Cellulose.

4-HYDROXY-4-METHYL-7-cis-DECANOIC ACID GAMMALACTONE • Flavoring. ASP

4-HYDROXYMETHYL-2,6-DI-TERT-BUTYLPHENOL • Used as an antioxidant. Shall not exceed 0.02 percent of oil in food. ASP

2-HYDROXYMETHYL-6,6-DIMETHYLBICYCLO(3.1.1)HEPT-2-ENYL FORMATE • Flavoring. ASP

10-HYDROXYMETHYLENE-2-PINENE • Flavoring. See Pinene. EAF

4-HYDROXY-5-METHYL-3(2H)-FURANONE • Flavoring. See Furans. ASP

3-(HYDROXYMETHYL)-2-HEPTANONE • Flavoring. See Heptanoic Acid. ASP

2-HYDROXY-5-METHYL-3-HEXANONE • Flavoring. See Hexanoic Acid. EAF

3-HYDROXY-5-METHYL-2-HEXANONE • Flavoring. See Exanoic Acid. EAF

4-HYDROXY-4-,METHYL-5-HEXENOIC ACID GAMMA LACTONE • Flavoring determined GRAS by FEMA (see).

4-HYDROXY-3-METHYLOCTANOIC ACID LACTONE • Flavoring. See Octanoic Acid and Lactic Acid. EAF

HYDROXYNONANOIC ACID, DELTA-LACTONE • Flavoring. See Octanoic Acid and Lactic Acid. ASP

HYDROXYOCTACOSANYL HYDROXYSTEARATE • See Stearic Acid and Hydroxylation.

5-HYDROXY-4-OCTANONE • A synthetic butter, butterscotch, fruit, cheese, and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-HYDROXY-2-OXOPROPIONIC ACID • Flavoring. See Propionic Acid. EAF

3-HYDROXY-2-PENTANONE • Flavoring. See Valeric Acid. ASP

4-HYDROXY-3-PENTENOIC ACID LACTONE • Flavoring. See Pentenoic Acid and Lactic Acid. ASP

3-HYDROXY-4-PHENYLBUTAN-2-ONE • Flavoring determined GRAS by FEMA (see). See Butanoic Acid. ASP

4-(p-HYDROXYPHENYL)-2-BUTANONE • Synthetic fruit flavoring for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. ASP

HYDROXYPHENYL GLYCINEAMIDE • Derived from the nonessential amino acid glycine (see) used as a buffering additive and as a violet scent.

HYDROXYPIPERITONE • A mint flavoring derived from the essential oil from dried aerial parts of Micromeria dolichodontha, an endemic species in Turkey. See Mint. EAF

HYDROXYPROLINE • L-Proline. The hydroxylated (see) amino acid used to add “protein” to a compound. NUL

L-HYDROXYPROLINE • An amino acid analog of proline. NUL

HYDROXYPROPYLAMINE NITRITE • See Isopropanolamine and Nitrites.

HYDROXYPROPYL CELLULOSE • Thickener. See Hydroxymethylcellulose. ASP

HYDROXYPROPYL GUAR • Guar Gum. 2-Hydroxypropyl Ether. See Guar Gum.

HYDROXYPROPYL METHYLCELLULOSE • An emulsifier used in food, except standard foods that do not provide for such use. Use in food in general including meat products. See Cellulose Gums. GRAS. ASP

HYDROXYPROPYL METHYLCELLULOSE-EXPANDED SUBSTITUTION PATTERN • HPMC-ESP. Use in food in general and particularly in meat products. GRAS application pending. See Methylcellulose.

HYDROXYPROPYL STARCH, HYDROXYPROPYL STARCH OXIDIZED, and HYDROXYPROPYL DISTARCHPHOSPHATE • These are all modified starches. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that while no evidence in the available information on these starches demonstrates a hazard to the public when they are used at levels that are now current and in the manner now practiced, uncertainties exist requiring that additional studies should be conducted. In 1980, the FDA said GRAS status would continue while tests were being completed and evaluated. The FDA has reported nothing new since then. E

HYDROXYQUINOLINE SULFATE • Was used as a component of a cottage cheese coagulant but has been banned by the FDA.

HYDROXYSTEARIC ACID • See Stearic Acid.

HYDROXYSTEARMIDE MEA • Mixture of ethanolamide of hydroxystearic acid. See Stearic Acid.

HYDROXYSTEARYL METHYLGLUCAMINE • An amino sugar. See Glucose.

2-HYDROXY-3,5,5-TRIMETHYL-2-CYCLOHEXENONE • Flavoring used in tobacco. ASP

HYDROXYTYROSOL • HTS. A natural polyphenol (see) found in olives, it reportedly is good for eye health. Laboratory tests using cells from the human retina, with mitochondria—the cells' power stations—were reported to benefit eye health by researchers reporting in the Journal of Neurochemistry. HTS may extend the shelf life of fish products to the same extent as synthetic preservatives. Fish is difficult to incorporate into formulations since the oil is highly susceptible to oxidation. The result is a fishy taste and smell that can be off-putting. However, the nutritional properties of fish oil have been promoted as beneficial, especially omega-3, of which fish is recognized as the best source. To help people consume omega-3 in their diet—and especially those who have an aversion to fish—formulators have sought to overcome the stability issues and deliver food products that are untainted by sensory issues. HTS, an antioxidant compound in olives, may be a solution to this problem. HTS was also cited to aid oxidative stability of bulk fish oil, oil-in-water emulsions, and frozen minced fish muscle in the Journal of Agricultural and Food Chemistry.

5-HYDROXYUNDECANOIC ACID LACTONE and DELTA-LACTONE • Flavoring. See Decanoic Acid and Lactic Acid. ASP

HYGROMYCIN • A broad spectrum antibiotic from Streptomyces hygroscopicus used in animal feed. The FDA allows zero residue in poultry eggs and in uncooked edible tissues and by-products of swine and poultry.

HYPERACTIVITY • See Attention Deficit Hyperactivity Disorder (ADHD).

HYPERICUM • Hypericin. Blue black needles obtained from pyridine (see). The solutions are red or green with a red cast. Small amounts seem to be a tranquilizer and have been used as an antidepressant in medicine. It can produce a sensitivity to light.

HYPERSENSITIVITY • The condition in persons previously exposed to an antigen in which tissue damage results from an immune reaction to a further dose of the antigen.

HYPERTENSION • High Blood Pressure. Hypertension is persistently elevated arterial blood pressure. It is the most common public health problem in developed countries. Emphasis on lifestyle modifications has given diet a prominent role for both the primary prevention and management of hypertension.

HYPO- • Prefix from the Greek, meaning “under” or “below,” as in hypoacidity—acidity in a lesser degree than is usual or normal.

HYPOGLYCEMIA • Low blood sugar—the opposite of diabetes.

HYPOPHOSPHORIC ACID • Crystals used in baking powder, sodium salt.

HYPOTHALAMUS • Brain control area involved in emotion, movement, and eating. Less than the size of a peanut and weighing a quarter of an ounce, this small area deep within the brain also oversees appetite, blood pressure, sexual behavior, sleep, and emotions, and sends orders to the pituitary gland.

HYSSOP EXTRACT • Extract of Hyssopus officinalis. A synthetic flavoring from the aromatic herb. Used in bitters. The extract is liquor flavoring for beverages, ice cream, and ice. Native to southern Europe. It was used to calm the nerves. GRAS. NIL

HYSSOP OIL • Hyssopus officinalis. A liquor and spice flavoring. A historical and biblical herb whose name is derived from the Greek word azob, or holy herb, has a pleasant mild fragrance that is used in aromatherapy. People with high blood pressure or seizures are warned not to ingest or smell this oil. EAF

IARC • The abbreviation for the International Agency for Research on Cancer of the World Health Organization. The IARC monographs identify environmental factors that can increase the risk of human cancer. These include chemicals, complex mixtures, occupational exposures, physical and biological agents, and lifestyle factors. National health agencies use this information as scientific support for their actions to prevent exposure to potential carcinogens. Interdisciplinary working groups of expert scientists review the published studies and evaluate the weight of the evidence that an agent can increase the risk of cancer. The principles, procedures, and scientific criteria that guide the evaluations are described in the preamble to the IARC monographs. Since 1971 more than nine hundred additives have been evaluated, of which approximately four hundred have been identified as carcinogenic or potentially carcinogenic to humans. IARC's mission is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcino-genesis, and to develop scientific strategies for cancer control. The agency is involved in both epidemiological and laboratory research and disseminates scientific information through publications, meetings, courses, and fellowships.

ICELAND MOSS EXTRACT • The extract of Lichen islandicus. A water-soluble gum that gels on cooling. Used to flavor alcoholic beverages only. NIL

IgE • Antibodies that are responsible for the majority of allergic reactions. Medical scientists feel that if their efforts succeed in suppressing IgE formation, they will have a method of not only more effectively treating allergies but also of preventing many of them from occurring. See also Antibody.

IGF-1 • The abbreviation for insulinlike growth factor-1 (IGF-1), which was once called somatomedin C. It is a polypeptide protein hormone similar in molecular structure to insulin. Growth hormone may act directly on tissues, but much of its effect is mediated by stimulation of the liver and other tissues to produce and release insulinlike growth factors, primarily IGF-1. The name reflects the fact that hormones have insulinlike actions in some tissues, but in fact they are far less potent than insulin in decreasing blood sugar concentrations, and their fundamental action is to stimulate growth. Allegations have been made that milk from treated cows may cause breast cancer. The FDA says the consumption of dietary IGF-1 in milk from cows given growth hormone plays no role in inducing or promoting any human disease, including breast cancer. See Bovine Somatotropin and Growth Hormone.

IMAZALIL • An antifungal used on dried citrus pulp for animal feed. FDA residue tolerance is 25 ppm in the pulp and 0.01 to 0.50 ppm in cattle fats, swine, sheep, and milk.

IMAZETHAPYR • An herbicide used on soybeans. FDA residue tolerance is 0.1 ppm.

IMIDAZOLE • Glyoxaline. White crystalline base made by the action of ammonia and formaldehyde on glyoxal. It is used as a biological control of pests and as an antihistamine.

IMIDAZOLIDINYL UREA • A bactericidal preservative with a low toxicity in animals. Sensitivity reactions have been reported in humans.

IMIDAZOLINE • A derivative of imidazole (see) also called glyoxalidine.

IMITATION • A flavor containing any portion of nonnatural materials. For instance, unless a strawberry flavoring is made entirely from strawberries, it must be called imitation. When processors fail to use all the standard ingredients in mayonnaise, they have to call it salad dressing. Imitation used to mean that the product contains fewer vitamins, minerals, or other nutrients than the food it resembles. An imitation food is defined as a food that “is a substitute for and resembles another food but is nutritionally inferior to that food.” Nutritional inferiority is determined by comparing the percentages of so-called “essential nutrients” in the substitute to those in the food for which it substitutes. The essential nutrients are protein and the nineteen vitamins and minerals for which the federal government has established recommended daily allowances (see RDAs). Basically, if the substitute contains less of any essential nutrient present to a measurable degree in the food substituted for, the substitute must be labeled with the word imitation.

IMMORTELLE EXTRACT • Erythrina micopteryx. Helichrysum angustifolium. A natural flavoring extract from a red-flowered tropical tree. The name derives from the French immortel, “immortal” or “everlasting.” Used in raspberry, fruit, and liquor flavoring for beverages, ice cream, ices, baked goods, candy, gelatin desserts, and chewing gum. GRAS. EAF

IMPERATORIA • Peucedanum ostruthium. A flavoring from a tropical grass used in malt beer. Used in alcoholic beverages only. NUL

INDENO (1,2,3-cd)PYRENE • May contaminate drinking water. Unregulated—the EPA has not established a maximum legal limit in tapwater for this contaminant. Indeno[1,2,3-cd]pyrene is a pollutant from the incomplete combustion of coal, wood, and gasoline combustion; a pollutant from municipal waste incineration, coke ovens, and cigarette smoke; constituent in gasoline, fresh and used motor oil; and a pollutant in road runoff. Potential health impacts associated with indeno[1,2,3-cd]pyrene include cancer. Identified as priority hazardous substance by the European Union.

INDIAN GUM • See Ghatti Gum.

INDIGO • Probably the oldest known dye. Prepared from various Indigofera plants native to Bengal, Java, and Guatemala. Dark blue powder with a coppery luster. No known skin irritation.

INDIGO CARMINE • Indigotine. See FD and C Blue No. 2. E

INDOLE • A white, lustrous, flaky substance with an unpleasant odor, occurring naturally in jasmine oil and orange flowers and used as a synthetic flavoring additive in raspberry, strawberry, bitters, chocolate, orange, coffee, violet, fruit, nut, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. It can be extracted from coal tar and feces; in highly diluted solutions, the odor is pleasant. The lethal dose in dogs is 60 milligrams per kilogram of body weight. Moderately toxic by ingestion and skin contact. Has caused tumors and cancer in laboratory animals. ASP

INH • FDA abbreviation for inhibitor.

INORGANIC BROMIDES PRESENT AS A RESULT OF FUMIGATION OF PROCESSED FOODS WITH ORGANIC BROMIDES and/or FROM USE ON RAW PRODUCTS • The FDA's residue tolerances are less than 25 ppm in malt beverages; 125 ppm on all processed food; less than 125 ppm in animal feed grain milled fractions; less than 250 ppm in concentrated tomato products and dried figs; less than 325 ppm in Parmesan or Roquefort cheeses; less than 400 ppm in dried egg, or processed herbs, spices, and dog food; less than 90 in dried citrus pulp for use as cattle feed. See Bromides.

INOSINATE • A salt of inosinic acid used to intensify flavor, as with sodium glu-tamate (see). Inosinic acid is prepared from meat extract, also from dried sardines.

INOSINIC ACID • Flavor enhancer. A substance found in muscle and on hydrolysis yields inosine. E

INOSITOL • A dietary supplement of the vitamin B family used in emollients. Found in plant and animal tissues. Isolated commercially from corn. A fine, white crystalline powder, it is odorless with a sweet taste. Stable in air. GRAS. ASP

INSECTICIDE • A class of crop protection and specialty chemicals used to control insects on farms and in forests, as well as nonagricultural applications such as residential lawns, golf courses, and public tracts of land.

INSOL. FIBER • Label listing for insoluble fiber (see).

INSOLUBLE • A substance that cannot be dissolved.

INSOLUBLE GLUCOSE ISOMERASE ENZYME PREPARATIONS • See Enzymes. GRAS. EAF

INTAKE • Amount of material inhaled, ingested, or absorbed through the skin during a specified period of time.

INTENSE SWEETENERS • Intense sweeteners are nonnutritive sweeteners, also referred to as low-calorie sweeteners or artificial sweeteners. Intense sweeteners can replace nutritive sweeteners in most foods at a caloric saving of approximately 16 calories per teaspoon (the calories of a teaspoon of sugar). Examples of intense sweeteners in use in the U.S. food supply are saccharin, aspartame, and acesulfame K (see all). Under EU rules, polyols can only claim to contain 2.4 kcal/g of the sweetener, as opposed to 4 kcal/g for sugar.

INTERMEDIATE • A chemical substance found as part of a necessary step between one organic compound and another, as in the production of dyes, pharmaceuticals, or other artificial products that develop properties only upon oxidation. Used frequently for artificial colors.

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER • IARC. A United Nations organization that gathers information on suspected environmental carcinogens and summarizes available data with appropriate references. Included in these reviews are synonyms, physical and chemical properties, uses and occurrence, and biological data relevant to the evaluation of the risk of cancer to humans.

INTERNATIONAL NUMBERING SYSTEM FOR FOOD ADDITIVES • INS. Intended to harmonize the naming system for food additives, as an alternative to using specific names. Inclusion in the INS does not imply approval by Codex (see). A single food additive can often be used for a range of technological purposes and it remains the responsibility of the manufacturer to declare the most descriptive functional class in the list of ingredients.

INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY • IPCS. Has a range of activities to evaluate the safety of food components, toxic natural constituents and contaminants, as well as food additives and residues of pesticides and veterinary drugs. These activities include providing the secretariats and scientific advice to the Joint Expert Committee on Food Additives (JECFA) and the Joint Meeting on Pesticide Residues (JMPR) and carrying out international risk assessments of chemicals of concern such as acrylamide, produced as a by-product of food processing and cooking. For the assessment of chemicals in food, as with other chemicals assessment work, the development, harmonization, and use of internationally accepted, scientifically sound, and transparent principles and methods is vitally important. JECFA and JMPR are organized jointly by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) and their work is used by Codex Alimentarius as well as member states to develop international food standards and to propose international food safety guidelines

INTRINSIC FACTOR COMPLEX • A dietary supplement of liver-stomach concentration. The FDA has deemed it illegal.

INULIN • Flavoring from chicory (see). The prebiotic inulin may enhance the texture of probiotic (see) ice cream, resulting in a potentially health-friendly snack, according to newer research. Inulin is already used by the food industry as a water binder, emulsifier, stabilizer, and texturizer. Formulation of a low-fat probiotic ice cream with inulin resulted in “the best improvement in textural characteristics in terms of firmness, melting properties, and first dripping time,” Turkish researchers reported in the Journal of Food Science. The study taps into the growing trend of companies moving into the market for more premium products and unusual combinations of flavors in response to stagnation in the European ice cream sector. This has been due to a maturation of the sector, health concerns, and growing competition from cheaper private-label products, according to analysts. Inulin occurs naturally in some foods and is increasingly used as a food additive. Because it is fermentable, it can cause gas. GRAS

INVERT SUGAR and SYRUP • Inversol. Colorose. A mixture of 50 percent glucose and 50 percent fructose. It is sweeter than sucrose. Commercially produced by “inversion” of sucrose. Honey is mostly invert sugar. Invert sugar is used in confectionery and in brewing. Like glycerin (see), it holds in moisture and prevents drying out. Used medicinally in intravenous solutions. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. ASP

INVERTASE FROM SACCHAROMYCES CEREVISIAE • An enzyme used in processing. GRAS. ASP. E

INVITRO • Chemical effects in tissues, cells, or subcellular extracts usually in a laboratory.

INVIVO • Chemical effects in intact living organisms.

IODINE SOURCES • Calcium Iodate. Cuprous Iodide. Potassium Iodate. Potassium Iodide. Discovered in 1811 and classed among the rarer earth elements, iodine is found in the earth's crust as bluish black scales. It is an integral part of the thyroid hormones, which have important metabolic roles, and is an essential nutrient for humans. Iodine deficiency leads to thyroid enlargement or goiter. Nutritionists have found that the most efficient way to add iodine to the diet is through the use of iodized salt. The FDA has ordered all table salts to specify whether the product contains iodide. However, many commercially prepared food items do not contain iodized salt. Iodized salt contains up to 0.01 percent; dietary supplements contain 0.16 percent. Cuprous and potassium iodides are used in table salts; potassium iodide is in some drinking water; and potassium iodate is used in animal feeds. Dietary iodine is absorbed from the intestinal tract, and the main human sources are from food and water. Seafoods are good sources, and dairy products may be good sources if the cows eat enriched grain. Adult daily iodine requirement is believed to be 110 to 150 milligrams. Growing children and pregnant or lactating women may need more. Iodine compounds can produce a diffuse red pimply rash, hives, asthma, and sometimes, anaphylactic shock.

ION • An electrically charged atom. Compounds that form ions are called electrolytes because they enable the solution to conduct electricity.

ION EXCHANGE MEMBRANES • Membranes made of highly cross-linked ion exchange resins (see) that allow passage of ions but not of water are used for electrodialysis, the passage of salt ions from one solution to another with the aid of electric current. NUL

ION EXCHANGE RESIN • An insoluble support structure that has pores on the surface of which are sites with easily trapped and released ions. The trapping of ions takes place only with simultaneous releasing of other ions; thus, the process is called ion exchange. There are multiple different types of ion exchange resin, which are made to selectively prefer one or several different types of ions. Ion exchange resins are widely used in different separation, purification, and decontamination processes. The most common examples are water softening and water purification, juice purification, and sugar manufacturing. EAF a- and b- IONOL • See BHT. ASP

IONONE • Flavoring. It occurs naturally in boronia, an Australian shrub. Colorless to pale yellow with an odor reminiscent of cedar wood or violets. It may cause allergic reactions. ASP

b-IONONE EXPOXIDE • Flavoring and taste-modifying agents in the preparation of foodstuffs in general and imitation flavors for foodstuffs, beverages, animal feeds, pharmaceutical preparations, and tobacco products. See Ketones. EAF

IONOPHORES • Antimicrobials such as monensin, lasalocid, laidlomycin, salinomycin, and narasin specifically target the bacterial population of

IONOPHORES • Antimicrobials such as monensin, lasalocid, lardomycin, salinomycin, and narasin specifically target the bacterial population of ruminants and are commonly fed to ruminant animals to improve feed efficiency. These antibiotics result in increased carbon and nitrogen retention by the animal, increasing production efficiency. Not all bacteria are susceptible to ionophores, and several species have been shown to develop several mechanisms of ionophore resistance. The prophylactic use of antimicrobials as growth promotants in food animals has fallen under greater scrutiny due to fears of the spread of antibiotic resistance. Because of the complexity and high degree of specificity of ionophore resistance, it appears that ionophores do not contribute to the development of antibiotic resistance to important human drugs. Therefore it appears that ionophores will continue to play a significant role in improving the efficiency of animal production in the future. Added to poultry feed to help prevent an intestinal colonization by coccidian, Tyson, the large chicken producing company, was chastised in 2008 by the FDA for saying that its chickens were raised without antibiotics. b-IONYL ACETATE • Boronia megastigma (Rutaceae). EAF

IPCS INCHEM • The abbreviation for International Programme on Chemical Safety of the World Health Organization.

IPRODIONE • Glycophene. A fungicide used on various commodities, including cattle, goats, hogs, chickens, sheep, and eggs. FDA residue tolerance on animal feed ranges from 10 to 300 ppm and is used on almonds, head lettuce, leaf lettuce, carrots, and peaches. Low acute oral and skin toxicity.

IPRONIDAZOLE • A feed additive, antiprotozoal agent, it also promotes growth and feed utilization in poultry. Banned for animal use January 17, 1989, in the United States and in 1997 in Europe. It was found to cause tumors, mutations, and fetal harm. It was supposed to be stopped originally six days before slaughter but residues were still a problem.

IRIS • The Integrated Risk Information System prepared and maintained by the U.S. Environmental Protection Agency (U.S. EPA).

IRIS FLORENTINA • See Orris root extract.

IRISH MOSS • Emulsifier for frozen desserts, dressings, fruits, jellies, and preserves. See Carrageenan.

a-IRISONE • See Ionone. ft-IRISONE • See Ionone.

IRON, ELEMENTAL • An essential mineral element that occurs widely in foods, especially organ meats such as liver, red meats, poultry, and leafy vegetables. The principal foods to which iron or iron salts are added are enriched cereals; some beverages, including milk; poultry stuffing; cornmeal and corn grits; and bread. Iron ammonium citrate is an anticaking additive in salt. Iron-choline citrate is cleared for use as a source of iron in foods for special dietary use. Iron peptonate, a combination of oxide and peptone, is made soluble by the presence of sodium citrate and is used in the treatment of iron-deficiency anemia. The RDAs for children and adults are from 0.2 milligram to 1 milligram and 18 milligrams per day for pregnant women. Iron ascorbate, carbonate, chloride, citrate, fumarate, gluconate, lactate, oxide, phosphate, pyrophosphate, sulfate, and reduced iron are dietary supplements. Iron is potentially toxic in all forms. GRAS. ASP

IRON AMMONIUM CITRATE • A salt for human or animal consumption. An anticaking additive that the FDA says should be less than 25 ppm. See Iron Salts. ASP

IRON CAPRYLATE, IRON LINOLEATE, IRON NAPHTHENATE, and IRON TALLATE • All are used in packaging. Iron naphthenate was said by the Select Committee on GRAS Substances to have so little known about it that there was nothing upon which to base an evaluation of it when it is used as a food ingredient. As for the others, the final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that they should continue GRAS status with no limitations other than good manufacturing practices. No reported use of iron caprylate, iron naphthenate, or iron linoleate and there is no toxicology information available so all are NUL.

IRON-CHOLINE CITRATE COMPLEX • Used in animal feed. See Iron and Citrate Salts. ASP

IRON (HARMLESS SALTS OF) • Used as nutrients in flour, macaroni and noodles, and bakery products. See Iron Salts.

IRON HYDROXIDE • See Iron Oxide. E

IRON LINOLEATE • Used in packaging. It is a substance classified as a drier, when migrating from food-packaging material. GRAS. NUL

IRON NAPHTHENATE • Used in packaging. It is a substance classified as a drier, when migrating from food-packaging material. GRAS. NUL

IRON OXIDE • Any of several natural or synthetic oxides of iron (iron combined with oxygen) varying in color from red-brown or black-orange to yellow. Used for dyeing eggshells and for pet food. There is no reported use of the chemical and there is no toxicology information available. See Iron for toxicity. ASP. E

IRON POLYVINYLPYRROLIDONE • Nutrient. NUL

IRON, REDUCED • Elemental iron obtained by a chemical process. It is a grayish black powder used as a nutrient and dietary supplement.

IRON SALTS • Iron Sources. Ferric. Choline Citrate. Ferric Orthophosphate. Iron Peptonate. Ferric Phosphate. Ferric Sodium Pyrophosphate. Ferrous Fumarate. Ferrous Gluconate. Ferrous Lactate. Ferrous Sulfate. Widely used as enrichment for foods, ferric phosphate is used as a food supplement, particularly in bread enrichment. Ferric pyrophosphate is a grayish blue powder used in ceramics. Ferric sodium pyrophosphate is used in prepared breakfast cereals, poultry stuffing, enriched flours, self-rising flours, farina, cornmeal, corn grits, breads, and rolls. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and should continue as GRAS with limitations on amounts that can be added to food. It may cause gastrointestinal disturbances. Ferrous lactate is greenish white with a sweet iron taste. Air and light affect it. It is also used to treat anemia. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence that ferrous lactate is hazardous and therefore it should continue as GRAS with limitations. Ferrous sulfate is blue-green and odorless and oxidizes in air and is used as a wood preservative, weed killer, and to treat anemia. Large quantities can cause gastrointestinal disturbances. For ferric choline citrate, see Choline Chloride. Among other irons used are ferrous gluconate, ferrous fumarate, sodium ferric EDTA, sodium ferricitropyrophosphate, ferrous citrate, and ferrous ascorbate. All NUL. a-IRONE • A synthetic flavoring derived from the violet family and usually isolated from irises and orris oil. A light yellow, viscous liquid, it gives off the delicate fragrance of violets when put in alcohol. It is also used to flavor dentifrices and in perfumery. See Orris Root Extract for toxicity.

IRRADIATED ENZYMES • Used to control insects. The FDA requires that the dose not exceed 10 kilograys.

IRRADIATED ERGOSTEROL • See Vitamin D_2.

IRRADIATED FISH • The FDA put in abeyance (see) the request to use cobalt-60 gamma radiation as an antimicrobial treatment for fresh seafood. The FDA also put in abeyance a petition to use low-dose radiation to sanitize shellfish.

IRRADIATED FOOD • Food is loaded onto a conveyor belt and passed through a radiation cell where it is showered with beams of ionizing radiation produced by high radioactive isotopes. The radiation can inhibit ripening and kill certain bacteria and molds that induce spoilage, so that food looks and tastes fresh for up to several weeks. The process does not make food radioactive and does not change the food's color or texture in most cases. Does it destroy nutrients? Does it create radiolytic products in food after exposure that may cause genetic damage? Is irradiation less dangerous than some of the other chemicals added to foods as preservatives? These questions are being hotly debated. The FDA requires foods that

have been irradiated to reveal that on the label and to display an international logo, a flower in a circle, so you will be able to decide for yourself. FDA regulations say the dose cannot exceed 1 kilogray. See pages 141–142.

IRRADIATED MEATS • Minimum dose 10 kilograys for sterilization of frozen packaged meats.

IRRADIATED MOLLUSCAN SHELLFISH • Control of Vibrio bacteria and other microorganisms in or on fresh and frozen molluscan shellfish. The maximum dose is 5.5 kilograys.

IRRADIATED PORK • Control of Trichinella spiralis. The FDA says minimum dose is 10 kilograys.

IRRADIATED POULTRY • To control pathogens in fresh or frozen uncooked poultry. The FDA says minimum dose is 10 kilograys.

IRRADIATED POULTRY FEED • Dose ranges from 2 to 25 kilograys gamma radiation from cobalt-60 to render poultry feed salmonella (see) negative.

IRRADIATED SPICES, HERBS, and SEASONINGS • To control insects and/or microorganisms. The FDA says dose is not to exceed 30 kilograys.

IRRADIATED YEAST • A nutrient in enriched farina, a source of vitamin D.

ISO • Greek for "equal." In chemistry, it is a prefix added to the name of one compound to denote another composed of the same kinds and numbers of atoms but different from each other in structural arrangement. Examples are isomer—the same part; isotopes—the same place; and isometric—the same measure.

ISOAMYL ACETATE • A synthetic flavoring additive that occurs naturally in bananas and pears. Colorless, pearlike odor and taste, it is used in raspberry, strawberry, butter, caramel, coconut, cola, apple, banana, cherry, grape, peach, pea, pineapple, rum, cream soda, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (2,700 ppm), and gelatin desserts. Exposure to 950 ppm for one hour has caused headache, fatigue, shoulder pain, and irritation of the mucous membranes. ASP

ISOAMYL ACETOACETATE • A synthetic fruit and apple flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

ISOAMYL ALCOHOL • A synthetic flavoring additive that occurs naturally in apples, cognac, lemons, peppermint, raspberries, strawberries, and tea. Used in chocolate, apple, banana, brandy, and rum flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and brandy. A central nervous system depressant. Vapor exposures have caused marked irritation of the eyes, nose, and throat as well as headache. Amyl alcohols are highly toxic, and ingestion has caused human deaths from respiratory failure. Isoamyl alcohol may cause heart, lung, and kidney damage. ASP

ISOAMYLASE FROM PSEUDOMONAS AMYLODERAMOSA • Enzymes used to modify starch. The JECFA (see) granted a "not specified" ADI (see) in 2007 because the data were not sufficient for establishing it. GRAS

ISOAMYL BENZOATE • A synthetic berry, apple, cherry, plum, prune, liquor, rum, and maple flavoring additive for beverages, ice cream, ices, candy, gelatin desserts, baked goods, and chewing gum. ASP

ISOAMYL CINNAMATE • A synthetic strawberry, butter, caramel, chocolate, cocoa, fruit, peach, pineapple, and honey flavoring additive for beverages, ice cream, candy, and baked goods. ASP

ISOAMYL FORMATE • Formic Acid. A synthetic flavoring additive, colorless, liquid, with a fruity smell. Used in strawberry, apple, apricot, banana, peach, and pineapple flavorings for beverages, ice cream, candy, baked goods, gelatin desserts, and chewing gum. See Formic Acid for toxicity. ASP

ISOAMYL 2-FURANBUTYRATE • A synthetic chocolate, coffee, fruit, and whiskey flavoring additive for beverages, ices, candy, baked goods, and gelatin.

ISOAMYL 2-FURANPROPIONATE • A synthetic chocolate, coffee, fruit, and whiskey flavoring additive for beverages, ice cream, ices, candy, and baked goods. a-ISOAMYL FURFURYLACETATE • See Isoamyl 2-Furanpropionate.

ISOAMYL 3-(2-FURAN)BUTYRATE • Artificial flavoring. See Furans. ASP a-ISOAMYL FURFURYLPROPIONATE • See Isoamyl 2-Furanbutyrate.

ISOAMYL HEXANOATE • Synthetic flavoring. See Hexanoic Acid. ASP

ISOAMYL ISOBUTYRATE • A synthetic fruit and banana flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, and chewing gum (2,000 ppm). Used in manufacture of artificial rum and fruit essences. ASP

ISOAMYL ISOVALERATE • A synthetic flavoring additive, clear, colorless, liquid, with an apple odor. Occurs naturally in bananas and peaches. Used in raspberry, strawberry, apple, apricot, banana, cherry, peach, pineapple, honey, rum, walnut, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, jellies, liqueurs, and chewing gum. ASP

ISOAMYL LAURATE • The ester of isoamyl alcohol and lauric acid (see both) used as a synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

ISOAMYL NONANOATE • A synthetic chocolate, fruit, and liquor flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. NIL

ISOAMYL OCTANOATE • A synthetic chocolate, fruit, and liquor flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

ISOAMYL PHENYLACETATE • A synthetic butter, chocolate, cocoa, peach, honey, licorice, and anise flavoring additive for beverages, ice cream, ices, candy, baked goods, toppings, and gelatin desserts. ASP

ISOAMYL PYRUVATE • A synthetic flavoring additive and colorless liquid, with a pleasant odor. Used in root beer and fruit flavorings for beverages, ice cream, ices, candy, and baked goods. Also used in perfumery and soaps. See Salicylic Acid for toxicity. ASP

ISOAMYL SALICYLATE • Synthetic flavoring. See Salicylates. ASP

ISOASCORBIC ACID • Preservative. See Erythorbic Acid. GRAS

ISOBORNEOL • A synthetic fruit and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. See Borneol for toxicity. ASP

ISOBORNYL ACETATE • Synthetic pine odor used as a fruit flavoring for beverages, ice cream, ices, candy, baked goods, and gelatin.

ISOBORNYL FORMATE • Synthetic flavoring. See Isoborneol. ASP

ISOBORNYL ISOVALERATE • Synthetic flavoring. See Isoborneol. ASP

ISOBORNYL PROPIONATE • Synthetic flavoring. See Isoborneol. ASP

ISOBUTANE • A propellant. See Butanes. GRAS. NUL. E

ISOBUTYL ACETATE • The ester of isobutyl alcohol and acetic acid used as a synthetic flavoring additive. A clear, colorless liquid with a fruity odor. Used in raspberry, strawberry, butter, banana, and grape flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts,

odor. Used in raspberry, strawberry, butter, banana, and grape flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and icings. It may be mildly irritating to mucous membranes, and in high concentrations it is narcotic. ASP

ISOBUTYL ACETOACETATE• A synthetic berry and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Isobutyl Acetate for toxicity. ASP

ISOBUTYL ALCOHOL • Present in fusel oil; also produced by fermentation of carbohydrates. Colorless liquid with an odor of amyl alcohol, it is used in the manufacture of synthetic fruit flavorings and as a solvent. It is mildly irritating to skin and mucous membranes and, in high concentrations, narcotic. ASP

ISOBUTYL ALDEHYDE • A synthetic flavoring additive that occurs naturally in soy sauce, tea, tobacco, and coffee. It has a pungent odor. Used in berry, butter, caramel, fruit, liquor, and wine flavorings for beverages, ice cream, ices, candy, baked goods, and liquor.

ISOBUTYL ANGELATE • Flavoring with a green, sweet and spicy taste. It occurs naturally in Roman chamomile (see). Used in caraway, chamomile, dill, pepper, spearmint, spice, and tobacco. The JECFA (see) has no safety concern at current levels of intake when used as a flavoring agent. ASP

ISOBUTYL ANTHRANILATE • Synthetic mandarin orange, cherry, and grape flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum (1,700 ppm). ASP

ISOBUTYL BENZOATE • Synthetic berry, cherry, plum, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ISOBUTYL BUTYRATE • Synthetic berry, apple, banana, pineapple, liquor, and rum flavoring additive for beverages, ice cream, ices, candy, puddings, liquors, and baked goods. ASP

ISOBUTYL CINNAMATE • Flavor said to be identical to natural flavor from aromatic raw materials. ASP

2(4)-ISOBUTYL-4(2),DIMETHYLDIHYDRO-4H-1,3,5-DIMETHYLDIHYDRO-4H-1,3,5-DITHIAZINE • A newer synthetic flavoring. ASP

ISOBUTYL FORMATE • Synthetic flavoring. ASP

ISOBUTYL 2-FURANPROPIONATE • A synthetic berry and pineapple flavoring additive for beverages, ice cream, ices, gelatin desserts, and chewing gum. ASP

ISOBUTYL HEPTANOATE • Synthetic flavoring. See Heptanoic Acid. ASP

ISOBUTYL HEXANOATE • A synthetic apple and pineapple flavoring additive for beverages, ice cream, ices, chewing gum, and baked goods. ASP

ISOBUTYL ISOBUTYRATE • A synthetic strawberry, butter, fruit, banana, and liquor flavoring additive for beverages, ice cream, ices, candy, gelatin desserts, puddings, liquors, and baked goods. ASP

ISOBUTYLENE-ISOPRENE COPOLYMER • Thickener used in chewing gum. See Butyl Rubber. ASP

2-ISOBUTYL-3-METHOXYPYRAZINE • Thickener and synthetic flavoring. See Butyl Rubber. ASP

ISOBUTYL N-METHYLANTHRANILATE • Synthetic flavoring. ASP

2-ISOBUTYL-3-METHYLPYRAZINE • Synthetic flavoring. See Piperazine. ASP

ISOBUTYL 3-METHYLTHIOBUTYRATE • Flavoring used in baking, soft fruits, and dairy products. Colorless liquid; pungent aroma with fruity undertones. The JECFA has no safety concern about this additive. EAF

ISOBUTYL PABA • See Propylparaben.

ISOBUTYL PALMITATE • See Palmitate.

ISOBUTYL PARABEN • See Parabens.

ISOBUTYL PELARGONATE • The ester of isobutyl alcohol and pelargonic acid (see both).

ISOBUTYL PHENYLACETATE • A synthetic butter, caramel, chocolate, fruit, honey, and nut flavoring additive for beverages, ice cream, ices, candy, puddings, maraschino cherries, and baked goods. ASP

ISOBUTYL PROPIONATE • A synthetic strawberry, butter, peach, and rum flavoring additive for beverages, ice cream, candy, and baked goods. Used in the manufacture of fruit essences. ASP

ISOBUTYL SALICYLATE • A synthetic flavoring additive; colorless liquid with an orchid odor. Used in fruit and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. See Salicylic Acid for toxicity. ASP

ISOBUTYL STEARATE • The ester of isobutyl alcohol and stearic acid. See Fatty Alcohols.

ISOBUTYLENE/ISOPYRENE COPOLYMER • A copolymer of isobutylene and isoprene monomers derived from petroleum and used as resins. A chewing-gum base. Isobutylene is used to produce antioxidants for foods, food supplements, and packaging. Vapors may cause asphyxiation.

ISOBUTYLENE/MALEIC ANHYDRIDE COPOLYMER • Derived from petroleum and used as a resin. Strong irritant.

ISOBUTYLENE RESIN, POLYISOBUTYLENE • A component of chewing-gum base.

a-ISOBUTYLPHENETHYL ALCOHOL • A synthetic butter, caramel, chocolate, fruit, and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, liqueurs, and chocolate. See Isoamyl Alcohol for toxicity.

ISOBUTYLTHIAZOLE • Flavoring used to improve the aroma and flavor of tomato products. No safety concern at current levels of intake when used as a flavoring additive. ASP

ISOBUTYRIC ACID • A synthetic flavoring additive that occurs naturally in bay, bay leaves, parsley, and strawberries. It has a pungent odor. Used in butter, butterscotch, fruit, liquor, rum, cheese, nut, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and margarine. It is a mild irritant. A pungent liquid that smells like butyric acid (see). ASP

ISOCETYL ALCOHOL • See Cetyl Alcohol.

ISOCETYL ISODECANOATE • See Cetyl Alcohol.

ISOCETYL PALMITATE • See Cetyl Alcohol.

ISOCETYL STEARATE • See Cetyl Alcohol and Stearic Acid.

ISOCETYL STEAROYL STEARATE • The ester of isocetyl alcohol, stearic alcohol, and stearic acid. See Fatty Acids.

ISOCYCLOCITRAL • Synthetic flavoring with a green, aldehydic, herbal, leafy odor. Has a sharp leafy note. It is used in hyacinth and sweet pea compositions. See Citral. ASP

ISOEUGENOL • An aromatic liquid phenol oil obtained from eugenol (see) by mixing with an alkali. A synthetic flavoring additive with a floral odor. Occurs naturally in mace oil. Used in mint, fruit, spice, cinnamon, and clove flavorings for beverages, ice cream, ices, baked goods, chewing gum (1,000 ppm), and condiments. Used in the manufacture of vanillin (see). Moderately toxic by ingestion. Has caused mutations in experimental

gum (1,000 ppm), and condiments. Used in the manufacture of vanillin (see). Moderately toxic by ingestion. Has caused mutations in experimental animals. ASP

ISOEUGENOL ACETATE • See Acetylisoeugenol. ASP

ISOEUGENYL ACETATE • A synthetic berry, fruit, and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

ISOEUGENYL ETHYL ETHER • A synthetic flavoring additive, white, crystalline, with a spicy, clovelike odor. Used in fruit and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods.

ISOEUGENYL FORMATE • A synthetic spice flavoring additive used in condiments. See Formic Acid for toxicity. ASP

ISOEUGENYL METHYL ETHER • A synthetic raspberry, strawberry, cherry, and clove flavoring additive for beverages, ices, ice cream, candy, baked goods, gelatin desserts, and chewing gum. ASP

ISOEUGENYL PHENYLACETATE • A synthetic fruit, honey, and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ISOJASMONE • See Jasmone. ASP

ISOLATE • A substance that is freed from chemical contaminants.

ISOLEUCINE • L Form. An essential amino acid not synthesized within the human body. Isolated commercially from beet sugar, it is a building block of protein. Used as a nutrient and dietary supplement. The FDA asked for further study of this nutrient in 1980. GRAS. ASP

ISOMALT • A candidate for an artificial sweetener, it has 45 to 65 percent the sweetness of sugar. A component of bread obtained by the action of enzymes on starch. It contains calories and is physically similar to sugar. It has a sweet taste reportedly without any aftertaste. While it is not as sweet as sugar, it may be enhanced with an intense sweetener such as acesulfame K (see). It is used in fifteen countries in candies, gums, ice cream, jams, and baked goods. E

ISOMALTO-OLIGOSACCHARIDE • Low-calorie sweetener in a variety of food products, except meat and poultry, at a level of up to 30 grams per day. The company that makes it, BioNutra, notified the FDA that in the company's view iso-malto-oligosaccharide is GRAS through scientific procedures, for use as a low-calorie sweetener in a variety of foods. The company then withdrew its notice with the understanding that BioNutra may, in the future, submit another GRAS notice for the use of isomalto-oligosaccharide.

ISOMALTULOSE • Palatinose. Used as a nutritive sweetener in a variety of foods including baked goods and baking mixtures, cereals, confectionery, chewing gum, frozen dairy desserts and mixes, fruit and water ices, gelatins, desserts, puddings, jams, jellies and spread, nuts and peanut spreads, milk products, processed fruit and fruit juicers or vegetable juices, sugar substitutes, sweet sauces, toppings and syrups. FDA has no questions about the application by the producer, Südzucker, for its GRAS status. The FDA reviewed studies that demonstrated that the product is completely hydrolyzed and absorbed in the small intestine as glucose and fructose. Biological data, toxicological and metabolic studies, as well as research into gastrointestinal tolerance concluded that the use presents no health concerns, said the company in a statement. In Japan, it has been used as a food ingredient since 1985. Palatinit, a subsidiary of global sugar producer Südzucker AG, claims that this sugar replacer not only maintains sweetness but also has a low blood sugar effect and can be used to enhance the nutritional value of foods, since it is digested much more slowly than sucrose, providing energy over a longer time period. The FDA permits the claim that isomaltulose does not cause dental caries (cavities).

DL-ISOMENTHONE • Synthetic flavoring. See Menthol. ASP

ISOMERS • Two or more chemical compounds having the same structure but different properties.

a-ISOMETHYLIONONE • Flavoring. See Ionone. ASP a-ISOMETHYLIONYL ACETATE • Synthetic flavoring. EAF

ISONONYL ISONONANOATE • The ester (see) produced by the reaction of nonyl alcohol with nonanoic acid. Used in fruit flavorings for lipsticks and mouth-washes. Occurs in cocoa, oil of lavender.

ISOPARAFFINIC PETROLEUM HYDROCARBONS, SYNTHETIC • Coating additive, insecticide formulations, used on eggs, fruits, pickles, vegetables, wine, and vinegar. See Paraffin. ASP

ISOPENTYLAMINE • Used in processing. Irritating to the skin. ASP

ISOPENTYLIDENEISOPENTYLAMINE • Synthetic flavoring. Widely used in baked goods, beverages, breakfast cereals, chewing gum, confectionery frostings, egg products, frozen dairy, fruit ices, gelatins, hard candy imitation dairy, instant coffee, meat products, snack foods, soups, and soft candy. Declared GRAS by FEMA (see). EAF

ISOPHORONE • White, watery liquid that is irritating to skin and eyes. It is used in solvents for polyvinyl and nitrocellulose resins, and pesticides. ASP

ISOPROPANOL • See Isopropyl Alcohol.

ISOPROPANOLAMINE • An emulsifying additive with a light ammonia odor that is soluble in water.

cis-5-ISOPROPENYL-cis-2-METHYLCYCLOPENTAN-

1-CARBOXALDEHYDE • Synthetic flavoring. The JECFA (see) has no safety concern about it. ASP

5-ISOPROPENYL-2-METHYL-2-VINYLTETRAHYDROFURAN • Colorless liquid; pungent herbaceous, green, camphoraceous, piney aroma. The JECFA says it has no safety concern at current levels of intake when used as a flavoring agent. However, see Furans and Vinyl. NUL

ISOPROPENYLPYRAZINE • Synthetic flavoring. NIL

ISOPROPYL ACETATE • Synthetic nutty flavoring. ASP

P-ISOPROPYLACETOPHENONE • Synthetic flavoring. NIL

ISOPROPYL ALCOHOL • Isopropanol. An antibacterial, solvent, and denaturant (see). Solvent for the spice oleoresins. The FDA permits residues of 250 ppm or less in modified hop extract; 50 ppm in spice oleoresins; 6 ppm in manufacture of lemon oil; 2 percent by weight in hop extract as residue from extraction of hops in manufacture of beer. It is also used in defoaming additives for processing beet sugar and yeast, on food-processing equipment and on food-contact surfaces as well as on glass containers for holding milk. It is prepared from propylene, which is obtained in the cracking of petroleum. Also used in antifreeze compositions and as a solvent for gums, shellac, and essential oils. Ingestion or inhalation of large quantities of the vapor may cause flushing, headache, dizziness, mental depression, nausea, vomiting, narcosis, anesthesia, and coma. The fatal ingested dose is around a fluid ounce. ASP

ISOPROPYL BENZOATE • Preservative. See Benzoic Acid. NIL

P-ISOPROPYLBENZYL ALCOHOL • See Benzyl Alcohol. ASP

ISOPROPYL BUTYRATE • Occurs naturally in apples, cranberries, strawberries, and wine. Used as a flavoring for apple, blackberry, cherry, cranberry, ginger, and grape. ASP

ISOPROPYL CINNAMATE • Synthetic flavoring. ASP

ISOPROPYL CITRATE • A sequestrant and antioxidant additive used in oleomargarine and salad oils. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. When heated to decomposition, it emits acrid smoke and irritating fumes. ASP

ISOPROPYL-2-CYCLOHEXENONE • See Isopropyl Alcohol. EAF

ISOPROPYL FORMATE • Formic Acid. A synthetic berry and melon flavoring additive for beverages, ice cream, candy, and baked goods. ASP

ISOPROPYL HEXANOATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ISOPROPYL ISOBUTYRATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ISOPROPYL ISOSTEARATE • See Stearic Acid and Propylene Glycol.

ISOPROPYL ISOVALERATE • A synthetic pineapple and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ISOPROPYL 2-METHYLBUTYRATE • Synthetic flavoring. EAF

2-ISOPROPYL-5-METHYL-2-HEXENAL • Synthetic flavoring. ASP

2-ISOPROPYL-4-METHYLTHIAZOLE • Synthetic flavoring. ASP

ISOPROPYL MYRISTATE • A widely used fatty compound derived from isopropyl alcohol and myristic acid. Used as a solvent in pesticide formulations. ASP

ISOPROPYL PALMITATE • Colorless and odorless, used as a lubricant. ASP

2-ISOPROPYLPHENOL • Synthetic flavoring. See Thymol. ASP

P-ISOPROPYLPHENYLACETALDEHYDE • Synthetic flavoring. The JECFA has no safety concern about it. ASP

ISOPROPYL PHENYLACETATE • A synthetic butter, caramel, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ISOPROPYL PROPIONATE FLAVORING • Flavoring. The JECFA (see) said in 1998 that there was no safety concern at current levels of intake when used as a flavoring additive. Toxic. ASP

2-ISOPROPYLPYRAZINE • Synthetic green pepper flavoring. EAF

ISOPROPYL TIGLATE • Synthetic sweet mint flavoring. ASP

2-ISOPROPYL-N,2,3-TRIMETHYLBUTYRAMIDE • Synthetic flavoring with a menthol taste. EAF

ISOPROTURON • Herbicide. Identified as priority hazardous substance by the EU. Toxicity to humans, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity.

ISOPULEGOL • Synthetic flavoring with a menthol taste. The JECFA says it has no safety concern. ASP

ISOPULEGONE • Synthetic flavoring with a mint taste. See Pennyroyal Oil. ASP

ISOPULEGYL ACETATE • Synthetic fragrance. ASP

ISOQUINOLINE • Synthetic flavoring. ASP

ISOSAFROEUGENOL • White crystalline powder with a vanilla odor used as a flavoring additive in various foods. Moderately toxic by ingestion.

ISOSTEARIC ACID • A saturated fatty acid that has the same uses as stearic acid and oleic acid (see both).

ISOTHIOCYANATES • Found in mustard, horseradish, radishes, they seem to induce protective enzymes.

ISOTHIOUREA • Antifungal additive used on citrus fruit. Prohibited from direct addition or use in human food.

ISOVALERIC ACID • Occurs in valerian, hop oil, tobacco, and other plants. Colorless liquid with a disagreeable taste and odor used in flavors and perfumes. A poison by skin contact. Moderately toxic by ingestion. A corrosive skin and eye irritant. See Valeric Acid. ASP

ISOVALERIC ACID, ALLYL ESTER, BENZYL ESTER, BUTYL ESTER, ETHYL ESTER • Flavoring additives in various foods. The allyl ester is under IARC review. The allyl form is poisonous by ingestion. The others are mildly toxic by ingestion. Moderately toxic by skin contact. Skin irritants.

ISOVINYL FORMATE • Formic Acid. A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Formic Acid for toxicity.

ISOVINYL PROPIONATE • See Isovinyl Formate.

I.U. • International Unit. A term for measurement of vitamins that are fat soluble (do not mix with water and need fat for proper absorption). Vitamins A, E, D, and K are usually measured in I.U.s.

IVA • Achillea moschata. A flavoring for alcoholic beverages only from a small American ground pine that smells like skin. There is no reported use of the chemical and there is no toxicology information available. NUL

IVERMECTIN • Mectizan. Hyvermectin. A drug used to treat river blindness in humans, it is used to treat worms in animals, especially beef, pork, and reindeer. The FDA limits residues to 15 ppb in cattle and reindeer liver, and 20 ppb in swine liver. Poison by injection under the skin. Potential adverse human effects include dizziness, fever, headache, tender swollen glands, rash, and fatigue. See Guar Gum.

JAMBUL OLEORESIN • Java Plum. Syzygium jambolanum. Used as a flavoring in foods. Employed medically as an antidiarrheal medication. ASP

JAPAN WAX • Japan Tallow. Sumac Wax. Vegetable Wax. A fat squeezed from the fruit of a tree grown in Japan and China. Pale yellow, flat cakes, disks, or squares, with a fatlike rancid odor and taste. It is related to poison ivy and may cause allergic contact dermatitis. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there were insufficient relevant biological and other studies upon which to base an evaluation of it when it is used as a food ingredient. It remains GRAS for packaging. NUL

JAPÓNICA • See Honeysuckle. GRAS

JASMINE • Oil and Spiritus (alcoholic solution). The oil is extracted from a tropical shrub with extremely fragrant white flowers and is used in raspberry, strawberry, floral, and cherry flavorings for ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and jelly. The spiritus is used in blackberry, strawberry, and fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin, and cherries. Used in perfumes. May cause allergic reactions. GRAS. EAF

JASMINE ABSOLUTE • Oil of jasmine obtained by extraction with volatile or nonvolatile solvents. Sometimes called the “natural perfume” because the oil is not subjected to heat and distilled oils. See Absolute. May cause allergic reactions. ASP

JASMINE, CONCRETE • Flavoring. The quality of jasmine concrete obtained from morning-harvested jasmine (see) is better than jasmine concrete obtained from evening-harvested flowers. EAF

JASMINE SPIRITUS • Jasminum grandiflorum. Natural flavoring. See Jasmine Absolute. EAF

JASMONATES • Derived from fragrant compounds with the odor of jasmine flowers (see Jasmine Absolute), these have been found to keep stored potatoes from sprouting.

JASMONE, CIS • Derived from the oil of jasmine flowers, it is used in flavorings and perfumery. ASP

JASMONYL • See 1,3-Nonanediol Acetate.

JECFA • The abbreviation for Joint Expert Committee on Food Additives (see).

JELUTONG • Any of several trees with a milky white exudate. Resembles chicle and is used chiefly in waterproofing and in chewing gum. ASP

JOINT EXPERT COMMITTEE ON FOOD ADDITIVES • JECFA. The Joint Expert Committee on Food Additives of the Food and Agriculture Organization (FAO) of the United Nations and the World Health Organization (WHO) has been meeting since 1956 to evaluate the safety of food additives, contaminants, naturally occurring toxicants, and residues of veterinary drugs in food. The JECFA has evaluated more than fifteen hundred food additives, approximately forty contaminants and naturally occurring toxicants, and residues of approximately ninety veterinary drugs. At times, the committee develops principles for the safety assessment of chemicals in food that are consistent with current thinking on risk assessment and take into account recent developments in toxicology and other relevant sciences, such as exposure assessment. After collecting and evaluating scientific data on food additives, the JECFA makes recommendations on safe levels of use. This has been accomplished (a) by elaborating specifications for the identity and purity of individual food additives that have been toxicologically tested and are in commerce and (b) by evaluating the toxicological data on these food additives and estimating acceptable intakes by humans. See ADI. In 1972, the scope of the evaluations was extended to include contaminants in food, while in 1987 the scope was extended even further to include residues of veterinary drugs in food. When evaluating the latter compounds, maximum residue limits are recommended based upon acceptable intakes estimated by the committee and data relating to good practice in the use of veterinary drugs. The JECFA meets twice a year with individual agendas usually covering (a) food additives, contaminants, and naturally occurring toxicants in food or (b) residues of veterinary drugs in food. The membership of the meetings varies accordingly, with different sets of experts being called on depending upon the subject matter of the meeting.

JUNIPER • Juniperus communis. Extract, Oil, and Berries. A flavoring from the dried ripe fruit of trees grown in northern Europe, Asia, and North America. The greenish yellow extract is used in liquor, root beer, sarsaparilla, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, and baked goods. The oil is used in berry, cola, pineapple, gin, rum, whiskey, root beer, ginger, and meat flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, meats, and liquors. The berries are used in gin flavoring for condiments and liquors. Juniper is used also in fumigating and was formerly a diuretic for reducing body water. The oil is mildly toxic by ingestion, a human skin irritant and allergen, and if taken internally, a severe kidney irritation similar to that caused by turpentine may result. GRAS. NIL

JUNIPER OIL • The oil is ASP. See Juniper.

KABAT • Altosid. Methoprene. Amber liquid used as an insect growth regulator in animal feed, dried apples, apricots, barley cereal, beef, corn cereal, cornmeal, grits, hominy, macaroni, oat cereal, dried peaches, potable water, dried prunes, raisins, rice cereal, rye cereal, spices, wheat cereal, and wheat flour. The FDA's insect growth regulator residue tolerance is 10 ppm in the grains, rice, and dried fruits. Exempt from the tolerance is potable water. Moderately toxic by skin contact. Mildly toxic by ingestion. Has caused mutations in laboratory animals.

KADAYA • See Karaya Gum.

KAOLIN • China Clay. Used as an anticaking additive in food. Originally obtained from Kaoling Hill in Kiangsi Province in southeast China. Essentially a hydrated aluminum silicate (see). Used medicinally to treat intestinal disorders, but in large doses it may cause obstructions, perforations, or granuloma (tumor) formation. See also Clays. GRAS

KARAYA GUM • Kaday. Katilo. Kullo. Kuterra. Sterculia. Indian Tragacanth. Mucara. The exudate of a tree found in India. The finely ground white powder is used as a stabilizer in gelatins, gumdrops, prepared ices, and ice cream, and as a filler for lemon custard. Also a citrus and spice flavoring additive for beverages, ice cream, ices (1,300 ppm), candy, meats, baked goods, toppings (3,500 ppm), and emulsions (18,000 ppm). Used instead of the more expensive gum tragacanth (see) and in bulk laxatives. Reevaluated by the FDA in 1976 and found to be GRAS in the following percentages: 0.3 percent for frozen dairy desserts and mixes; 0.02 percent for milk products; 0.9 percent for soft candy; and 0.002 percent for all other food categories. GRAS. ASP. E

KATILO • See Karaya Gum.

KAUTSCHIN • See Limonene.

KELP • Recovered from the giant Pacific marine plant Macrocystis pyriferae. Used as seasoning or flavoring and to provide iodine when used in dietary foods. It has many minerals that are associated with seawater and, as a result, is very high in sodium. The FDA residue tolerance is less than 0.225 mg per day without reference to age or physical state; 0.045 mg per day for infants; 0.105 mg per day for those under four years; 0.225 mg per day for adults and children. For pregnant or lactating women, 0.20 mg per day. It is a source of iodine in foods for special dietary use. The Japanese report that kelp reduced normal thyroid function, probably because of its iodine content. The FDA has also reported that high levels of arsenic have been found in people who eat a lot of kelp as a vegetable. GRAS. See Algae, Brown. ASP

KETO- • Prefix meaning of or from ketone (see).

2-KETO-4-BUTANETHIOL • Flavoring. ASP

a-KETOBUTYRIC ACID • A breakdown product of the amino acid threonine (see). ASP

KETONAROME • See Methylcyclopentenolone.

KETONE • When fats are broken down for energy, chemicals called ketones appear in the blood and urine. Ketones are chemical substances that the body makes when it does not have enough insulin in the blood. When ketones build up in the body for a long time, serious illness or coma can result.

KETONE C-7 • See 2-Heptanone.

2-KETOPROPIONALDEHYDE • See Pyruvaldehyde.

KETOPROPIONALDEHYDE • See Pyruvic Acid.

kg • The abbreviation for kilogram, which is equal to about 2.205 pounds.

KIDNEY BEAN EXTRACT • Extract of Phaseolus vulgaris, the beans were used as a nutrient and a laxative by the American Indians.

KILOGRAM (kg) • Equal to about 2.205 pounds.

KOLA NUT EXTRACT • Guru Nut. A natural extract from the brownish seed, about the size of a chestnut, produced by trees in Africa, the West Indies, and Brazil. Contains caffeine (see). Used in butter, caramel, chocolate, cocoa, coffee, cola, walnut, and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. Has been used to treat epilepsy. GRAS. ASP

KONJAC FLOUR • Konjac Mannan. Konnyaku. Yam Flour. It is derived from the tubers of Amorphophallus konjac, a large plant grown in Japan for its flour. A food additive that is expected to increase in use as a gelling additive, thickener, emulsi-fier, and stabilizer in such foods as soup, gravy, mayonnaise, and jam. There is a long history of use in traditional Japanese and Chinese foods; the average consumption of konjac flour from these uses is estimated to be between 2 and 3 grams per person per day and sometimes as high as 4 grams. The anticipated maximum consumption of konjac flour from food additive uses is about 3 grams per person per day. Human studies were conducted for up to sixty-five days at dose levels of up to 8.6 grams of konjac flour per person per day. Volunteers consuming approximately 5.2 grams or more reported loose stools, flatulence, diarrhea, and abdominal pain or distension. Studies with normal and diabetic volunteers demonstrated that consumption of 7.2 to 8.6 grams of konjac flour per day for seventeen days significantly decreased mean fasting blood sugar levels; in addition, a dose of 3.9 to 5 grams consumed in a single meal or administered with glucose was reported to delay the increase in blood sugar and insulin levels for several hours following the meal, also delaying their return to baseline levels. The test meal also appeared to impair vitamin E absorption (up to 30 percent decrease) and influenced the absorption of the coadministered drug glibenclamide (a diabetes medication). On the basis of the available toxicological data and the long history of use of konjac in food, the committee allocated temporary ADI (see) “not specified” for konjac flour and said a review should be done of konjac's effect on vitamin E and other fat-soluble vitamins. Also, it was noted that consumption of dry konjac has been associated with obstruction of the esophagus and that it should be consumed only in hydrated form. E

KONNYAKU • See Konjac Flour.

KOSHER • Parve. U. Hebrew word meaning “proper” or “fit,” used especially for food prepared according to Orthodox dietary and religious laws. Forbidden are pork, horseflesh, shellfish, and parts of beef and lamb. All meat and poultry must be killed by a Jewish person trained in the prescribed ritual, then soaked or salted to remove all blood. Milk and its products must not be eaten with meat. U or parve on packages means the product has been prepared under dietary laws. See NS.

KRAMERIA EXTRACT • Rhatany Extract. A synthetic flavoring derived from the dried root of either of two American shrubs. Used in raspberry, bitters, fruit, and rum flavorings. Used in cosmetics as an astringent. Low oral toxicity. Large doses may produce gastric distress. Can cause tumors and death after injection, but not after ingestion.

KRILL-DERIVED LECITHIN • Ingredient in breakfast bars at a level of 3.8 percent, dairy products analogs (soy products) and milk-based beverages at a level of 0.6 percent, fat spreads at a level of 10 percent, yogurt at a level of 0.7 percent, and soft candy at a level of 3.3 percent. GRAS.

KULLO • See Karaya Gum.

KUTEERA • See Karaya Gum.

LABDANUM • Absolute, Oil, and Oleoresin. A synthetic musk flavoring additive. It is a volatile oil obtained by steam distillation from gum extracted from various rockrose shrubs with a strong balsamic odor and a bitter taste. The absolute is used in raspberry, fruit, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. The oil is used in fruit and spice flavorings for beverages, ice cream, ices, candy, and baked goods. The oleoresin (see) is used in fruit and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. Also used in perfumes, especially as a fixative. Mildly toxic by ingestion. A skin irritant. There is reported use of the chemical; it has not yet been assigned for toxicology literature. EAF

LABRADOR TEA EXTRACT • Hudson Bay Tea. Marsh Tea. The extract of the dried flowering plant or young shoots of Ledum palustre or Ledum groenlandicum, a tall, resinous evergreen shrub found in bogs, swamps, and moist meadows. Brewed like tea, it has a pleasing odor and is stimulating. It was used by the Indians and settlers as a tonic supposed to purify blood. It was also employed to treat wounds. Ledum palustre contains, among other things, tannin and valeric acid (see both).

LACTALBUMIN • Albumin Milk. A component of skim milk protein. Exact function is not known, but it may aid in stabilization of fat particles. Alpha-lactalbumin has been associated as of this writing with stress reduction; anticancer with human alpha-lactalbumin, immunomodulation, and antimicrobial activity after protein breakdown. May cause an allergic reaction in those allergic to milk. ASP

LACTALBUMIN PHOSPHATE • A protein in milk that may cause allergy. See Lactalbumin. NUL

LACTASE ENZYME PREPARATION FROM ASPERGILLIUS NIGER • See Enzymes. GRAS status pending.

LACTASE ENZYME PREPARATION FROM KLUYVEROMYCES LACTIS • Breaks down lactose. GRAS

LACTASE ENZYME PREPARATION FROM SACCHAROMYCES FRAGILIS or KLUVEROMYCES LACTIS • An enzyme that breaks down lactose (see). There is no reported use of the chemical and there is no toxicology information available. GRAS. NUL

LACTASE PREPARATION FROM CANDIDA PSEUDOTROPICALIS • Lactase enzyme preparation from Candida pseudotropicalis, a yeast for use in hydrolyzing lactose to glucose and galactose. GRAS EAF

LACTIC ACID • Butyl Lactate. Ethyl Lactate. Odorless, colorless, usually a syrupy product normally present in blood and muscle tissue as a product of the metabolism of glucose and glycogen. Present in sour milk, beer, sauerkraut, pickles, and other food products made by bacterial fermentation. It is produced commercially by fermentation of whey, cornstarch, potatoes, and molasses. Used as an acidulant in beverages, candy, olives, dried egg whites, cottage cheese, confections, bread, rolls, buns, cheese products, frozen desserts, sherbets, ices, fruit jelly, butter, preserves, jams (sufficient amounts may be added to compensate for the deficiency of fruit acidity), and in the brewing industry. Also used in infant-feeding formulas. Used in blackberry, butter, butterscotch, lime, chocolate, fruit, walnut, spice, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, gelatins, puddings, chewing gum, toppings, pickles, and olives (24,000 ppm). Also used in skin fresheners. It is caustic in concentrated solutions when taken internally or applied to the skin. In cosmetic products, it may cause stinging in sensitive people, particularly in fair-skinned women. GRAS. ASP. E

LACTIC YEASTS • Obtained from milk. See Lactic Acid.

LACTITOL • A reduced-calorie sweetener derived from milk sugar. Internationally, it is approved for use in many countries, including the European Union (EU), Canada, Japan, Israel, and Switzerland. GRAS status has been applied for in the United States. See Lactose. E

LACTOBACILLUS CASEI, SUBSP. RHAMNOSUS GG • Ingredient in term infant formula, at levels not to exceed 108 colony forming units per gram of powdered formula. GRAS pending at this writing.

LACTOFEN • A pesticide used on soybeans. FDA tolerance is 0.05 ppm.

LACTOFERRIN • (aLF). Bioactive milk protein that is said to play a role in the immune system response and helps protect the body against infections. Besides the stimulation of the immune system, scientific studies have revealed that lactoferrin also prevents the growth of pathogens, exerts antibacterial and antiviral properties, controls cell and tissue damage caused by oxidation, and facilitates iron transport. On August 22, 2003, the FDA announced that aLF Ventures, Salt Lake City, Utah, had consulted with the agency about aLF Ventures' plans to market lactoferrin as a component of an antimicrobial spray. This spray can be applied to uncooked beef carcasses to fight E. coli 0157:H7, an organism that can cause severe gastrointestinal disease in humans. The FDA informed aLF Ventures that it does not question its decision to market lactoferrin, an antimicrobial protein found in cows' milk and beef. Although aLF Ventures was not required to seek approval from the FDA before it marketed lactoferrin, aLF Ventures provided to the FDA scientific data supporting the firm's conclusion that lactoferrin is “generally recognized as safe” (GRAS), for the general population as well as for individuals who are allergic to milk. “Innovative technology is a critical building block in preserving the strong foundation of the U.S. food supply,” said Dr. Lester Crawford, Deputy Commissioner of the Food and Drug Administration. “We must continue to encourage scientific research and new technology to maintain this nation's safe food supply.” In its notice submitted to the FDA, aLF Ventures noted that the amount of added lactoferrin that remains on the beef after spraying is comparable to the amount of lactoferrin that is naturally occurring in the beef. Data were also submitted to the U.S. Department of Agriculture (USDA) regarding the effectiveness of lactoferrin against E. coli 0157:H7. The USDA is the agency responsible for addressing labeling issues with lactoferrin-treated beef.

LACTOFERRIN PURIFIED FROM RICE • Ingredient in meal replacements, yogurt, Popsicles, sports beverages, snack bars, frozen dairy desserts, and mixes. Ingredient in oral rehydration solutions at levels not to exceed 1.0 milligrams per milliliter. GRAS pending at this writing.

LACTOFLAVIN • See Riboflavin.

LACTONES • In general, they are colorless liquids, having a weak aromatic odor. They are so called because the typical lactone is derived from lactic acid (see).

LACTOSE • Milk Sugar. Saccharum Lactin. D-Lactose. A slightly sweet-tasting, colorless sugar present in the milk of mammals (humans have 6.7 percent and cows 4.3 percent). Occurs as a white powder or crystalline mass as a by-product of the cheese industry. Produced from whey (see). It is inexpensive and is widely used in the food industry as a culture medium, such as in souring milk, and as a humectant (see) and nutrient in infant or debilitated patient formula. Also used as a medical diuretic and laxative. Stable in air but readily absorbs odors. It is generally nontoxic. However, it was found to cause tumors when injected under the skin of mice in 50 milligram doses per kilogram of body weight. ASP

LACTOSE HYDROLYZED • A nutritive sweetener used in cheeses. See Lactose. NUL

LACTOSE INTOLERANCE • Lactose is a sugar found naturally in milk. It is important to distinguish between lactose intolerance and milk allergy, because milk allergy can cause severe reactions. Lactose intolerance is caused by a shortage of the enzyme lactase, which is needed to break down lactose so it can be absorbed into the bloodstream. When someone doesn't have enough of this enzyme, lactose isn't absorbed properly from the gut, which can cause symptoms such as bloating and diarrhea. This condition normally appears in adults because people's levels of lactase begin to

decrease after childhood. Some children are born with lactose intolerance, but this is rare. Lactose intolerance is more common in certain countries and ethnic groups than in others. In communities where milk is not traditionally part of the typical adult diet, a much bigger proportion of people are affected. For example, in South America, Africa and Asia, more than 50 percent of the population are intolerant to lactose, rising to nearly 100 percent in some parts of Asia. In the UK, Ireland, Northern Europe, and America, we think, on average, that about 5 percent of the adult population have this condition. Digestive diseases or injuries to the small intestine can sometimes cause lactose intolerance, because damage to the lining of the small intestine may reduce the amount of lactase produced. In extremely rare cases, the condition can be inherited. Milk from animals including cows, goats, sheep, and humans all contain lactose. This means that goats' milk and sheep's milk aren't suitable alternatives to cows' milk for people who are intolerant to lactose. There is no medical treatment for lactose intolerance, but symptoms can be avoided by controlling the amount of lactose in the diet. Adults with lactose intolerance can often have a small amount of milk without reacting. Since November 25, 2005, food labeling rules require prepacked food sold in the UK, and the rest of the EU, to show clearly on the label if it contains milk (or if one of its ingredients contains it). Bear in mind that there could still be foods on the shelves that were produced before this date. People with lactose intolerance often find that they can eat cheese and yogurt without any problems. Cheese contains much less lactose than milk. Yogurt contains a similar amount of lactose to milk, but it still seems to be easier to digest for people with lactose intolerance. This might be something to do with the bacteria used to make it.

LACTYLATED ESTERS OF FATTY ACIDS • Emulsifiers used in food products. See Esters and Fatty Acids. ASP

LACTYLIC ESTERS OF FATTY ACIDS • Emulsifier in snacks, cheeses, dehydrated potatoes, milk substitutes, dehydrated vegetables, and fruit. See Lactic Acid and Fatty Acids. ASP

LACTYLIC STEARATE • Salt of stearic acid used as a dough conditioner to add volume and to keep baked products soft; it makes bread less sticky. See Stearic Acid for toxicity.

LADY'S-MANTLE EXTRACT • From the dried leaves and flowering shoots of Alchemilla vulgaris. A common European herb covered with spreading hairs, it has been used for centuries by herbalists to concoct love potions.

LAKES, COLOR • A lake is an organic pigment prepared by precipitating a soluble color with a form of aluminum, calcium, barium potassium, strontium, or zirconium, which then makes the colors insoluble. Not all colors are suitable for making lakes.

LAMINARIA • Seaweed from which algin is extracted. See Alginates. GRAS

LAMINARIA JAPONICA BROTH and EXTRACT POWDER • Used as a flavoring in meat products, poultry, fish, soups, gravies, and seasonings. GRAS

LANALOOL • Synthetic flavoring. GRAS

LANOLIN • Wool Fat. Wool Wax. A product of the oil glands of sheep. Used as a chewing-gum base component. A water-absorbing base material and a natural emulsifier, it absorbs and holds water to the skin. Chemically a wax instead of a fat. Contains about 25 to 30 percent water. Products derived from it are less likely to cause allergic reactions. ASP

LANTANA • See Oregano.

LARCH • Arabinogalactan. AG. A fine white powder with a mildly sweet taste, it is a source of dietary fiber that offers therapeutic benefit as a prebiotic (see) and as a modulator of the immune system. It reputedly has potential as a supplement in the treatment of chronic diseases, including cancer. Arabinogalactan (AG) is a polysaccharide (see) found in the cell walls of a wide variety of edible and nonedible woody plants. Polysaccharides are often found in many medicinal herbs used for immune enhancement The wood of the western larch tree, Larix occidentalis, provides free arabinogalactan from its inner bark. This complex carbohydrate helps the tree recover from injury from lightning strikes and protects against the freeze-thaw cycles experienced in the high altitudes of the Pacific and inland Northwest where it grows. It is easily incorporated into foods and beverages. The FDA approved it for use as a dietary fiber and as a food additive. There are no known reports of toxicity.

LARCH GUM • Larch Turpentine. Venice Turpentine. Oleoresin (see) from Larix decidua, grown in middle and southern Europe. A yellow, sometimes greenish, tenacious, thick liquid with a pleasant aromatic odor, it has a hot, somewhat bitter taste. It becomes hard and brittle on prolonged exposure. It is used as a stabilizer, thickener, and texturizer.

LARD and LARD OILS • Pork Fat and Oils. It is the purified internal fat from the abdomen of the hog. It is a soft, white, unctuous mass, with a slight characteristic odor and a bland taste; used in packaging and in chewing-gum bases. Easily absorbed by the skin, it is used as a lubricant, emollient, and base in shaving creams, soaps, and various cosmetic creams. Insoluble in water. When lard was fed to laboratory animals in doses from 2 to 25 percent of the diet, the male mice had a shortened life span and increased osteoarthritis. This was thought to be due to the large amounts of fat and not specifically to lard. GRAS. There is no reported use of the chemical and there is no toxicology information available. Lard is EAF and lard oil is ASP.

LARD GLYCERIDE • See Lard.

LARIXINIC ACID • See Maltol.

LASALOCID • An antibiotic used in beef, chicken, and lamb. Tolerance residue of 10.3 ppm in chicken skin, 0.7 ppm, in cattle liver, and 1.2 ppm in sheep muscle. Poison by ingestion and injection. An eye and skin irritant.

LASOLOCID SODIUM • An antibiotic feed additive. The tolerated residue in edible tissues of chicken is 0.05 ppm; 4.8 ppm in cattle liver.

LASSO • See Alachlor.

LATENCY • Time from the first exposure to a chemical until the appearance of a toxic effect.

LATEX • Synthetic Rubber. Component of chewing-gum base. The milky, usually white juice or exudate of plants obtained by tapping. Any of various gums, resins, fats, or waxes in an emulsion of water and synthetic rubber of plastic are now considered latex. Ingredients of latex compounds can be poisonous, depending upon which plant products are used. Can cause skin rash. In May 1991, the FDA cautioned doctors and manufacturers about potential allergic reactions to latex products. Allergic reactions caused the death of four patients undergoing medical procedures involving an inflatable latex cuff.

LATOLRUBINE BK • Coloring approved by the EU. See Rubine. E.

LAURAMIDE ARGININE ETHYL ESTER • Antimicrobial ingredient added directly to food, including meat and poultry but not in baby food. Salts of GRAS acids. Based on the information provided by a producer and other information available to the FDA, the agency has determined that it has no questions at this time regarding the conclusion that substituting lactic acid, acetic acid, glutamic acid, citric acid, or phosphoric acid for hydrochloric acid to form salts of lauramide arginine ethyl ester is safe and lawful, consistent with standard regulatory interpretation. GRAS

LAUREL BERRIES • Laurus nobilis. The fresh berries and leaf extract of the laurel tree. The berries are used as a flavoring for beverages and the leaf extract is a spice flavoring for vegetables. See Laurel Leaf Oil. GRAS. NIL

LAUREL GÁLLATE • An antioxidant, the laurel ester gallic acid. See Propyl Gallate.

LAUREL LEAF OIL • Derived from steam distillation of the leaves of Laurus nobilis, it is a yellow liquid with a spicy odor used as a flavoring additive. Moderately toxic by ingestion. A skin irritant. GRAS

LAURIC ACID • Dodecanoic Acid. A common constituent of vegetable fats, especially coconut oil and laurel oil. Used in the manufacture of miscellaneous flavors for beverages, ice cream, candy, baked goods, gelatins, and puddings. Also used as a coating for fruit. Its derivatives are widely used as a base in the manufacture of soaps, detergents, and lauryl alcohol (see Fatty Alcohols) because of their foaming properties. Has a slight odor of bay. A mild irritant but not a sensitizer. ASP

LAURIC ALDEHYDE • See Lauric Acid. ASP

LAUROAMPHOACETATE and LAUROAMPHODIACETATE • Preservatives. See Imidazole.

LAUROAMPHODIPROPIONATE • See Propionic Acid and Lauric Acid.

LAUROAMPHODIPROPIONIC ACID • Preservative. See Lauric Acid and Propionic Acid.

LAUROAMPHOHDROXYPROPYLSULFONATE • See Imidazolin.

LAUROAMPHOPROPINOATE • See Lauric Acid and Propionic Acid.

LAUROSTEARIC ACID • See Lauric Acid.

LAUROYL DIETHANOLAMIDE • Indirect food additive used as a surfactant. See Diethanolamide and Lauric Acid. ASP

LAURYL ACETATE • Dodecyl Acetate. Colorless liquid with fruity odor used in flavoring. ASP

LAURYL ALCOHOL, SYNTHETIC • See Fatty Alcohols. ASP a-LAURYL-OMEGA-HYDROXYPOLY(OXYETHYLENE) • Sanitation compound. May be used on beverage containers including milk containers and equipment.

LAVANDIN ABSOLUTE AND CONCRETE • Lavandula officinalis. See Lavandin Oil. EAF

LAVANDIN OIL • A flavoring from a hybrid related to the lavender plant, pale yellow liquid with a camphor-lavender smell. Used in berry and citrus flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. A skin irritant. GRAS. EAF

LAVENDER OIL • Lavandula officinalis. The colorless liquid extracted from the fresh, flowery tops of the plant. Smells like lavender and is used in ginger ale flavoring for beverages. Lavender absolute is a fruit flavoring for beverages, ice cream, ices, candy, and baked goods. Lavender concrete is a fruit flavoring for beverages, ice cream, ices, candy, and baked goods. Lavender was once used to break up stomach gas. It can cause allergic reactions and has been found to cause adverse skin reactions when the skin is exposed to sunlight. GRAS. EAF

LAVENDER OIL, SPIKE • Lavandula. In aromatherapy, lavender oil is used to promote relaxation, relieve anxiety, and treat headaches. Traditional remedy for gassy stomach. EAF

LAVENDER, SPIKE • Lavandula latifolia. The name lavender comes from the Latin lavare, to wash, and refers to the Roman custom of scenting bath water with the leaves and flowers of this aromatic plant. Used in perfumes, soaps, and sachets. Antispasmodic, aromatic, carminative, cholagogue, diuretic, sedative, stimulant, stomachic, tonic, relaxant, antibacterial, antiseptic. Contains coumarin, triterpene, tannins, and flavonoid. One of the most popular medicinal herbs since ancient times; in Arab medicine, it is used as an expectorant and an antispasmodic. In European folk tradition, it is used as a wound herb and a worm medicine for children. NUL

LC • The abbreviation for lethal concentration.

LC50 • The abbreviation for the concentration of toxicant necessary to kill 50 percent of the organisms being tested. It is usually expressed in parts per million (ppm).

LD • The abbreviation for lethal dose.

LD50 • The amount of a chemical that is lethal to one-half (50 percent) of the experimental animals exposed to it. LD50s are usually expressed as the weight of the chemical per unit of body weight (mg/kg). It may be fed (oral LD50), applied to the skin (dermal LD50), or administered in the form of vapors (inhalation LD50).

LEAD • This metal can enter the body in two ways—by ingestion and by inhalation. Lead can build up in the body even if you are exposed to just small amounts for a long time. In general, the more lead in your body, the more likely harm will occur. It is one of the most hazardous of toxic metals because its poison is cumulative and its toxic effects are many and severe. Among these are leg cramps, muscle weakness, numbness, depression, brain damage, coma, and death. Obvious symptoms of lead toxicity may occur in some people with levels as low as 40 micrograms of lead per deciliter of blood. The good news is that the almost complete elimination of lead-soldered side seams in canned foods in a number of countries has contributed to a reduction in lead exposure. The FDA reports that the mean level in canned foods in the United States decreased from 0.20 mg/kg in 1982–83 to 0.01 mg/kg since 1988–89. Most relevant to the concern about infant exposure to lead is that the concentration of lead in canned evaporated milk decreased from 0.11 mg/kg in 1982–83 to undetectable levels (less than 0.01 mg/kg) since 1985–86. The lead content of drinking water may be greater than 100 micrograms per liter where lead pipes or lead solder are used in plumbing.

The lead content of drinking water in Canada and the United States is generally below 5 micrograms per liter and averages 1 or 2 micrograms per liter. WHO recommends lead content of drinking water should not exceed 10 micrograms per liter. The experts also said there is a need for continued epidemiological studies on the effects of lead on intellectual development in children. In particular, information is needed on whether a reduction in blood lead concentrations leads to reversal of lead-related intellectual deficits. The provisional tolerable weekly intake (PTWI) of 25 μg/kg body weight was maintained. The JECFA considered the results of a quantitative risk assessment and concluded that the concentrations of lead found currently in food would have negligible effects on the neurobehavioral development of infants and children. It noted, however, examples of foods with high levels of lead remain in commerce. A complete risk assessment of lead should also take into account other sources of exposure. It is in the top seven high-quantity priority chemicals to be studied by the EPA. It is number two on the CERCLA Priority List of Hazardous Substances (see).

LEATHER MEAL, HYDROLYZED • Used in feed. FDA tolerance, 1 percent by weight of feed.

LEAVENING • From the Latin levare, “to raise.” It is a substance, such as yeast, acting to produce fermentation in dough or liquid. Leavening serves to lighten or enliven, such as baking soda when it produces a gas that lightens dough or batter.

LECHEA CASPI or DE VACA • A genus of herbs that have branched stems and minute purplish flowers. ASP

LECHE DE VACA BROMSIMUM ÚTIL PITTIER AND POULSENIA SPP • Chewing-gum base. See Lechea Caspi. ASP

LECITHIN • From the Greek, meaning “egg yolk.” A natural antioxidant and emollient composed of units of choline, phosphoric acid, fatty acids, and glycerin (see all). Commercially isolated from eggs, soybeans, corn, and egg yolks and used as an antioxidant in prepared breakfast cereal, candy, sweet chocolate, breads, rolls, buns, and oleomargarine. Egg yolk is 8 to 9 percent lecithin. Hydroxylated lecithin is a defoaming component in yeast and beet sugar production. Lecithin with or without phosphatides (components of fat) is an emulsifier for sweet chocolate, milk chocolate, bakery products, frozen desserts, oleomargarine, rendered animal fat, or a combination of vegetable-animal fats. Also used in eye creams, lipsticks,

liquid powders, hand creams and lotions, soaps, and many other cosmetics. Also a natural emulsifier and spreading additive. Nontoxic. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. ASP. E

LECITHIN, BENZOYL PEROXIDE MODIFIED • Commercial lecithin is a naturally occurring mixture of the phosphatides of choline, ethanolamine, and inositol, with smaller amounts of other lipids. It is isolated as a gum following hydration of solvent-extracted soy, safflower, or corn oils. Lecithin is bleached, if desired, by hydrogen peroxide and benzoyl peroxide and dried by heating. ASP

LECITHIN, ENZYME-MODIFIED • EM Lecithin. In enzyme-modified lecithin, the middle-position fatty acid is removed with an enzyme. EM lecithin is used mainly for yeast-raised baked goods to extend shelf life, but it also improves volume with its ability to act as a dough-strengthening additive. EM lecithin can replace monoglycerides (see). Its use in bread is becoming more popular with bakeries today. GRAS. EAF

LECITHIN, HYDROGEN PEROXIDE MODIFIED • See Lecithin, Benzyol Peroxide Modified. ASP

LECITIHIN, HYDROXYLATED LECITHIN • See Lecithin and Hydroxylated.

LEEK OIL • Sempervivum tectorum. Native to the mountains of Europe and to the Greek Islands, its longevity led to its being named sempervivum, which translated means “ever alive.” It is used as a flavoring. It has been used to treat shingles, gout, and to get rid of bugs. Its pulp was applied to the skin for rashes and inflammation, and to remove warts and calluses. The juice was used to reduce fever and to treat insect stings. The juice mixed with honey was prescribed for thrush, a fungal infection of the mouth, and an ointment made from the plant was used to treat ulcers, burns, scalds, and inflammation. There is reported use of the chemical; it has not yet been assigned for toxicology literature research. EAF

LEGUMES • Plants that include seeds in a pod, such as beans and peas. The Leguminosae family includes over eighteen thousand species and is one of the most economically important plant families in the world. They include the phytochemicals being studied as health factors. Phytochemicals from legumes are utilized as food additives, fungicides, and anticancer additives.

LEMON • Extract and Oil. The common fresh fruit. Lemon extract is used in flavorings for beverages, ice cream, ices, candy, baked goods, and icings. Lemon oil is a blueberry, loganberry, strawberry, butter, grapefruit, lemon, lime, orange, cola, coconut, honey, wine, rum, root beer, and ginger ale flavoring for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum (1,900 ppm), condiments, meats, syrups, icings, and cereals. Lemon oil is suspected of being a cancer-causing additive. GRAS. ASP

LEMON BALM • Sweet Balm. Garden Balm. Used in perfumes and as a soothing facial treatment. An Old World mint cultivated for its lemon-flavored fragrant leaves. Often considered a weed, it has been used by herbalists as a medicine and to flavor foods and medicines. It reputedly imparts long life. Also used to treat earache and toothache.

LEMON EXTRACT • See Lemon Oil. ASP

LEMON JUICE • See Lemon. EAF

LEMON OIL • Cedro Oil. Used in perfumes and food flavorings, it is the volatile oil expressed from the fresh peel. It has a characteristic odor and taste of the outer part of fresh lemon peel. It can cause an allergic reaction and has been suspected of being a coadditive cause of cancer. Lemon oil is reportedly found in ninety-eight cosmetic formulations.

LEMON OIL, TERPENELESS • A lemon fruit, ginger, and ginger ale flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and toppings. Terpene, which is removed to improve flavor, is a class of unsaturated hydrocarbons. See Lemon for toxicity. ASP

LEMON PEEL • From the outer rind, the extract is used as a flavor in medicines and in beverages, confectionery, and cooking. See Lemon for toxicity. ASP

LEMON TERPENES • Terpene (see) fraction obtained from cold-pressed lemon oil. Oily taste associated with lemons. ASP

LEMON VERBENA EXTRACT • Extract of Lippia citriodora. Flavoring in alcoholic beverages only. See Lemongrass Oil. EAF

LEMONGRASS OIL • Indian Oil of Verbena. Used in perfumes, especially those added to soap. It is the volatile oil distilled from the leaves of lemon grasses. A yellowish or reddish brown liquid, it has a strong odor of verbena. Also used in insect repellent. Used in lemon and fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Death reported when taken internally; an autopsy showed lining of the intestines was severely damaged. ASP

LEPIDINE • Obtained by the distillation of cinchonine. See Quinoline. NIL

LEUCINE • L and DL forms. At the Codex (see) meeting in 2008, the committee decided this additive should be listed as a flavor enhancer. An essential amino acid (see) for human nutrition not manufactured in the body. It is isolated commercially from gluten, casein, and keratin (see all). The L form is a food additive that the FDA says can be 3.5 percent of table weight. Used in aspartame (see) tabs as a lubricant. It has a sweet taste. It has caused birth defects in experimental animals. ASP

LEVAMISOLE • Ergamisol. A drug that appears to restore depressed immune function. Used as an animal drug and in animal feed to fight parasites. It is employed in treatment of beef, lamb, and pork. FDA limitations are 0.1 ppm in cattle, sheep, and swine. Poisonous by ingestion and other routes. Human systemic effects by ingestion include coma, skin rash and irritation, and fever. There was a great deal of controversy over the pricing of this drug in 1992, when it was revealed that while the veterinary drug cost $14, for a human cancer patient the cost was up to $1,500. The company that produces the drug explained that it backed fourteen hundred studies involving forty thousand patients, and that this was factored into the cost of the drug for humans.

LEVULINIC ACID • Crystals used as an intermediate for plasticizers, solvents, resins, flavors, and pharmaceuticals. ASP

LEVULOSE • See Fructose. ASP

L-GLUTAMIC ACID • See Glutamic Acid.

LICORICE • Liquorice. Glycyrrhizin. Monoammonium Glycyrrhizinate. Ammoniated Glycyrrhizin. Extract, Extract Powder, and Root. A black substance derived from a plant, Glycyrrhiza glabra, “sweet root,” belonging to the Leguminosae family and cultured from southern Europe to central Asia. It is used in fruit, licorice, anise, maple, and root beer flavorings for beverages, ice cream, ices, candy (29,000 ppm), baked goods, gelatin, chewing gum, and syrups. Licorice root is used in licorice and root beer flavorings for beverages, candy, baked goods, chewing gum (3,200 ppm), tobacco, and medicines. Some people known to have eaten licorice candy regularly and generously had raised blood pressure, headaches, and muscle weakness. It can cause asthma, intestinal upsets, and contact dermatitis. No known skin toxicity. GRAS. ASP

LIGHT GREEN • See FD and C Green No. 2.

LIGNIN • Sulfate. Ammonium. Calcium. Magnesium. Sodium and lignin from Abaca. Binding additive in animal feed from plant fibers. The FDA says it can be up to 4 percent of finished pellets in animal feed. It is also used on flakes and as a surfactant in molasses used in feeds. NUL

LIGNIN SODIUM SULFONATE • Lignosulfonates are noted for their versatility and applicability in a variety of uses. They're found in everything

from concrete mixtures to animal feeds. They have nine specific regulatory approvals issued by the FDA and the U.S. Environmental Protection Agency (EPA). Can be a direct or indirect additive component of packaging in contact with food and also used as a defoaming ingredient. ASP

LIGNOSULFONATE • Any of various compounds produced from the spent sulfite liquor in the pulping of softwood in papermaking and used especially for binders and dispersing agents. On priority list of the FDA for toxicology studies. See Sulfite.

LIGNOSULFONIC ACID • See Lignin Sodium Sulfonate. ASP

LIME ESSENCE • See Lime Oil. ASP

LIME JUICE • Natural juice obtained from the whole fruit of Citrus aurantifolia. Known as Key lime, Mexican lime, or West Indian lime. Flavoring. Fresh lime juice is similar to fresh limes in caloric and nutrient levels, except that the juice is likely to be much lower in bioflavonoids, which are found mainly in the peel and membranes within the fruit. This juice is very low in saturated fat, cholesterol, and sodium. It is also a good source of potassium, and a very good source of vitamin C. Bottled lime juice contains only about two-thirds as much vitamin C as fresh lime juice. ASP

LIME JUICE, DEHYDRATED • Reconstituted limeade concentrate contains about 50 percent more calories, but is much lower in nutrients than fresh lime. See Lime Juice. NUL.

LIME OIL • A natural flavoring extracted from the fruit of a tropical tree. Colorless to greenish. Used in grapefruit, lemon, lemon-lime, lime, orange, cola, fruit, rum, nut, and ginger flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum (3,100 ppm), and condiments. Terpeneless (see Lemon Oil) lime oil is used in lemon, lime, lemon-lime, cola, pineapple, ginger, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and syrups. Also used in perfumery and as an antiseptic. A source of vitamin C. Can cause an adverse reaction when skin is exposed to sunlight. GRAS. ASP

LIME WATER • Calcium hydroxide (see) solution. Clear, colorless, and odorless, it is strongly alkaline. Used to prepare many food additives such as emulsifiers and waterproofing compounds. See Calcium Stearate, for example.

LIMESTONE, GROUND • Flavoring additive. GRAS

LIMINOIDS • Found in citrus fruits, they seem to induce protective enzymes.

LIMONENE • D,L, and DL forms. A synthetic flavoring additive that occurs naturally in star anise, buchu leaves, caraway, celery, oranges, coriander, cumin, cardamom, sweet fennel, common fennel, mace, marigold, oil of lavandin, oil of lemon, oil of mandarin, peppermint, petitgrain oil, pimento oil, orange leaf (absolute), orange peel (sweet oil), origanum oil, black pepper, peels of citrus, macrocarpa bunge, and hops oil. Used in lime, fruit, and spice flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. A skin irritant and sensitizer. GRAS. It caused loss of weight and tumors in some experimental animals and, therefore, the JECFA (see) recommended its use be reduced and restricted to 75 nanograms per kilogram of body weight per day. For D and L limonene, the principal toxicological finding was that limonene worsens spontaneously occurring nerve damage in mature male rats with subsequent occurrence of kidney tumors. The committee concluded that "the postulated mechanism for d-limonene-induced nerve damage and kidney tumors in the male rat was probably not relevant to humans." The ADI (see) was established based upon the significant decreases in the body weight gain associated with the administration of d-limonene to male and female rats and mice and female rabbits. It was based on the lowest NOEL (see) for this effect, which was 150 mg per kg of body weight per day administered by gavage in a two-year study of male rats. At its latest meeting, the committee concluded that the ADI should not be set on the basis of the highest dose level in the long-term rat study, where kidney damage in male rats precluded testing at higher doses. The committee noted that no toxicity, other than decreased weight gain, had been observed at nonfatal doses in female rats or in other species, and that current patterns of use indicate that most d-limonene consumption would be associated with natural sources. The committee therefore withdrew the previous ADI for d-limonene and allocated an "Acceptable Daily Intake not specified." D-and l-limonene are ASP while dl-limonene is NUL.

LINÁLOE WOOD OIL • Bois de Rose Oil. A natural flavoring additive that is a colorless to yellow volatile essential oil distilled from a Mexican tree. It has a pleasant flowery scent and is soluble in most fixed oils. Used in berry, citrus, fruit, liquor, and ginger flavorings for beverages, ice cream, ices, candy, baked goods, and liquors. May cause allergic reactions. ASP

LINALOOL • A synthetic flavoring that occurs naturally in basil, bois de rose oil, cassia, coriander, cocoa, grapefruit, grapefruit oil, oranges, peaches, tea, bay and bay leaf extract, ginger, lavender, laurel leaves, and other oils. Used in flavorings such as blueberry, chocolate, and lemon. It is a fragrant, colorless liquid. May cause allergic reactions and is mildly toxic by ingestion. ASP

LINALOOL OXIDE • Linalool oxide offers a floral woody earthy note with a camphoraceous undertone. It's a key component of lavender, lavandin, and geranium-type fragrances. ASP

LINALYL ACETATE • A colorless, fragrant liquid, slightly soluble in water, it is the most valuable constituent of bergamot and lavender oils, which are used in perfumery. It occurs naturally in basil, jasmine oil, lavandin oil, lavender oil, and lemon oil. It has a strong floral scent. Colorless, it is used in berry, citrus, peach, pear, and ginger flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. GRAS. ASP

LINALYL ANTHRANILATE • A synthetic berry, citrus, fruit, and grape flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

LINALYL BENZOATE • A synthetic flavoring, brownish yellow, with a roselike odor. Used in berry, citrus, fruit, and peach flavorings; additive for beverages, ice cream, ices, candy, gelatin desserts, and baked goods. ASP

LINAYL BUTYRATE • Flavoring that occurs in lavender oil (see) used in apple, balsam, banana, bergamot, blueberry, chypre, citrus, cologne, fern fougere, honey miel, jasmine, lavender, lilac lilas syringe, mandarin, melon, watermelon, muskmelon, cantaloupe, mimosa wattle, pear, pineapple, plum, rose, tea. Taste is floral, terpy, fruity, citrus, and berry. Linalyl n-butyrate did not induce skin sensitization or cause irritation when applied, diluted, to the skin of volunteers. The material was not irritating to intact or abraded rabbit skin. A low acute toxicity was demonstrated in rats treated orally and in rabbits treated dermally. ASP.

LINALYL CINNAMATE • A synthetic loganberry, floral, rose, fruit, grape, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

LINALYL FORMATE • Formic Acid. A synthetic flavoring additive that occurs naturally in oil of lavandin. Used in berry, apple, apricot, peach, and pineapple flavorings for beverages, ice cream, ices, candy, and baked goods. See Formic Acid for toxicity. ASP

LINALYL HEXANOATE • Synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

LINALYL ISOBUTYRATE • Synthetic flavoring, colorless to slightly yellow, with a fruity odor. Used in berry, citrus, fruit, banana, black currant, cherry, pear, pineapple, plum, nut, and spice flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

LINALYL ISOVALERATE • Synthetic flavoring, colorless to slightly yellow, with a fruity odor. Used in loganberry, apple, apricot, peach, pear, and plum flavorings for beverages, ice cream, ices, candy, gelatin desserts, and baked goods. ASP

LINALYL OCTANOATE • A synthetic citrus, rose, apple, pineapple, and honey flavoring additive for beverages, ice cream, ices, candy, gelatin desserts, and baked goods. ASP

LINALYL PHENYLACETATE • Artificial flavor. See Linalool. ASP

LINALYL PROPIONATE • Synthetic currant, orange, banana, pear, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

LINCOMYCIN • Lincocin. An antibacterial used to treat respiratory tract, skin, soft tissue, gynecologic, and urinary tract infections; osteomyelitis, blood poisoning caused by streptococci, pneumococci, and staphylococci in humans. Potential adverse reactions may include blood problems, dizziness, headache, low blood pressure, sore tongue, ringing in the ears, nausea, vomiting, severe colitis, persistent diarrhea, abdominal cramps, itching around the anus, vaginitis, jaundice, rashes, hives, pain at injection site, and serious allergic reactions. The Food and Drug Administration (FDA) approved Lincomycin to make medicated drinking water for swine for the treatment of swine dysentery and to broiler chickens for the control of intestinal infections. FDA tolerance for residues are 0.1 ppm for edible tissues of chickens and swine, 0.1 ppm in milk. The available data indicate that disruption of the protective "good" bacteria in the human gastrointestinal tract is the major concern rather than the emergence of antibiotic resistance to lincosaminides. Resistance to lincomycin, however, has been found to develop in staph infections in both humans and animals. No studies were available to establish a NOEL (no-observed-effect level) for lincomycin on the human gastrointestinal microflora. The JEFCA (see) noted that lincomycin belongs to a group of antibiotics active against gram-positive bacteria and that the human gastrointestinal flora are sensitive to therapeutic doses of this group of compounds, yet the committee established an ADI of 0–30 µg/kg bw on the basis of the NOEL (see) of 2.5 mg/kg bw.

LINDANE • See Hexachlorobenzene.

LINDEN FLOWERS • Tilia glabra. A natural flavoring extract from the flowers of the tree grown in Europe and the United States. Used in raspberry and vermouth flavorings for beverages (2,000 ppm). Also used in fragrances. Linden has been found to lower blood pressure and, according to health practitioners, helps reduce mild anxiety. GRAS. ASP

LINDEN LEAVES • A natural flavoring used in alcoholic beverages only. See Linden Flowers.

LINOLEAMIDE • A releasing additive that prevents food from sticking to containers. See Linoleic Acid.

LINOLEIC ACID • An essential fatty acid (see) prepared from edible fats and oils. Component of vitamin F and a major constituent of many vegetable oils, for example, cottonseed and soybean. Used in emulsifiers and vitamins. Large doses can cause nausea and vomiting. When given in large doses to rats, weight loss and progressive secondary anemia developed. No known skin toxicity and, in fact, may have emollient properties. GRAS. ASP

LINSEED OIL • Golden amber or brown oil with a peculiar odor and bland taste. Used in paints, varnishes, as a film, in printing inks, and for its protein. See Flax.

LIPASE • Any class of enzymes that break down fat to glycerol and fatty acids (see both). It is used in the manufacture of cheeses. ASP

LIPASE ENZYME PREPARATION DERIVED FROM RHIZOPUS NIVEUS • As an enzyme to produce tailored triglycerides for use in infant formula. GRAS

LIPASE ENZYME PREPARATION FROM HANSENULA POLYMORPHA EXPRESSING A GENE ENCODING A LIPASE ENZYME FROM FUSARIUM HETEROSPORUM • As an enzyme at levels to achieve intended effect to modify lipids in breads, noodle or pasta dough, in egg yolk for cakes and mayonnaise manufacture, and to de-gum soybean oil. GRAS pending.

LIPASE FROM ANIMAL TISSUE • Most natural lipase products on the market today contain ground-up animal tissue. Lipases are enzymes that hydrolyze (see Hydrolysis) fats to glycerol and fatty acids. Lipase is abundant in the pancreas but also occurs in the intestines, fatty tissue, and milk. GRAS.

LIPASE FROM ASPERCILLUS NICER or ASPERCILLUS ORYZAE • Lipase, an enzyme, is derived from these fungi. It is used to hydrolyze (see Hydrolysis) fats to glycerol and fatty acids. GRAS. ASP

LIPIDS • Lipids are very diverse in both their respective structures and functions. These diverse compounds that make up the lipid family are so grouped because they are insoluble in water. They include fats, phospholipids, and steroids (see all).

LIQUID SMOKE • A concentrated seasoning often used to duplicate the appealing flavor and aroma of real smokehouse wood without the need for a real smokehouse. Wood chips or sawdust, often from hickory, are burned to produce smoke; the smoke is captured in water. Other woods used include apple, mesquite, and pecan. Some of the brands contain just water and smoke concentrate. Other brands contain water, smoke flavor, and other ingredients such as vinegar, molasses, caramel or caramel color, salt, spices, sugar and vegetable protein. Liquid smoke is frequently used commercially, especially in making smoked meats such as bacons. Some manufacturers offer commercial buyers the option of purchasing their liquid smoke in water, in oil-based liquids, or in powder form. Liquid smoke is derived from actual smoke generated under controlled conditions from popular woods used for outdoor barbecuing and smoking. The production of commercial liquid smoke begins with the wood. Mesquite or hickory have both been associated with meat barbecuing for decades, while regional woods such as pecan or apple wood have grown in popularity. To make liquid smoke, a supply of wood is placed inside a large oven known as a retort. The wood itself is not burned to create the smoke, but intensely heated by another source to create a slow smolder. This smoke is then drawn out of the retort for further processing and then piped into oak barrels for aging. The smoke is then filtered to eliminate any impurities and bottled. Liquid smoke is also a common ingredient in many barbecue sauces featuring hickory or mesquite flavor enhancements. One of the smoke flavorings being assessed, Primary Product FF-B, has raised concern. The European Food Safety Authority (EFSA) Panel on food additives, flavorings, processing aids, and materials in contact with food concluded that Primary Product FF-B may damage DNA, the genetic material in cells in animals. In 2007, FF-B was removed from the market because the EFSA could not establish its safety in use when added to food. University of Kansas researchers, however, found a benefit in liquid smoke. The active antibacterial compounds in the additive are primarily organic acids, including acetic and propionic (see both), which lower pH and destroy bacteria cell walls. Also, phenolic compounds, which are traditionally involved in flavor formation, are well-known bactericides. Research conducted at the University of Alaska-Fairbanks at the Fishery Industrial Technology also found benefit in a liquid smoke/acidulant treatment for smoked salmon. The Alaskans concluded liquid smoke should be useful to the seafood industry in protecting consumers from minimally preserved products.

LITESSE • A specialty carbohydrate that is sugar free, prebiotic, and high in fiber and has a low glycemic index (GI).

LITHOLRUBINE BK • Coloring. A synthetic azo dye, reddish in color, used solely for coloring the rind of hard cheeses. People who suffer from asthma, rhinitis, or the skin disease urticaria have been reported to find their symptoms become worse following consumption of azo dyes. Symptoms may include hyperactivity, asthma, skin sensitivity, and insomnia. The JECFA (see) study says there is no information available. In a long-term mouse study, there was a dose-related increase in mortality and renal pathology, but detailed histopathology was not conducted on the low- and intermediate-dose groups. The long-term study in rats was complicated by high mortality rates, which led to premature termination of the study for males. In addition, only limited histopatho-logical examinations were conducted. In view of these limitations, it was not possible to determine an unequivocal NOEL in either study. Therefore, an ADI (see) could not be established. Used as a coloring in Europe. Banned in

Australia. E

LITSEA CUBEBA BERRY OIL • An essential oil used for a lemon flavor, or a base note in citrus notes like orange. It can also be used to treat acne or put into face products for oily skin. It is used as an antiseptic, disinfectant, and insecticide as well as a sedative. EAF

LIVER-STOMACH CONCENTRATE WITH INTRINSIC FACTOR COMPLEX

• A dietary supplement illegal in food.

LOAEL • Lowest-Observable-Adverse-Effect Level. Used to signify the lowest dose of a substance that causes an adverse effect in an experimental animal. See also NOEL.

LOCUST BEAN GUM • St. John's Bread. Carob Bean Gum. A natural flavor extract from the seed of the carob tree cultivated in the Mediterranean area. Also used as a thickener and stabilizer. The history of the carob tree dates back more than two thousand years when the ancient Egyptians used locust bean gum as an adhesive in mummy binding. It is alleged that the "locust" (through confusion of the locusts with carob) and wild honey, which sustained John the Baptist in the wilderness, was from this plant, thus the name St. John's Bread. The carob pods are used as feed for stock today because of their high protein content. Some health food enthusiasts also eat them for the same purpose. See Carob. GRAS status with limitations on amounts that can be added to food. ASP. E

LOEL • Lowest-Observed-Effect-Level; the lowest dose in an experiment that produced an observable effect.

LOVAGE • Smallage. Levisticum officinale. Flavoring obtained from the root of an aromatic herb native to southern Europe and grown in monastery gardens centuries ago for medicine and food flavoring. It has a hot, sharp, biting taste. The oil is extracted from the root or other parts of the herb. It has a reputation for improving health and inciting love; Czechoslovakian girls reportedly wear it in a bag around their necks when dating boys. Used in bitters, maple, and walnut flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and table syrups. The extract is used in berry, butter, butterscotch, caramel, maple, meat, black walnut, and spice flavorings for the same foods as above, plus condiments and icings. The oil, yellow-brown and aromatic, is used in butter, butterscotch, caramel, coffee, fruit, licorice, liquor, maple, nut, walnut, and spice flavorings for the same food as is the extract. ASP

LOVAGE EXTRACT and LOVAGE OIL • Levisticum officinale. See Lovage. ASP

LOW CALORIE • Fewer than 40 calories per serving.

LOW CALORIE SWEETENERS • See Intense Sweeteners.

LOW CARB • The newest craze, quickly taken up by food producers, is the low-carb diet. Books such as those by the late Robert Atkins, M.D., and The South Beach Diet by Arthur Agatston, M.D., have promoted meat, eggs, and other fatty foods over carbohydrates (see). Although the phenomenon may not last too long, the shelves of the supermarkets are increasingly filled with products containing fewer carbohydrates. They achieve the "low carbs" by doing such manipulations as replacing wheat flour with soy flour, adding extra fiber and high-fat ingredients, and replacing sugar with sugar alcohols (see). The FDA as of this writing has not set standards for labeling products as "low carb."

LOW CHOLESTEROL • 20 milligrams or less per serving.

LOW FAT • 3 grams or less per serving.

LOW-FAT MILK • See Milk.

LOW SATURATED FAT • 1 gram or less per serving.

LOW SODIUM • 140 milligrams or less per serving.

LPE • Lysophosphatidylethanolamine. A compound found in many plants and animal tissues, it is purified from egg yolks and soybeans. When applied before harvest, this compound accelerates the development of fruit flavor and color. It is also believed to make fruit last longer on grocers' shelves and in refrigerators. At this writing, it was being tested on cranberries, peaches, tomatoes, grapes, and cut flowers.

LUNGMOSS • Lungwort. Sticta pulmonacea. Any of several plants once thought helpful in pulmonary diseases. Used as a flavoring in foods. NIL

LUPULIN EXTRACT • Lupine. Hops. Extract of Lupinus albus. The seed has been used as a food since earliest times. A natural flavoring additive from a plant (Humulus lupulus) grown in Europe, Asia, and North America. Used in beer brewing. Formerly used as aromatic bitters and as a sedative. At one time veterinary usage was recommended for treatment of nymphomania. It contains lupulone, which is active against fungus and bacteria, and also humulone, an antibiotic. GRAS. EAF

LUTEIN • A natural xanthophyll pigment (see) obtained from marigolds. Some uses may require a color listing. In some studies of toxicity, including developmental toxicity, no adverse effects were found in animals, including monkeys or humans. See Xanthophyll. GRAS. E

LYCOMATO TOMATO LYCOPENE EXTRACT • A red coloring in foods. Exempt from certification. This action is in response to a Color Additive Petition filed by LycoRed Natural Products Industrie to the FDA to list it as a color additive. The FDA evaluated two LycoMato concentrations: one containing no less than 5.5 percent lycopene (referred to as tomato lycopene extract); and the other containing no less than 60 percent lycopene (referred to as tomato lycopene concentrate). The agency also assessed related studies and the company's manufacturing processes. Lycopene is a natural food colorant whose coloring ability depends on its concentration, the method of dispersion and formulation used. LycoMato is already marketed as a food colorant in Europe and Japan. LycoMato, a standardized tomato oleoresin, contains a high concentration of lycopene, partially dissolved and mostly dispersed in tomato oil, as well as phytoene, phytofluene, α-carotene, tocopherols, and phytosterols—tomato phytonutrients that act synergistically, enhancing the biological activity of the lycopene (see).

LYCOPENE • Red crystals, insoluble in water. The main pigment of tomato, paprika, grapefruit, and rose hips. Lycopene extracted from tomatoes is authorized within the EU as a red food coloring. Lycopene from tomatoes is permitted as a food color, but synthetic lycopene and lycopene fermented from Blakeslea trispora have not been approved because of questions over ADI (acceptable daily intake) levels. The EFSA (see) assessment looked at lycopene's use as a food coloring in the broad range of food categories for which it is permitted, including beverages, confectionery, sauces, snacks, seafood products, soups and dietary supplements. Of all, it found that nonalcoholic flavored drinks were seen to be the largest potential source for all population groups considered, ranging from 66 percent of ADI for male adults to 90 percent in preschool children. Lycopene from natural sources and as a food color would likely be within the ADI for most people. After considering lycopene use from all sources, including that contained naturally in whole foods such as tomatoes and fruits and vegetables, the EFSA recently issued an ADI of 0-0.5 mf/kg body weight per day. Regular intakes of lycopene from natural dietary sources in different populations are, according to dietary surveys, estimated to be on average between 0.5 and 5 mg/day, with high exposures up to about 20 mg/day. Lycopene is being studied as a compound to prevent heart disease and cancer. E

LYCOPENE FROM BLAKESLEA TRISPORA • Lycopene from B. trispora is produced through a cofermentation process. Ingredient in foods in general, except meat and poultry, at levels ranging from 5 to 575 ppm. Vitatene notified the FDA of the view of Vitatene's lycopene from B. trispora is GRAS, through scientific procedures, for use as an ingredient in a number of food categories (baked goods, baking mixes, beverages and beverage bases, breakfast cereals, cheeses, condiments and relishes, confections and frostings, fats and oils, frozen dairy desserts and mixes, gelatins,

puddings and fillings, gravies and sauces, milk products, plant protein products, processed fruits and fruit juices, snack foods) at levels up to 50 ppm and in soups and soup mixes that do not contain tomatoes at levels up to 575 ppm. FDA notes that Vitatene's lycopene from B. trispora when used in food products has the potential to impart color. As such, the use of lycopene from B. trispora in food products may constitute the use of a color additive. Based on the information provided by Vitatene, as well as other information available to the FDA, the agency had no questions at the time regarding Vitatene's conclusion that lycopene from B. trispora is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of lycopene from B. trispora. As always, it is the continuing responsibility of Vitatene, the FDA wrote, to ensure that the food ingredients the firm markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

LYSINE • L form. An essential amino acid (see) isolated from casein, fibrin, or blood. It is used for food enrichment for wheat-based foods. Lysine improves their protein quality and results in improved growth and tissue synthesis. Employed in the fortification of specialty bread and cereal mixes up to 0.25 percent to 0.5 percent of the weight of flour. On the FDA list for further study since 1980. GRAS. ASP

LYSOPHOSPHOPHATIDYLETHANOLAMINE • See LPE.

LYSOZYME • Found in animal tissue and used in cheese production to inhibit the growth of Clostridium tyrobutyricum. The use level is less than 40 mg of lysozyme per liter of cheese milk, resulting in a concentration of less than 400 mg of lysozyme per kg of cheese. In studies related to allergenic effects, the reactions produced by egg-white lysozyme in humans were less severe than those seen with other proteins such as albumin, which have a long history of use as food components. On the basis of available data, the JECFA (see) concluded that the low additional intake of lysozyme via cheese was not a hazard to consumer health, provided that the enzyme complied with the specifications.

LYSOZYME PURIFIED FROM RICE • Ingredient in term infant formulas at levels up to 0.6 grams/liter, in preterm infant formulas and fortifiers at levels up to 0.3 grams/liter, and in pediatric oral rehydration solutions at levels up to 2 mil-ligrams/milliliter. See Lysozyme.

MACE • Myristica fragrans. Mace Oil and Oleoresin. Obtained by steam distillation from the ripe, dried seed of the nutmeg. Colorless to pale yellow, with the taste and odor of nutmeg. Used in bitters, meat, and spice flavorings for beverages, ice cream, ices, baked goods, condiments, and meats (2,000 ppm). The oil is used in chocolate, cocoa, coconut, cola, fruit, nut, spice, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, condiments, and meats. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that while no evidence in the available information on it demonstrates a hazard to the public at current use levels, uncertainties exist, requiring that additional studies be conducted. ASP

MACE OIL • See Mace. ASP

MADURAMICIN AMMONIUM • Cygro. An antiparasite medication used in chicken feed to prevent infection. FDA residue tolerances are 0.24 ppm in muscle, 0.72 ppm in liver, and 0.48 ppm in fat. When used as a medication to treat infection, the residue tolerances are the same as in uncooked chicken, except for 0.48 ppm in uncooked chicken fat.

MAGNESIA • Slightly alkaline white powder taken from any one of several ores such as periclase. Named after Magnesia, an ancient city in Asia Minor. An antacid.

MAGNESIUM • Magnesium Acetate, Magnesium Phosphate, Magnesium Sulfate, Magnesium Oxide, Magnesium Silicate, Magnesium Chloride, Magnesium Carbonate, Magnesium Cyclaniate, Magnesium Stearate, and Magnesium Hydroxide. A silver white, light, malleable metal that occurs abundantly in nature and is widely used in combination with various chemicals as a powder. Magnesium acetate is used as a buffer and neutralizer in nonalcoholic beverages. Magnesium phosphate, a white, odorless powder, and magnesium sulfate are used as mineral supplements for food, leavening additives, and pH control additives. Recommended daily allowances, according to the National Academy of Sciences, are 40 milligrams for infants, 100 to 300 milligrams for children, 350 milligrams for adult males and females. Magnesium sulfate is used also as a corrective in the brewing industry and for fertilizers. Magnesium silicate, a fine, white, odorless and tasteless powder, is used in table salt and vanilla powder as an anticaking additive; in table salt it is limited to 2 percent. Magnesium chloride is used as a buffer and neutralizer in nonalcoholic beverages and is used for color retention and as a firming additive. Magnesium carbonate is used as an alkali for sour cream, butter, ice cream, cacao products, and canned peas. It is also used as a drying additive and an anticaking additive as well as a coloring additive. It is a silver white salt that occurs in nature as magnetite or dolomite. Can be prepared artificially and is also used in table salt, and as an antacid. Nontoxic to the intact skin but may cause irritation when applied to abraded skin. Magnesium citrate is a buffer and neutralizer in nonalcoholic beverages. Magnesium cyclamate was banned in 1969 as an artificial sweetener. Magnesium hydroxide is used as an alkali in dentifrices and skin creams, in canned peas, and as a drying additive and color retention additive for improved gelling in the manufacture of cheese. It is permitted as an optional ingredient in standardized food. Slightly alkaline, crystalline compound obtained by hydration of magnesia (see) or precipitation of seawater by lime. Toxic when inhaled. Harmless to skin and in fact soothes it. Magnesium phosphate is a nutrient supplement. Magnesium was reevaluated by the FDA in 1976 as not harmful in presently used current levels. However, the JECFA (see) recommends further study of magnesium silicate because kidney damage in dogs has been reported upon ingestion. Magnesium acetate, carbonate, chloride, sulfate, stearate, phosphate, and silicate are all GRAS according to the final report to the FDA of the Select Committee on GRAS Substances and they should continue their GRAS status with no limitations other than good manufacturing practices. Magnesium sulfate, however, was given an ADI of “not specified” (see) because there was insufficient data.

MAGNESIUM DIGLUTAMATE • See Glutamic Acid. E

MAGNESIUM FUMARATE • Magnesium fumarate is a “nutrient dense” supplementary form of magnesium and an energy-rich substrate-fumarate. Magnesium as quantitative element is an essential part of animal nutrition, Fumarate is one of the key intermediates of the Krebs cycle, which contributes to efficient energy production in humans. Magnesium fumarate helps to increase body magnesium levels and thus enhance the benefits of magnesium to many areas that are concerned with energy and muscular performance. Carbohydrates, lipids, and proteins cannot produce the sources of muscle contraction energy without the presence of magnesium. NUL

MAGNESIUM GLUCONATE • A buffering additive in soda water. See Magnesium. ASP

MAGNESIUM LACTATE • Buffering and neutralizing additive in cacao products and in canned peas. See Magnesium.

MAGNESIUM LAURATE • An anticaking agent and emulsifier. NUL

MAGNESIUM MYRISTATE • An anticaking agent and emulsifier. NUL

MAGNESIUM OLÉATE • An anticaking agent and emulsifier. NUL

MAGNESIUM OXIDE • Magnesia. White, odorless powder used as an alkali, anti-caking additive, firming additive, free-flow additive, lubricant, neutralizing additive, nutrient, pH control additive, and releasing additive. It is used as a neutralizer in frozen dairy products, butter, cacao products, and canned peas. Inhalation can cause fever in humans. Also used as a dietary supplement. Has caused tumors in hamsters. See Magnesium. GRAS. ASP. E

MAGNESIUM PALMITATE • A salt of fatty acids (see) used as a coating is applied as a continuous film to serve as a functional barrier between the food and the base upon which it is placed. NUL

MAGNESIUM PHOSPHIDE • A fumigant used in animal feed and on processed foods. FDA residue tolerance is 0.01 ppm in processed foods and 0.1 ppm in animal feeds. A poison. Moderately toxic by inhalation. See Magnesium.

MAGNESIUM SALTS OF FATTY ACIDS • See Magnesium and Fatty Acids. ASP

MAGNESIUM SILICATE • An anticaking additive. Used in table salt and vanilla powder. See Magnesium and Silicate. GRAS. ASP. E

MAGNESIUM STEARATE • Miscellaneous uses as a migratory substance from packaging materials, stabilizer, defoaming additive, anticaking additive. See Magnesium. GRAS. ASP

MAGNESIUM SULFATE • Nutrient supplement. See Magnesium. GRAS. ASP

MAIDENHAIR FERN • Venus Hair. Extract of the leaves of the fern Adiantum capillus-veneris. Used as a flavoring in alcoholic beverages only and to soothe irritated skin in herbal creams. NUL

MAILLARD REACTION • The browning that takes place during cooking. A French scientist, Dr. Louis Camille Maillard, showed that certain reactions between amino acids and sugars gave rise to odor compounds that are very reminiscent of aromas of certain foods, such as roasted meats, chocolate, coffee, or other heated products. These reactions are probably one of the most studied reactions in chemistry, certainly in flavor chemistry, and have led us to understand the development of thermally developed flavors.

MALATHION • Derived from diethyl maleate and dimethyldithiophosphoric acid, it is an insecticide against such pests as aphids, the leaf-cutter bee, and the Mediterranean fruit fly. Toxic when absorbed through the skin and can damage transmission of nerve signals. In dehydrated citrus

pulp for animal feed, the FDA allows a tolerance of 50 ppm; in nonmedicated cattle feed concentrate blocks from application of pesticide to paper used in packaging, the residue tolerance allowed in the blocks is 10 ppm.

MALEIC ACID • Made from benzene (see), it is a strong irritant. Used in the manufacture of artificial resins and to retard rancidity of fats and oils, which are said to keep three times longer than those without the acid. ASP

MALEIC HYDRAZIDE • Regulates the growth of unwanted "suckers" on about 90 percent of the U.S. tobacco crop. It is also applied to 10 to 15 percent of domestic potatoes and onions to prevent sprouting after harvest. It is highly toxic to humans and has produced central nervous system disturbances and liver damage in experimental animals. It has led to liver and other tumors in some mice. However, other studies, including one done for the National Cancer Institute and published in 1969, report no carcinogenic effects. It has produced genetic damage in plant and animal systems, a fact that often signals a cancer-causing effect. The FDA residue tolerance for potato chips is 160 ppm from use as a preharvest pesticide.

MALIC ACID • A colorless, crystalline compound with a strong acid taste that occurs naturally in a wide variety of fruits, including apples and cherries. A flavoring additive and aid in aging wine. It has a strong acid taste. Used as an alkali in frozen dairy products, beverages, baked goods, confections, fruit, butter, and jelly and jam preserves "in an amount sufficient to compensate for the deficiency of fruit in artificially sweetened fruit." Irritating to the skin. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. ASP. E

MALLOW EXTRACT • From the herb family. A moderate purplish red that is paler than magenta rose. Used in coloring and also as a source of pectin (see).

MALT EXTRACT • Extracted from barley that has been allowed to germinate, then heated to destroy vitality, and dried. It contains sugars, proteins, and salts from barley. The extract is mixed with water and allowed to solidify. It is used as a nutrient and as a texturizer in cured meat and poultry. FDA limitations are 2.5 percent in cured meat. It is also widely used in the brewing industry. GRAS. NUL

MALT SYRUP • Component of caramel coloring. See Malt Extract. GRAS. ASP

MALTITOL and MALTITOL SYRUP • Obtained by the hydrogenate from maltose (see). Used as a sugar substitute, it has 90 percent the sweetness of sugar and does contain calories. It is used in confections, baked goods, and candy coatings. In a cancer study in rats, changes were observed in the adrenal gland, which included increased incidence of both benign and malignant tumors of the adrenal glands in both sexes and a "slight increase" in breast cancer in female rats. The JECFA (see) did not consider these cancers to be related to treatment. The committee, however, recommended that the information database on adrenal overgrowth and tumors associated with polyols and other poorly absorbed carbohydrates (see both) be reviewed and that the mechanisms of appearance of these lesions and their toxicological significance be assessed at a future meeting. It also reportedly raises blood sugar and may have a laxative effect. E

MALTODEXTRIN • The sugar obtained by hydrolysis of starch. A combination of maltol (see) and dextrin (see) used as a texturizer and flavor enhancer in candies, particularly chocolate. Has fewer calories than sucrose (see). GRAS. ASP

MALTOL • A white, crystalline powder with a butterscotch odor found in the bark of young larch trees, pine seeds, chicory, wood tars, and in roasted malt. It imparts a "freshly baked" odor and flavor to breads and cakes. Used as a synthetic chocolate, coffee, fruit, maple, nut, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and jelly. ASP

MALTOL PROPIONATE • 3-Methyl-4H-pyran-4-one-3-yl propionate. Flavoring. White crystalline solid with a caramel aroma. EAF

MALTOSE • Malt Sugar. Colorless crystals derived from malt extract and used as a nutrient, sweetener, culture medium, and stabilizer. It is soluble in water and used as a supplement of sugar for diabetics. Used in cheeses. It is also used in brewing and as a stabilizer. It is nontoxic but it has been reported to cause tumors when injected under the skin of mice in doses of 500 milligrams per kilogram of body weight. ASP

MALTYL ISOBUTYRATE • Artificially synthesized flavor. See Maltol and Isobutyric Acid. ASP

MANDARIN OIL • Obtained by expression of the peel of a ripe mandarin orange, Citrus reticulata. Has a pleasant orangelike odor and is used in orange, tangerine, cherry, and grape flavoring for beverages and ice cream. GRAS.

MANEB • A pesticide used on growing grapes. The residue tolerances are 28 ppm in raisins; 20 ppm in bran of barley, oats, rye, and wheat; and 1 ppm in flours of barley, oats, rye, and wheat. See Zinc.

MANGANESE BACITRACIN • An antibiotic in animal feed. See Bacitracin and Manganese Sources.

MAGANESE CHLORIDE • Dietary supplement. See Manganese Sources. GRAS. ASP

MANGANESE CITRATE • A light, pink-white, fine, granular solid. It is used as a nutrient. See Manganese Sources. GRAS. NUL

MANGANESE GLUCONATE • Dietary supplement. See Manganese Sources. GRAS. ASP

MANGANESE GLYCEROPHOSPHATE • Dietary supplement. See Manganese Sources. GRAS. NUL

MANGANESE HYPOPHOSPHITE • Dietary supplement. See Manganese Sources. GRAS. NUL

MANGANESE SOURCES • Manganese Acetate. Manganese Carbonate. Manganese Chloride. Manganese Citrate. Manganese Sulfate. Manganese Glycerophosphate. Manganese Hypophosphite. Manganese Oxide. A mineral supplement first isolated in 1774, manganese occurs in minerals and in minute quantities in animals, plants, and in water. The chloride, citrate, gluconate, glycerate, hypophosphite, and sulfate are all used as dietary supplements and nutrients and are considered GRAS. Many forms are used in dyeing. Manganous salts are activators of enzymes and are necessary to the development of strong bones. They are used as nutrients and as dairy substitutes. Toxicity occurs by inhalation. Symptoms include languor, sleepiness, wakefulness, emotional disturbances, and Parkinsonlike symptoms. Manganese chloride, citrate, glycerophosphate, and hypophosphite are all considered GRAS except manganese oxide, because the committee says not enough is known about it to base an evaluation upon it when it is used as a food ingredient. NUL.

MANGANESE SULFATE • Dietary Supplement. There is reported use of the chemical; it has not yet been assigned for toxicology literature. See Magnesia. GRAS. ASP

MANGANOUS OXIDE • A dietary supplement derived by reduction of the dioxide in hydrogen or by heating the carbonate without air. It is also used in ceramics, paints, bleaching tallow, animal feeds, and fertilizers. GRAS. NUL

MANNITOL • Widespread in plants but mostly prepared from seaweed. It is about 70 percent as sweet as sugar and it does contain calories. White, crystalline solid, odorless, and sweet tasting. Used as a texturizer in chewing gum, up to 31 percent, hard candy up to 5 percent, and pressed mints, 98 percent. It is also used in soft candy at 40 percent, frostings at 8 percent, jams and jellies at 15 percent. It has been used as a sweetener in "sugar-free" products but has calories and carbohydrates. The FDA says that excess consumption may have a laxative effect: if ingested daily, it must carry that warning on the label. In 1982, the FDA reported that it does not cause cancer in rats. GRAS on an interim basis. ASP. E

MANNOSE • A carbohydrate occurring in some plants. It has a sweet taste.

MAO INHIBITORS • See Monoamine Oxidase Inhibitor Medications.

MAPLE, MOUNTAIN • Flavoring.

MARGARINE • Oleomargarine. A butter substitute made from animal or vegetable fats or oils. If oils are used they are “hardened” into fats by the process of hydro-genation (see). Skim milk, water, salt, coloring matter (see Carotene), artificial flavors, lecithin (see), and small amounts of vitamins are usually added. By federal regulations, margarine contains at least 80 percent fat.

MARIGOLD, POT • Calendula officinalis. A natural plant extract. The oil is used in various flavorings for beverages, ice cream, ices, candy, and baked goods. See Tagetes. GRAS. NIL

MARJORAM, POT • Sweet Marjoram. Origanum marjorana and Origanum onites. The natural extract of the flowers and leaves of two varieties of the fragrant marjoram plant. The oleoresin (see) is used in sausage and spice flavorings for condiments and meats. The seed is used in sausage and spice flavorings for meats (3,500 ppm) and condiments. Sweet marjoram is used in sausage and spice flavorings for beverages, baked goods (2,000 ppm), condiments, meats, and soups. The sweet oil is used in vermouth, wine, and spice flavorings for beverages, ice creams, ices, candy, baked goods, and condiments. Can irritate the skin. May produce allergic reactions. Essential oils such as marjoram are believed to penetrate the skin easily and produce systemic effects. GRAS. ASP

MARJORAM SEED • Majorana hortensis. Origanum marjorana. Natural flavor isolated by physical methods. This is a member of the mint family and is a cousin of oregano but with a milder, sweeter flavor. It gives Polish sausage its flavor. Sources are Egypt and the United States. NIL

MARJORAM, SWEET • See Marjoram, Pot. GRAS. ASP

MARSHMALLOW ROOT • See Althea Root.

MASSARANDUBA BALATA • Manilkara huberi. Natural masticatory substances of vegetable origin from a tree. Used as a chewing-gum base. ASP

MASSARANDUBA CHOCOLATE • Manilkara solimoesensis. Used in chewing-gum base. ASP

MASSOIA BARK OIL • Flavoring harvested from trees in the wild. NUL

MASTIC GUM • A natural resin from a small tree, Pistacia lentiscus, found in Greece and other Mediterranean countries. It is used as a food ingredient in the Mediterranean region. Mastic gum has been used for centuries by traditional healers for stomach upsets and ulcers, and heartburn. In clinical trials, it has been found that even small doses (one pea-size dose of 1 mg per day) over a period of two weeks could have a positive impact on stomach and duodenal ulcers; also helping to relieve pain. NUL

MATE EXTRACT • Paraguay Tea Extract. St. Bartholomew's Tea. Jesuits' Tea. A natural flavoring extract from small gourds grown in South America where mate is a stimulant beverage. Among its constituents are caffeine, purines, and tannins. See Caffeine and Tannic Acid for toxicity. GRAS. ASP

MATRICARIA EXTRACT and OIL • Wild Chamomile Extract. Extract of the flower heads of Matricaria chamomilla. Used as a soothing tea and tonic internally, and externally as a soothing medication for contusions and other inflammation. See Tannic Acid. GRAS

MATURING ADDITIVES • See Bleaching Additives.

MAXIMUM CONTAMINANT LEVEL • See MCL.

MAYONNAISE • The common salad dressing. Semisolid, made with eggs, vegetable oil, and vinegar or lemon juice.

MCG • The abbreviation for microgram, a metric measurement that is one millionth of a gram (see).

MCL • The abbreviation for the maximum contaminant level. The highest amount of a contaminant allowed by EPA in water supplied by a municipal water system.

MEAT RIPENING CULTURES • Maturation starter and surface cultures especially selected and developed for meat applications. Some are bacteria such as Lactobacillus curvatus, Lactococcus lactis, Lactobacillus plantarum, Lactobacillus sakei, Pediococcus acidilactici, Pediococcus pentosaceus, Staphylococcus carnosas, Staphylococcus xylosus and yeasts such as Candida famata, Debaryomyces hansenii and molds such as Penicillium candidum and Penicillium nalgiovensis.

MELAMINE • Cyanuramide. Used in the manufacture of paper and paperboard for packaging materials. There was a big scandal in 2007 when it was discovered that the Chinese added melamine to wheat gluten in pet food because it is a cheap, fake protein. It killed scores of American pets. The U.S. FDA banned imports of wheat gluten from China after it received more than fourteen thousand reports of pets believed to have been sickened by packaged food. The FDA issued an interim statement about melamine and its analogues' safety/risk assessment and the possible risk to human health associated with eating pork, chicken, fish, and eggs from animals that had been inadvertently fed animal feed that may have been adulterated with melamine and its analogues (cyanuric acid, ammelide, and ammeline). It was prepared in collaboration with the Food Safety and Inspection Service (FSIS) of the Department of Agriculture, and in consultation with the Centers for Disease Control and Prevention (CDC), the Environmental Protection Agency (EPA), and the Department of Homeland Security (DHS). The statement said the safety/risk assessment in response to ongoing investigation of contaminated vegetable protein products imported from China that were mislabeled as “wheat gluten” and “rice protein concentrate” is very unlikely to pose a human health risk. Melamine is an experimental cancer-causing and tumor-causing additive. Moderately toxic by ingestion. An eye, skin, and mucous membrane irritant. Causes skin rash in humans.

MELENGESTROL ACETATE • A progesterone used to treat animals and to suppress ovulation when added to feed.

MELISSA • Essential oil. See Balm Oil. GRAS

MELONAL • See 2,6-Dimethyl-5-Heptenal.

MENADIOL SODIUM DIPHOSPHATE • See Vitamin K. NUL

MENADIONE • Vitamin K3. A synthetic with properties of vitamin K. Dietary supplement. Extension of a petition has been filed to permit a limit of 1 mg per day. Its use was revoked March 22, 1963. No food additive regulation authorizing use of menadione in prenatal supplements or any other food products has been issued. However, menadione is permitted as a nutritional supplement in chicken and turkey feed for prevention of vitamin K deficiency and in swine feed. Used medically to prevent blood clotting and in food to prevent souring of milk products. Can be irritating to mucous membranes, respiratory passages, and the skin.

MENHADEN OIL • Hydrogenated and Partially Hydrogenated (see). Porgy Oil. Moss Bunker Oil. Obtained along the coast of Africa from the menhaden fish, which are a little larger than herrings. The fish glycerides of menhaden are reddish and have a strong fishy odor. Used as a nutrient. The FDA has affirmed the GRAS status of menhaden oil provided that the combined intake of EPA and DHA from consumption of menhaden oil does not exceed 3 grams per person per day (g/p/d). Concerns exist about the consumption of high levels of EPA and DHA and possible adverse effects of consumption on bleeding time, glycemic control, and low-density lipoprotein cholesterol levels. GRAS. The hydrogenated oil is NUL.

P-MENTH-1-ENE-9-AL • Flavoring. NIL

P-MENTH-1-EN-3-OL • Flavoring. NIL

P-MENTH-3-EN-1-OL • Flavoring. NIL

MENTHA ARVENSIS OIL • From Mentha arvensis, it is a colorless to yellow liquid with a minty odor used as a flavoring additive. Has caused reproductive problems in experimental animals. GRAS.

p-MENTHA-1,8-DIEN-7-OL • A synthetic citrus, fruit, mint, and vanilla flavoring additive for beverages, ice cream, ices, candy, and baked goods. It is found naturally in caraway. Can cause skin irritation. ASP

P-MENTHAN-2-ONE • Flavoring. ASP

P-MENTHA-8-THIOL-3-ONE • Flavoring. ASP

CIS- AND TRANS-P-1(7),8-MENTHADIEN-2-YL • Flavoring. NIL

MENTHADIENOL • Although allowed as a food additive, there is no current reported use of the chemical, and, therefore, although toxicology information may be available, it is not being updated, according to the FDA. NIL.

1-P-MENTHEN-9-YL ACETATE • Flavoring. ASP

1-P-MENTHENE-8-THIOL • Flavoring. EAF

MENTHOL • A flavoring additive that can be obtained naturally from peppermint or other mint oils and can be made synthetically by hydrogenation (see) of thymol (see). Used in butter, caramel, fruit, peppermint, and spearmint flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (1,100 ppm), and liquor. It is a local anesthetic. It is nontoxic in low doses, but in concentrations of 3 percent or more it exerts an irritant action that can, if continued too long, induce changes in all layers of the mucous membranes. It can also cause severe abdominal pain, nausea, vomiting, vertigo, and coma when ingested in its concentrated form. The lethal dose in rats is 2 grams per kilogram of body weight. GRAS. ASP

1-MENTHOL-PROPYLENE • Synthetic flavoring in baked foods, beverages, breakfast cereal, condiments, confectionery frostings, frozen dairy, fruit ices, gelatins, hard candy, imitation dairy, milk products, processed fruits, soft candy, soups, and snack foods. Declared GRAS by FEMA (see).

MENTHONE • A synthetic flavoring additive that occurs naturally in raspberries and peppermint oil. Bitter, with a slight peppermint taste. Used in fruit and mint flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. May cause gastric distress. There is reported use of the chemical; it has not yet been assigned for toxicology literature. ASP

MENTHONE 1,2-GLYCEROL KETAL • Flavoring. See Menthone. EAF

L-MENTHONE 1,2-GLYCEROL KETAL • Flavoring. See Menthone. EAF

MENTHONE-8-THIOACETATE • Flavoring. See Menthone. EAF

3-L-MENTHOXYPROPANE-1,2-DIOL • Flavoring. ASP

MENTHYL ACETATE • A natural flavoring additive that occurs naturally in peppermint oil. Colorless, with a mint odor. Used in fruit, mint, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum; also in perfumes and toilet waters. Mildly toxic by ingestion. A skin irritant. GRAS. ASP

L-MENTHYL ETHYLENE GLYCOL CARBONATED • Flavoring. See Menthyl Acetate. EAF

MENTHYL ISOVALERATE • Flavoring. See Menthyl Acetate. ASP

L-MENTHYL LACTATE • Flavoring. See Menthyl Acetate. ASP

1-MENTHYL METHYL ETHER • A flavoring determined GRAS by FEMA. See Cyclohexane. EAF

L-MENTHYL 1,2-PROPYLENE GLYCOL CARBONATE • Flavoring. See Menthyl Acetate. EAF

MENTHYL PROPYLENE GLYCOL CARBONATE • Flavoring. See Menthyl Acetate. EAF

MENTHYL VALERATE • Flavoring additive in baked goods; beverages (nonalcoholic); beverages (alcoholic); breakfast cereal; cheese; chewing gum; condiments/relishes; confectionery frostings; egg products; fats/oils; fish products; frozen dairy; fruit ices; gelatins/puddings; granulated sugar; gravies; hard candy; imitation dairy; instant coffee/tea; jams/jellies; meat products; milk products; nut products; other grains; poultry processed fruits; processed vegetables; reconstituted vegetables; seasonings/flavors; snack foods; soft candy; soups; sugar substitutes; and sweet sauces. FEMA (see) judged it GRAS. Menthyl valerate is a mild sedative that helps relieve the anxiety and irritability associated with nicotine withdrawal. EAF

MERCAPTAN • Thiol. Indicates the substance belongs to organic compounds resembling alcohols but having the oxygen of the hydroxyl group replaced by sulfur. Stinky. Used in gas lines to warn of leaks. Term has been changed officially to thiol since it was mistakenly thought to indicate the presence of mercury.

MERCAPTO- • Prefix indicating the additive comes from mercaptan (see).

2-MERCAPTOANISOLE • Flavoring. In the rat, it affected blood. See Phenol and Anisole. EAF

2-MERCAPTO-BUTANOL • Synthetic chicken flavoring used in chicken, garlic, onion, and savory. See Bismuth. ASP

2-MERCAPTO-3-BUTANONE • Flavoring used in coffee. Has insecticidal properties. May affect the liver. ASP

3-MERCAPTOHEXANOL • Flavoring. See Hexanoic Acid. EAF

3-MERCAPTOHEXYL ACETATE • Flavoring. See Acetic Acid. EAF

3-MERCAPTOHEXYL BUTYRATE • Flavoring. See Butyric Acid. EAF

3-MERCAPTOHEXYL HEXANOATE • Flavoring. See Hexanoic Acid. EAF

3-MERCAPTO-3-METHYL-1-BUTANOL • Flavoring. EAF

3-MERCAPTO-3-METHYLBUTYL FORMATE • Flavoring. See Formic Acid. EAF

3-MERCAPTO-2-METHYLPENTANAL • Flavoring. Used in baked goods, breakfast cereals, fish products, gravies, nut products, processed vegetables, and soups. Declared GRAS by FEMA (see). See 1-Pentanol. EAF

2-MERCAPTO-2-METHYL-1-PENTANOL • Flavoring. See 1-Pentanol. EAF

4-MERCAPTO-4-METHYL-2-PENTANONE • Flavoring. See 1-Pentanol. EAF

N-MERCAPTO METHYL PHTALIMIDE • Phosphamidon. An organophosphate insecticide limited to 0.2 ppm tolerance by the FDA as a residue in meat by-products of cattle. See Organophosphates for toxicity.

2-MERCAPTOMETHYLPYRAZINE • Flavoring. See Piperazine. ASP

3-MERCAPTO-2-PENTANONE • Flavoring. The IPCS INCHEM (see) says more information is needed. See 1-Pentanol. ASP

1-MERCAPTO-2-PROPANONE • Flavoring. See 1-Pentanol. EAF

2-MERCAPTOPROPIONIC ACID 3- • Antioxidants and reducing additives. Mercaptopropionic acid was found to be a potent inhibitor of respiration,

2-MERCAPTOPROPIONIC ACID • Antioxidants and reducing additives. Mercaptopropionic acid was found to be a potent inhibitor of respiration. ASP

MERCURY • Fish are important in a healthy diet. They are a lean, low-calorie source of protein. However, some fish may contain methylmercury or other harmful chemicals at sufficiently high levels to be a concern. Federal, state, and local governments issue fish consumption advisories when the fish are unsafe to eat. The advisories may suggest that people avoid eating certain kinds or certain amounts of fish. Some advisories apply to specific water types (like lakes). Some may focus on groups of particularly sensitive people. Some advisories include notices of "no restriction" to designate certain fish are safe to eat. As states increase the waters they monitor for contaminated fish, both the number of advisories and the waters where it is safe to eat fish are increasing. Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. Research shows that most people's fish consumption does not cause a health concern. However, it has been demonstrated that high levels of methylmercury in the bloodstream of unborn babies and young children may harm the developing nervous system, making the child less able to think and learn. People in the United States are mainly exposed to methylmercury, an organic compound, when they eat fish and shellfish that contain methylmercury. Whether an exposure to the various forms of mercury will harm a person's health depends on a number of factors. You probably have at least trace amounts of methylmercury in your tissues, reflecting methylmercury's widespread presence in the environment and especially if you like to eat fish and shellfish. You may be exposed to mercury in any of its forms under different circumstances. The factors that determine how severe the health effects are from mercury exposure include the chemical form of mercury (methylmercury is more toxic than elemental mercury); your age when exposed (the fetus is the most susceptible); the duration of exposure; the route of exposure—inhalation, ingestion, dermal contact, etc.; and your health when exposed. Birds and mammals that eat fish are more exposed to mercury than other animals in water ecosystems. Similarly, predators that eat fish-eating animals may be highly exposed. At high levels of exposure, methylmercury's harmful effects on these animals include death, reduced reproduction, slower growth and development, and abnormal behavior. The EPA issues regulations that require industry to reduce mercury releases to air and water and to properly treat and dispose of mercury wastes. The EPA also works with industry to promote voluntary reductions in mercury use and releases; with partners in state, local, and tribal governments to improve their mercury reduction programs; and with international organizations to prevent the release of mercury in other countries. Methylmercury is number three on the CERCLA Priority List of Hazardous Substances (see). Check the EPA's fish advisory website, http://www.epa.gov/waterscience/fish/ especially if you are pregnant or have young children.

MESQUITE WOOD EXTRACT • Prepared by stirring 1 pound of wood chips from mesquite (Prosopis spp.) in 400 gallons of 80 proof alcohol for two hours without heat. The final product is obtained by removing the chips with filtration. It is used primarily as an alternative to oak chips. Adults expected to consume alcoholic beverages containing mesquite wood extract have taste preferences for southwestern cuisine. As is true with oak chip extract, the use of mesquite wood extract is selflimiting, with high concentrations resulting in an undesirable astringent taste. Based on the very low estimated human exposure to mesquite wood extract and the information regarding the similarity of mesquite wood extract to oak chip extract, as well as other information available to the FDA, the agency has no questions at this writing regarding the conclusion of the Givaudan Roure Flavors Corporation that mesquite wood extract is GRAS for use as a flavoring ingredient in alcoholic beverages. The agency has not, however, made its own determination regarding the GRAS status of the notified use of mesquite wood extract. As always, it is the continuing responsibility of Givaudan Roure Flavors Corporation to ensure that the food ingredients the firm markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements. EAF

METABOLIC SYNDROME • A collection of health conditions—including fat around the waistline, high blood pressure, insulin resistance, and low HDL cholesterol—that taken together, significantly increase the risk of type 2 diabetes and heart disease.

METABOLISM • The process of chemical change by which energy is provided in living cells.

METALAXYL • A fungicide used in animal feed, dried hops, potato chips, processed potatoes, soybean meal, sugar beet molasses, processed tomatoes, and wheat-milling fractions. The FDA limits residues to 7 ppm in citrus oil, 4 ppm in processed potatoes including potato chips, and 3 ppm in processed tomatoes.

METALDEHYDE • A polymer of acetaldehyde (see) used as a slug and snail poison on strawberries at the time of harvest. FDA residue tolerance is zero. Ingestion may cause severe abdominal pain, nausea, vomiting, diarrhea, fever, convulsions, and coma.

METATARTARIC ACID • Prevents the precipitation of tartaric acid crystals in wine. E

METHACRYCLIC ACID-DIVINYL BENZENE COPOLYMER • Used as a carrier for vitamin B12 in nutritional supplements. ASP

METHANE • An odorless, colorless, flammable gas, the major constituent of natural gas, that is used as a fuel and is an important source of hydrogen and a wide variety of organic compounds. Methane is the starting material for the producing solvents such as methylene chloride, chloroform, and carbon tetrachloride, and of some of the freon refrigerants (see all).

METHANEARSONIC ACID • Used in or on cottonseed hulls used for animal feed. See Arsenic and Methane.

METHANE DICHLORIDE • Colorless, volatile liquid with the odor of chloroform used to dilute color and extract chemicals. It is used to decaffeinate coffee, fruits, hops, spices, and vegetables. The FDA permits residues of 30 ppm in spice oleoresins, 2.2 percent in hops extract, and 10 ppm in decaffeinated coffee. Moderately toxic by ingestion. An experimental cancer-causing and tumor-causing additive. Human systemic effects by ingestion and inhalation include numbness, altered sleep, convulsions, euphoria, and changes in cardiac rate. It causes birth defects in experimental animals and may be mutagenic in humans. It is an eye and severe skin irritant. See Methane.

p-METHANE-3,8-DIOL • A flavoring determined GRAS by FEMA (see). See Methane.

METHANETHIOL • Methyl Mercaptan. A pesticide and fungicide isolated from the roots of a plant. Occurs in the "sour" gas of West Texas, in coal tar, and in petroleum. Produced in the intestinal tract by action of bacteria. Found in urine after ingestion of asparagus. Its odor may cause nausea, and it may be narcotic in high concentrations.

METHANOL • Methyl Alcohol. Wood Alcohol. Wood Spirit. A solvent and denaturant obtained by the destructive distillation of wood. In the food industry, it is used to extract hops and spices. Flammable, poisonous liquid with a nauseating odor. Better solvent than ethyl alcohol. It is a softening additive for plastics. It is the raw material for making formaldehyde. It is on the Community Right to Know List (see). Methanol is highly toxic and readily absorbed from all routes of exposure. It possesses narcotic properties. Toxic effects are primarily on the nervous system. Symptoms include headache, dizziness, confusion, abdominal pain, lung problems, weakness, and coma. Ingestion can cause blindness and death. Lesser exposure causes blurring of vision, headache, and GI disturbances.

METHDIATHION • Insecticide. Residue tolerances are 0.03 ppm in milk, 0.05 ppm residue in fat, meat, and meat by-products of cattle, goats, hogs, poultry, and sheep.

METHILANIN • See Acimeton.

METHIONINE • D and DL Forms. An essential amino acid (see) that occurs in protein. Used as a dietary substance. It is attracted to fat, and Rutgers University researchers patented a process to impregnate a carrier material with methionine for use in deep-frying cooking oil to impart a "fresh" potato or potato chip flavor to snack foods, soups, and salad dressings. Not to be used in baby foods. Methionine is mildly toxic by injection and

potato or potato chip flavor to snack foods, soups, and salad dressings. Not to be used in baby foods. Methionine is mildly toxic by injection and has caused birth defects in experimental animals. ASP

METHIONINE HYDROXY ANALOG and ITS CALCIUM SALTS • A nutrient for animal feeds. GRAS

METHIONYL BUTYRATE • Flavoring. Colorless liquid with a cabbage/sewer odor. See Methionine and Butric Acid. EAF

METHOPRENE • A growth inhibitor that mimics juvenile hormone in insects. It is used in animal feed or mineral blocks for cattle. The FDA residue tolerances are 22.7 to 45.4 mg per 100 pounds body weight; 0.05 ppm as residue in eggs and milk; 0.1 ppm as residue in meat and meat by-products of cattle, goats, hogs, and sheep; 0.3 ppm as residue in fat of cattle, goats, hogs, and sheep; and 0.05 ppm as residue in fat and meat of poultry.

2-METHOXY-3,6-DICHLOROBENZOIC ACID • Banex. An herbicide used in animal feed and on sugarcane. The FDA residue tolerance is 2 ppm on sugarcane molasses and 2 ppm in sugarcane molasses when used for animal feed. In the EPA Genetic Toxicology Program (see). Moderately toxic by ingestion.

4-METHOXY-2-METHYL-2-BUTANETHIOL • The FDA has not yet done a search of the toxicology literature concerning this additive. p-METHOXY A-METHYLCINNAMALDEHYDE • A flavoring. ASP

2-METHOXY-4-METHYLPHENOL • Creosol. A synthetic flavoring that occurs naturally in cassia and is used in fruit, rum, nut, and clove flavorings for beverages, ice cream, ices, candy, baked goods, and liqueurs. About the same toxicity as phenol, a highly caustic, poisonous compound derived from benzene. ASP

2-METHOXY-3 (S)-METHYLPYRAZINE • A colorless liquid with the odor of roasted hazelnuts used as a flavoring additive in various foods. GRAS ASP

1-METHOXY-4-PROPENYL BENZENE • See Anethole.

2-METHOXY-4-PROPENYL PHENOL • See Isoeugenol.

2-METHOXYACETOPHENONE • Synthetic flavoring used in almond, amber, balsam, hawthorn, hay, new mown hay, mimosa wattle, and spice flavorings. Also in baked goods, nonalcoholic and alcoholic beverages, breakfast cereal, cheese, chewing gum, condiments/relishes, confectionery frostings, egg products, fats/oils, fish products, frozen dairy, fruit ices, gelatins/puddings, granulated sugar, gravies, hard candy, imitation dairy, instant coffee/tea, meat products, milk products, nut products, other grains, poultry, processed fruits, processed vegetables, reconstituted vegetables, seasonings/flavors, snack foods, soft candy, soups, sugar substitutes, and sweet sauces. FEMA (see) judged it GRAS. EAF

p-METHOXYACETOPHENONE • Acetanisole. Crystalline solid with apleasantodor. Derived from the interaction of anisole and acetyl chloride with aluminum chloride and carbon disulfide. Used as a synthetic flavoring. See 2-Methoxyacetophenone. ASP

4-METHOXYACETOPHENONE • Colorless to pale yellow solid with a hawthorn odor used as a flavoring additive in various foods. Moderately toxic by ingestion. Inhalation causes an increased pulse rate in humans. A skin irritant.

o-METHOXYBENZALDEHYDE • A synthetic flavoring additive that occurs naturally in cassia oil and is used in spice and cinnamon flavorings for beverages, baked goods, and chewing gum. See Benzyl Acetate. ASP

p-METHOXYBENZALDEHYDE • Anisaldehyde. A synthetic flavoring additive that occurs naturally in hawthorn, fennel, oil of anise, star anise, and Tahiti vanilla beans. Used in raspberry, strawberry, butter, caramel, chocolate, apricot, cherry, peach, licorice, anise, nut, black walnut, walnut, spice, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. See Benzyl Acetate. ASP

METHOXYBENZENE • See Anisole and Benzene. p-METHOXY BENZYL ACETATE • See Anisyl Acetate and Benzene. p-METHOXY BENZYL ALCOHOL • See Anisyl Alcohol and Benzene. p-METHOXYBENZYL FORMATE • See Anisyl Formate and Benzene.

1-METHOXYCARBONYL-1-PROPEN-2-YL DIMETHYL PHOSPHATE • Mevinphos. An organophosphate pesticide in dehydrated parsley as a result of application to the growing crop. FDA residue tolerance is 4 ppm. See Organophosphates for toxicity.

METHOXYCHLOR • Used to kill insects such as flies, mosquitoes, cockroaches, chiggers, and others. It is also used on food crops, as an insecticide, on farm animals (livestock), in animal feed, grain, home gardens, and on pets. Methoxychlor can enter your body when you breathe contaminated air or if you eat contaminated food. This insecticide, related to DDT, has been presumed to cause no effects for the fetus at doses below 5 mg/kg/d. Subsequent low-dose research found that methoxychlor causes changes in prostate size at a dose 250 times lower in animals exposed in utero. There isn't a lot of information on how methoxychlor can affect your health. Studies show that animals exposed to high doses of methoxychlor experienced tremors, convulsions, and seizures. Really high doses of methoxychlor may damage the nervous system. The U.S. Environmental Protection Agency (EPA) has proposed revoking tolerances for this pesticide. p-METHOXYCINNAMALDEHYDE • A flavoring. ASP

METHOXYETHANOL • See Ethanol.

4 (p-METHOXYPHENYL)-2-BUTANONE • A synthetic fruit, licorice, and anise flavoring additive with a sweet floral odor used for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. ASP

1-(p-METHOXYPHENYL)-1-PENTEN-3-ONE • A synthetic butter, cream, fruit, maple, nut, and vanilla flavoring additive for beverages, ice cream ices, candy, and baked goods. ASP

1-(p-METHOXYPHENYL)-2-PROPANONE • A synthetic flavoring additive that occurs naturally in star anise. Used in fruit and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

3-L-METHOXYPROPANE-1,2-DIOL • A synthetic flavoring.

2-METHOXYPYRAZINE • A colorless to yellow liquid with a nutty, cocoalike odor used as a flavoring in a variety of foods. Skin and eye irritant. GRAS. ASP p-METHOXYTOLUENE • See Ylang-Ylang Oil.

4-METHOXYTOLUENE-2,5-DIAMINE HCL • A colorless liquid used in perfumery and flavorings. See Toluene.

2-METHOXY-4-VINYLPHENOL • Spicy, vanilla flavoring also used in fragrances to add spicy notes. ASP

METHYL • From methane. Name derived from Greek methy, wine and hyle, wood. See Methane.

METHYL ABIETATE • See Abietic Acid.

METHYL ACETAMIDE • See Methyl Acetate.

METHYL ACETATE • Acetic Acid. Colorless liquid that occurs naturally in coffee, with a pleasant apple odor. Also naturally occurs in peppermint oil. A flavoring used in fruit, rum, and nut flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, and liquor. Used as a solvent for many resins and oils. May be irritating to the respiratory tract and, in high concentrations, may be narcotic. ASP

4-METHYL ACETOPHENONE • Colorless liquid with a fruit odor, it is used as a flavoring additive in various foods. Moderately toxic by ingestion. A human skin irritant. ASP

METHYLACETOPYRONONE • White crystalline powder used as a preservative in various foods. Poison by ingestion. Causes tumors in experimental

METHYLACETOPHENONE • White crystalline powder used as a preservative in various foods. Poison by ingestion. Causes tumors in experimental animals. GRAS

METHYL 5-ACETOXYHEXANOATE • A flavoring in baked goods, beverages, chewing gum, condiments, frozen dairy, fruit ices, gelatins, hard candy, and other food products. Determined GRAS by FEMA (see). See Hexanoic Acid.

METHYL 1-ACETOXYCYCLOHEXYL KETONE • A flavoring additive. The JECFA (see) determined this substance needs further study. NIL

METHYL ACRYLATE • 2-Propanoic Acid, Methyl Ester. Derived from ethylene chlorohydrin, it is transparent and elastic. Used to coat paper and plastic film. Can be highly irritating to the eyes, skin, and mucous membranes. Convulsions occur if vapors are inhaled in high concentrations. GRAS for packaging. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there were insufficient relevant biological and other studies upon which to base an evaluation of it when used as a food ingredient. NUL

METHYL ACRYLATE DIVINYLBENZENE, COMPLETELY HYDROLYZED,

COPOLYMER • Used in food processing. See Acrylamide. NUL

METHYL ALCOHOL • Wood Alcohol. Solvent for spice oleoresins and in hops extract for beer. Clear, colorless liquid derived from carbon monoxide and hydrogen under pressure. Toxic by ingestion. Can cause blindness. Used in the manufacture of formaldehyde, acetic acid, and other compounds. Used to denature (see) alcohol. FDA tolerance for residues on spices is less than 50 ppm or less than 2.2 percent by weight. In hop extract the residue for beer is less than 100 ppm. ASP

2-METHYLALLYL BUTYRATE • The JECFA says it has no safety concern at current levels of intake when used as a flavoring agent. See Butryic Acid. NIL

METHYL AMYL KETONE • See 2-Heptanone.

METHYL ANÍSATE • Anisic Acid. A synthetic fruit, melon, liquor, root beer, and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

METHYL ANTHRANILATE • Occurs naturally in neroli, ylang-ylang, bergamot, jasmine, and other essential oils. Colorless to pale yellow liquid with a bluish fluorescence and a grapelike odor. It is made synthetically from coal tar (see). Used in loganberry, strawberry, orange, floral, rose, violet, cherry, grape, melon, liquor, wine, and honey flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (2,200 ppm), and liquors. Can irritate the skin. GRAS. ASP

n-METHYL ANTHRANILIC ACID, METHYL ESTER • See Methyl Anthranilate.

a-METHYL BENZENE ACETATE • A colorless liquid with a honey or jasmine odor, it is used as a flavoring additive in a variety of foods. Moderately toxic by ingestion and skin contact. ASP

METHYL BENZOATE • Essence of oil of Niobe. Made from methanol and benzoic acid (see both). Colorless, transparent liquid with a pleasant fruity odor. Used in fruit rum, liquor, nuts, spices, and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. Also used in perfumes. ASP

METHYL BENZO CARBOXYLATE • Colorless liquid with a fragrant odor used as a flavoring additive in various foods. Moderately toxic by ingestion. Mildly toxic by skin contact.

METHYL-5-BENZOYL BENZIMIDAZOLE-2-CARBAMATE • Vermirax. Telmin. Mebendazole. An antiworm medicine for animals. In the EPA Genetic Toxicology Program. Poison by ingestion. Causes mutations in animals.

METHYL BROMIDE • Prepared from the action of hydrobromic acid on methanol (see), it is used as a fumigant in warehouses and for extracting oils from nuts, seeds, and flours. Inhalation causes dizziness, headache, vomiting, abdominal pain, mental confusion, convulsions, pulmonary edema, coma, and death. Chronic exposure can cause central nervous system depression or kidney injury. FDA tolerance for various crops is from 5 to 200 ppm.

METHYL-1-(BUTYL CARBAMOYL) 2-BENZIMIDAZOLYLCARBAMATE • BBC. Benylate. Benomyl. A fungicide used on apples, apricots, bananas, cherries, mangoes, nectarines, peaches, pears, pineapples, plums, raisins, and tomato products (concentrated). FDA residue tolerances are 50 ppm in raisins and concentrated tomato products, 125 ppm in dried grape pomace and raisin waste, 70 ppm in dried apple pomace, 50 ppm in dried citrus pulp, and 20 ppm in rice hulls. In the EPA Genetic Toxicology Program (see). Poison by ingestion. A human skin irritant. May cause birth defects.

METHYL p-ferf-BUTYLPHENYLACETATE • A synthetic chocolate, fruit, and honey flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

METHYL BUTYRATE • A synthetic flavoring additive that occurs naturally in apples. Colorless, used in fruit and rum flavorings for beverages, ice cream, candy, and baked goods.

METHYL CHLORIDE • Chloromethane. Colorless gas or colorless liquid with a sweet taste, it is used as a spray pesticide in food storage and processing areas. It is not supposed to contact fatty foods. The FDA tolerance for modified hop extract for beer is up to 250 ppm. Poisonous, it can cause severe injury to liver and kidney.

METHYL CINNAMATE • White crystals, strawberrylike odor, and soluble in alcohol. Derived by heating methanol, cinnamic acid, and sulfuric acid. A synthetic strawberry, butter, cream, cherry, grape, peach, plum, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. See Cinnamic Acid. ASP

6-METHYLCOUMARIN • Synthetic flavoring used in amber, balsam, caramel, coconut date fern, fig, hay, new-mown hay, incense, labdanum, lavender, mimosa wattle, moss, myrrh, oriental, tonka, vanilla, woody. See Coumarin. ASP

METHYLCROTONIC ACID • See Crotonic Acid. ASP

3-METHYLCROTONIC ACID • Coconutlike flavoring found in Peucedanum japonicum and used in dairy and greens. ASP

2-METHYL-1,3-CYCLOHEXADIENE • Synthetic flavoring. ASP

1-METHYLCYCLOHEXADIONE • Scent of the spruce beetle used as a flavoring and natural pesticide. ASP

METHYL CYCLOHEXANECARBOXYLATE • Flavor enhancer and flavoring. ASP

2-METHYLCYCLOHEXANONE • Flavoring. EAF

3-METHYL-2-CYCLOHEXEN-1-ONE • See 1-Methylcyclohexadione. EAF g-METHYLDECALACTON • Flavoring. The JECFA (see) says no average daily intake is known. EAF

METHYL-2-DECENOATE • Synthetic flavoring. See Decanoic Acid. NIL

METHYL 2-DECENOATE • Synthetic flavoring. See Decanoic Acid. NIL

METHYL DISULFIDE • A synthetic onion flavoring additive for baked goods, condiments, and pickle products. ASP

2-METHYL-1,3-DITHIOLANE • Flavoring liquid with a burned alliaceous odor. NIL

METHYL ESTER OF FATTY ACIDS • Produced from edible fats and oils. Used in dehydrating grapes to produce raisins. See Esters and Fatty Acids.

METHYL ESTER OF HIGHER FATTY ACIDS •Used in animal feed. See Fatty Acids.

METHYL ESTER OF ROSIN PARTIALLY HYDROGENATED • Used as a constituent of chewing-gum base. See Rosin and Hydrogenated.

METHYL ESTERS OF FATTY ACIDS PRODUCED FROM EDIBLE FATS and OILS • Used in dehydrating grapes to produce raisins. FDA tolerance is less than 3 percent of weight or less than 200 ppm in raisins.

METHYL ETHYL CELLULOSE • A foaming, aerating, and emulsifying additive prepared from wood pulp or chemical cotton. Used in vegetable-fat whipped topping and as an emulsifying additive. Used as a bulk laxative but absorbed from the bowel. See Sodium Carboxymethyl Cellulose for toxicity.

METHYL FORMATE • Colorless liquid with a sweet odor used as a fumigant in raisins and dried currants. FDA residue tolerance of 250 ppm as formic acid (see) in raisins and dried currants.

3-[(2-METHYL-3-FURYL)THIO]2-BUTAÑONE • A flavoring determined GRAS by FEMA. See Butanone.

METHYL GLUCOSIDE OF FATTY ACIDS OF EDIBLE COCONUT OIL • Used in the manufacture of beet sugar and as an aid in crystallization of sucrose and dextrose. Used as a surfactant in molasses meant for animal feed. Coconut is thought to contribute to cholesterol clogging of the arteries.

METHYL GROUP • Molecules from methane (see). The introduction of methyl groups in a compound usually increases the ability of a chemical compound to dissolve in fats, oils, lipids, and some solvents such as hexane or toluene (see both) and reduces the compound's water solubility. It can also improve absorption. The incorporation of a methyl group can increase metabolism. A lot depends upon what compound the group is attached.

METHYL HEPTANOATE • A synthetic berry, grape, peach, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

METHYL HEPTENONE • See 6-Methyl-5-Hepten-2-One.

6-METHYL-5-HEPTEN-2-ONE • Methyl Heptenone. A synthetic flavoring additive that occurs naturally in oil of lavender and oil of lemon. Used in berry, citrus, banana, melon, pear, peach, and pineapple flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Moderately toxic by ingestion. A skin irritant. ASP

METHYL HEXENOATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

METHYL-p-HYDROXYBENZOATE • Methylparaben. A preservative in beverages, baked goods, candy, and artificially sweetened jellies and preserves. Methylparaben may cause allergic skin reaction. On the FDA list of additives requiring further study. GRAS. E

METHYL ISOBUTYL KETONE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. Used as a solvent for cellulose and lacquer. Similar in toxicity to methyl ethyl ketone, which is irritating to the eyes and mucous membranes, but likely more toxic. Causes intestinal upsets and central nervous system depression. ASP

METHYL ISOBUTYRATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

1-METHYL-4-ISOPROPYLCYCLOHEXADIENE-1,3 • A colorless liquid with a lemony odor, it is used as a flavoring additive in various foods. Moderately toxic by ingestion.

2-METHYL-3-(P-ISOPROPYLPHENYL) PROPIONALDEHYDE • Flavoring. See Methyl- and Propionaldehyde.

METHYL JASMONATE • Found in jasmine and green tea. Used as a flavor and fragrance in apple, floral, gardenia, grease, herbal, honeysuckle, jasmine, lilac, lily, melon, watermelon, muskmelon, cantaloupe, lily of the valley, pea, petal flower, petal plum, and tutti-frutti. ASP

METHYL LAURATE • The ester of methyl alcohol and lauric acid. Derived from coconut oil. A synthetic flavoring additive for beverages, ice cream, ices, candy, and baked goods. It is also used in detergents, emulsifiers, wetting additives, stabilizers, resins, lubricants, and plasticizers.

METHYL LINOLEATE • The ester of methyl alcohol and linoleic acid, it is a colorless oil derived from safflower oil and used in detergents, emulsifiers, wetting additives, stabilizers, resins, lubricants, and plasticizers. ASP

METHYLMERCURY • The PTWI (see) of 3.3 µg/kg bw is maintained. The JECFA considered data on intake, quantitative relationships between daily intake of methylmercury and concentrations in blood and hair, and epidemiological studies in progress. The information available was insufficient to evaluate neurodevelopmen-tal effects on the children of mothers who had a low intake of methylmercury. No clear indication of consistent risk was detected in the epidemiological studies. The committee noted that fish, the major source of methylmercury in the diet, is an important component of nutrition, especially in certain regions and ethnic groups, and recommended that the nutritional benefits of fish be weighed against the possibility of harm when limits on the concentration of methylmercury in fish or on fish consumption are being considered.

METHYL MERCAPTAN • A synthetic flavoring additive that occurs naturally in caseinate, cheese, skim milk, coffee, and cooked beef. Used in coffee flavorings for beverages, ice cream, ices, candy, and baked goods. See Methanethiol fortoxicity. ASP

METHYL-2-METHYL BUTYRATE • Colorless liquid with a sweet, applelike odor used as a flavoring additive in various foods. ASP

METHYL MYRISTATE • Natural occurrence in violet roots. Waxy odor. See Myristic Acid.

1-METHYLNAPHTHALENE • A naphthalene-related compound that is also called alpha-methylnaphthalene. It is a clear liquid. Its taste and odor have not been described, but you can smell it in water when only 7.5 ppb are present. 1-Methylnaphthalene and 2-methylnaphthalene are used to make other chemicals such as dyes and resins. 2-methylnaphthalene is also used to make vitamin K. All three chemicals are present in cigarette smoke, wood smoke, tar, asphalt, and at some hazardous waste sites. Naphthalene and the methylnaphthalenes are unlikely to be present in tap water. Newly added, it is number 275 on the CERCLA Priority List of Hazardous Substances (see).

METHYL 6-NAPHTHYL KETONE • Orange Crystals. 2‘ Acetonaphthone. A synthetic flavoring additive used in berry, strawberry, citrus, fruit, grape and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. See Methyl Isobutyl Ketone for toxicity.

METHYL NICOTINATE • See Niacin. EAF

3-METHYL-2,4-NONANEDIONE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association.

METHYL NONANOATE • A synthetic berry, citrus, pineapple, honey, and cognac flavoring additive for beverages, ice cream, ices, candy, and baked goods. Smells like coconut. ASP

METHYL 2-NONENOATE • A synthetic berry and melon flavoring additive for beverages, ice cream, ices, candy, and baked goods.

METHYL 2-NONYNOATE • A synthetic berry, floral, violet, fruit, and banana flavoring additive for beverages, ice cream, ices, candy, gelatin desserts, baked goods, and condiments.

METHYL OCTANOATE • A synthetic flavoring additive that occurs naturally in pineapple. Used in pineapple and berry flavorings for beverages, ice cream, ices, candy, and baked goods.

METHYL 2-OCTYNOATE • A synthetic flavoring additive used in berry, raspberry, strawberry, floral, violet, fruit, peach, liquor, and muscatel flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and jellies. ASP

METHYL-p-HYDROXYBENZOATE • See Benzoic Acid. E

METHYL PELARGONATE • Nonanoic Acid. Methyl Ester. The ester of ethyl alcohol and pelargonic acid used in perfume and flavorings.

4-METHYL-2-PENTANONE • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods.

2-METHYL-4-PHENYL-2-BUTYL ACETATE • A synthetic fruit and tea flavoring additive for beverages, ice cream, ices, candy, and baked goods. a-METHYLBENZYL ALCOHOL • A flavoring additive in foods and beverages derived from alcohol and benzoic acid (see both) and also appears naturally in a variety of foods. The JECFA (see) found that in short-term toxicity studies, high rates of mortality were associated with dose levels of 1,000 mg and 2,000 mg per kg of body weight per day in mice and 2,000 mg per day in rats. It also adversely affected body weight, long-term survival rates, and caused birth defects. The committee said the intake of this compound from all sources is extremely low. On the basis of the evidence available, the committee concluded that the higher incidence of benign tumors in the kidneys of male rats was not relevant to humans. In view of the "limited database," the committee concluded that the available data could be used to set an ADI by application of a safety factor of 1,000 to the minimal-effect level of 93 mg per kg of body weight per day. Accordingly, an ADI of 0-0.1 mg per kg of body weight per day was allocated for this additive.

1-(3-METHYL)BUTYL BENZOATE • Amyl Benzoate. Isopentyl Benzoate. Used as a flavoring additive in various foods. Mildly toxic by ingestion. A skin irritant.

METHYLCHLOROPINDOL • Coccidiostat. An antibiotic drug for animals used on beef and in feed as well as cereal grains, chicken, fruits, goat, lamb, milk, pork, turkey, and vegetables. The FDA limits it to 0.2 ppm in cereal grains, vegetables, and fruits; 15 ppm in uncooked liver and kidney; 5 ppm in uncooked muscle of chickens and turkeys; and 3 ppm in uncooked kidney.

3-METHYL-3-PHENYL GLYCIDIC ACID, ETHYL ESTER • A synthetic strawberry flavoring. GRAS

METHYL PHENYLACETATE • Colorless liquid with a honeylike odor used in strawberry, chocolate, peach, and honey flavorings for beverages, ice cream, ices, baked goods, candy, gelatin desserts, chewing gum, and syrup. Also used in perfumery. Moderately toxic by ingestion and skin contact. See Phenyl Acetate. ASP

2-METHYL-4-PHENYLBUTYRALDEHYDE • A synthetic nut flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-METHYL-2-PHENYL BUTYRATE • A synthetic fruit flavoring for beverages, ice cream, ices, and candy. ASP

METHYL-4-PHENYLBUTYRATE • A synthetic strawberry, fruit, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP a-METHYLPHENETHYL BUTYRATE • Synthetic fruit flavoring. ASP

2-METHYL-4-PHENYL-2-BUTANOL METHYL CELLULOSE • A grayish-white powder prepared from cellulose (see) that swells to a highly viscous colloidal solution in water. Used as a food additive and in water paints, leather tanning, and cosmetics. It is sold under a variety of trade names and is used as a thickener and emulsifier in various food. Like cellulose, it is nondigestible, nontoxic, and nonal-lergenic. ASP

2-METHYL-4-PHENYL-2-BUTANOL • See 2-Methyl-4-Phenyl-2-Butanol Methyl Cellulose. ASP

2-METHYL-4-PHENYL-2-BUTYL ISOBUTYRATE • Colorless oily liquid with a sweet, floral-green odor. Used as a flavoring ingredient. Last evaluation by the JECFA in 2004. The ADI (see) was found acceptable and there were no safety concerns at current levels of intake when used as a flavoring agent. ASP

METHYL PIPERAZINE • Colorless liquid that absorbs water. Used as a surfactant (see). EAF

METHYL PREDNISOLONE • Medrol. Meprolone. A-MethaPred. SoluMedrol. A hormone secreted by the adrenal gland that affects carbohydrate and protein metabolism. It was introduced as a medication in 1957 to treat severe inflammation or for immunosuppression or to decrease residual damage following spinal cord trauma. Used to treat cows. The FDA limits residue to 10 ppb in milk. Most adverse reactions are the result of dose- or length-of-time of administration. Potential adverse reactions include euphoria, insomnia, psychotic behavior, high blood pressure, swelling, cataracts, glaucoma, peptic ulcer, GI irritation, increased appetite, high blood sugar, growth suppression in children, delayed wound healing, acne, skin eruptions, muscle weakness, pancreatitis, hairiness, decreased immunity, and acute adrenal gland insufficiency. FDA tolerance in milk from treated cows is 10 ppb.

METHYL SALICYLATE • Salicylic Acid. Oil of Wintergreen. Found naturally in sweet birch, cassia, and wintergreen. A natural product of many species of plants. Some of the plants producing it are called wintergreens. Methyl salicylate can be produced by esterifying (see) salicylic acid with methanol (see both). Commercial methyl salicylate is now synthesized, but in the past, it was commonly distilled from the twigs of sweet birch (Betula lenta) and eastern teaberry (Gaultheria procumbens). In small amounts as a flavoring agent at no more than 0.04. Used in strawberry, grape, mint, walnut, root beer, sarsaparilla, spice, wintergreen, birch beer, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum (8,400 ppm), and syrup. The volatile oil is obtained by maceration. Toxic by ingestion. It is also used to provide fragrance to various products and as an odor masking agent for some organophosphate pesticides (see). If applied in too high quantities, it can cause stomach and kidney problems. In pure form, methyl salicylate is toxic, especially when taken internally. Use in foods restricted by the FDA. The lowest published lethal dose is 101 mg/kg body weight in adult humans. It has proven fatal to small children in doses as small as 4 ml. ASP

METHYL-SALPHA-IONONE • Flavoring found in Peucedanum japonicum used in dairy and greens. ASP

METHYL SILICONS • Prepared by hydrolyzing (see) dimethyldichloroslane or its esters, it is used to help compounds resist oxidation. See Silicones.

METHYL SÓRBATE • 2,4-Hexadienoic acid, methyl ester, (2E,4E). Flavoring used in anise, licorice, prune, raisin, tobacco, vanilla. NIL

METHYL SULFIDE • A synthetic flavoring additive that occurs naturally in caseinate, cheese, coffee, coffee extract, and skim milk. Disagreeable odor. Used in chocolate, cocoa, fruit, and molasses flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and syrups. Used also as a solvent for minerals. ASP

METHYLSULFONYLMETHANE • Ingredient in meal supplement and meal replacement foods, fruit-smoothie-type drinks and fruit-flavored thirst-quencher-type beverages at levels up to 4,000 milligrams per kilogram (mg/kg); and in food bars such as granola bars and energy-type bars at levels up to 30,000 mg/kg. GRAS pending

2-METHYLTETRAHYDROFURAN-3-ONE • Flavoring. See Furans. ASP

2-METHYL-3-TETRAHYDROFURANTHIOL • Flavoring. See Furans. EAF

7-METHYL-4,4A,5,6-TETRAHYDRO-2(3H)-NAPHTHALENONE • Pesticide based on pheromones (see). EAF

4-METHYLTHIAZOLE • Flavoring. The JECFA says there is not a safety concern. However, this metabolite of the vitamin thiamine was reported in

2000 to have an adverse affect on rats' livers. NIL

4-METHYL-5-THIAZOLEETHANOL AND ACETATE • Flavoring. See 4-Methylthiazole. ASP

2-METHYL-2-THIOACETOXY-4,5-DIHYDROFURAN • Flavoring. See Furans. ASP

1-(METHYLTHIO)2-BUTANONE • Colorless liquid; odor remniscent of mushroom with a characteristic garlic undertone. ASP

METHYL THIOBUTYRATE • Natural flavoring from cheese and strawberry with a strong, sweet, cheesy taste. Used in cheese, berry, and chocolate. ASP

METHYLTHIOMETHYL HEXANOATE • Flavoring agent, colorless to pale yellow liquid. The latest JECFA evaluation in 1999 found no safety concern at current levels of intake when used as a flavoring agent. EAF

METHYLTHIOMETHYLMERCAPTAN • A sulfide flavoring. The JECFA has no concern when used as a flavoring agent. See Methyl Mercaptan. EAF

6-METHYLPHENETHYL ALCOHOL • 2-Phenylpropyl alcohol. Flavoring. Colorless liquid; sweet floral lilac, hyacinth-type aroma. ASP

METHYL PHENYL DISULFIDE • Flavoring. Colorless or slightly yellow liquid with unpleasant odor. EAF

3-METHYL-3-PHENYL GLYCIDIC ACID ETHYL ESTER • Synthetic flavoring widely used in food additives in acacia, aldehydic, almond, angel, apple, green apple, red apple, apricot, blackberry, blueberry, butterscotch, cassie acacia, cherry, cherry blossom, Christmas blends, citrus, civet, cranberry, cyclamendecumaria, floral, grape, hibiscus, hyacinth jacinthe, jasmine, kiwi, lilac lilas syringe, lily, melon, watermelon, muskmelon, cantaloupe, mulberry, orange blossom, fleur d'oranger, papaya, passion fruit, peach, peach blossom, pineapple, plum, potpourri, raspberry, black raspberry, rose, rose centifolia, spice, strawberry, tutti-frutti, vanilla, violet, and zibeline. Irritant. Dangerous for the environment. Animal studies show brain and nervous system effects at high doses, cancer, and mutations. The EPA's RTECS (see) considers it a mutagen. GRAS. ASP

5-METHYL-2-PHENYL-2-HEXENAL • Flavoring agent with a roasted hazelnut, cocoa taste. The JECFA's latest evaluation in 2004 found the ADI (see) acceptable. The committee had no safety concern at current levels of intake when used as a flavoring agent. ASP

4-METHYL-1-PHENYL-2-PENTANONE • Colorless oily liquid flavoring with a sweet, woody, spicy, burnt sugar odor. Used to flavor cigarettes. See Pentanoic Acid. ASP

4-METHYL-2-PHENYL-2-PENTENAL • Flavoring with a honey, cocoa odor, chocolate taste. See Pentanoic Acid. ASP

METHYL 3-PHENYLPROPIONATE • Colorless to pale yellow liquid with a fruity, rum odor. NIL

4-METHYLQUINOLINE • A synthetic butter, honey, and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods.

5-METHYLQUINOXALINE • A yellow liquid with a roast nut, roast corn, coffee odor and flavor. It is used in confectionery, desserts, meat products, and nonalcoholic beverages. ASP

2-METHYLRESORCINOL • Orcin. An aromatic compound with white crystalline prisms derived from lichen; used in medicine and as a readditive for sugars and starches. See Resorcinol. ASP

METHYLTHEOBROMINE • See Caffeine.

METHYLTHIOMETHYL BUTYRATE • Flavoring additive. In its latest evaluation in 1999, the JECFA said the ADI (see) is acceptable and there is no safety concern at current levels of intake when used as a flavoring agent. See Butryic Acid. ASP

2-(METHYLTHIO)ETHANOL • Flavoring that occurs naturally in passion fruit and has a meat odor. It is used in meat, milk products, jams, frozen dairy, condiments, and relishes. EAF

METHYL-2-THIOFUROATE • Flavor that naturally occurs in coffee and is used in cheese, chocolate, cocoa, coffee, milk, onion, and strawberry. ASP

METHYL-9-UNDECENOATE • A synthetic citrus and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

METHYL-2-UNDECYNOATE • A synthetic floral and violet flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

METHYL VALERATE • A synthetic flavoring for baked goods. ASP

2-METHYL VALERIC ACID • A synthetic chocolate flavoring additive for candy. ASP

2-(5-METHYL-5-VINYLTETRAHYDROFURAN-2-YL)PROPIONALDEHYDE • Flavoring determined GRAS by FEMA (see). See Furfural.

METHYLACETALDEHYDE • See Propionaldehyde.

METHYLACETIC ACID • See Propionic Acid.

2-METHYLALLYL BUTYRATE • A synthetic pineapple flavoring for beverages, ice cream, ices, candy, and baked goods.

o- and p-METHYLANISOLE • A synthetic berry, maple, black walnut, walnut, and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, condiments, and syrups.

METHYLATE • To mix with menthol or to introduce a methyl group or a compound in which a metal ion—methyl—replaces the hydrogen molecule of alcohol.

METHYLATED SPIRITS • Ethyl alcohol to which methyl alcohol (see) has been added to render it unfit for drinking. Often called denatured alcohol. Highly poisonous.

METHYLBENZYL ACETATE • A synthetic flavoring additive, colorless, with a gardenia odor. Used in cherry and fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum.

a-METHYLBENZYL BUTYRATE • A synthetic berry and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods.

a-METHYLBENZYL FORMATE • Formic Acid. A synthetic fruit and berry flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Formic Acid for toxicity.

a-METHYLBENZYL ISOBUTYRATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods.

2- and 3-METHYLBUTYRALDEHYDE • A synthetic flavoring additive that occurs naturally in coffee extract, oil of lavender, and peppermint oil. Used in butter, chocolate, cocoa, fruit, and nut flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts.

2-METHYLBUTYRIC ACID • A synthetic fruit flavoring additive for beverages, ice cream, ices, and candy.

METHYLCELLULOSE • Cellulose, Methyl Ether. A binder, thickener, dispersing, and emulsifying additive, it is prepared from wood pulp or chemical cotton by treatment with alcohol. Swells in water. Soluble in cold water and insoluble in hot. The commercial product has a methoxyl content of 29 percent. It is used as a bodying additive for beverages and canned fruits sweetened with artificial sweeteners; a thickener for kosher food products; a bulking additive for low-calorie crackers; a binder in non-wheat baked goods for nonallergic diets; a beer foam stabilizer; a condiment carrier; in food products for diabetics and low-calorie dietetic products; an edible film for food products; a leavening additive for prepared mixes; a clarifier for vinegar and beverages; and in imitation jellies and jams, processed cheese, confectionery, and toppings. It is a bulk laxative. Ingestion of large doses may cause flatulence, distension of the abdomen or intestinal obstruction, and may also affect the absorption of

minerals or other drugs. A dose injected into the abdomen of rats causes cancer. Nontoxic on the skin. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations in the amounts that can be added to foods. See also Carboxymethyl Cellulose.

6-METHYLCOUMARIN • White needlelike substance from benzene with a coconut odor. A synthetic flavoring additive used in butter, caramel, coconut, fruit, nut, root beer, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, and chewing gum. Unlike methylcoumarin, which is listed as GRAS by FEMA (see), coumarin, once widely used in foods, is banned. Prolonged feeding of coumarin causes liver injury. Carcinogenic and allergenic. ASP

METHYLCYCLOPENTENOLONE • A synthetic flavoring additive used in berry, butter, butterscotch, caramel, maple, hazelnut, pecan, walnut, fruit, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and syrups. ASP

METHYLENE CHLORIDE • Dichloromethane. Methane Dichloride. Methylene Dichloride. Aerothene NM. Solaestine. Freon 30 Somethine. F-30. A colorless gas that compresses into colorless liquid of pleasant odor and sweet taste. A solvent in the microencapsulation of thiamin hydrochloride (see) intended for use in both dry beverages and dry gelatin mixes. One of the most commonly used solvents, it is used to remove caffeine from coffee and tea. The FDA estimates, based on coffee industry tests, that about 0.1 ppm remain in most brands decaffeinating this way. Once absorbed into the body, methylene chloride generates carbon monoxide. Because of public concern about methylene chloride, some brands are now using other methods of decaffeinating. Used as an anesthetic in medicine. High concentrations are narcotic. Damage to the liver, kidney, and central nervous system can occur, and persistent postrecovery symptoms after inhalation include headache, nervousness, insomnia, and tremor. Can be absorbed through the skin and is then converted to carbon monoxide, which, in turn, can cause stress in the cardiovascular system. It is widely used as a degreaser; solvent for spices, waxes, oils, paint, and varnish thinner; as cleansers in many industries and work settings; in aerosols, including pesticides; in refrigeration and air-conditioning equipment. Methylene chloride enters your body when you breathe it in the air. Once it enters the body, methylene chloride generates carbon monoxide, which interferes with the blood's ability to pick up and deliver oxygen. The body responds to lack of oxygen by driving the heart to work harder. People with angina (chest pains) from coronary artery disease are extremely sensitive to carbon monoxide and may have increased chest pains from exposure to methylene chloride, even below the legal exposure limit (100 ppm over an eight-hour workshift). It is also a skin irritant. Methylene chloride is considered to have “poor warning properties,” since most people cannot smell it until it reaches a hazardous level (100–500 ppm). If you can smell it, you may be overexposed. Methylene chloride causes cancer in animals and is considered a potential cancer-causing additive in humans. The JECFA said that epidemiological studies have not shown any carcinogenic effect of methylene chloride after occupational exposure. However, the committee noted that the power to detect excess risk in these studies was limited. On the basis of the available data, the committee concluded that the use of methylene chloride as an extraction solvent in food processing should be limited to use for spice oleoresins and the decaffeination of tea and coffee and for food additives that included residues of dichloromethane. FDA residue tolerances are 30 ppm in spice oleoresins, less than 10 ppm in decaffeinated roasted coffee and decaffeinated instant coffee, and 2.2 percent as a residue in hops extract added before or during cooking of beer. ASP

5-METHYLFURFURAL • A synthetic honey, maple, and meat flavoring for beverages, ice cream, ices, candy, and baked goods. See Furans. ASP

2-METHYLOCTANAL • A synthetic citrus flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

METHYLOCTANOIC ACID • Colorless pale liquid used as a waxy fatty flavoring in butter, cheese, cream, dairy, lamb, meat, milk, tea. Natural occurrence in apple, lamb, pineapple, rum, strawberry and tea. Can be corrosive. ASP

2-METHYL-2-OCTENAL • Synthetic flavoring used in grapefruit, lily, melon, watermelon muskmelon, and cantaloupe.

METHYL 2-OCTANOATE • Waxy flavoring used in melon, watermelon, muskmelon, cantaloupe, orange orris, iris, pineapple, strawberry, tea, black tea. Naturally occurs in cider, coconut, orris, pineapple, strawberry, tea, black tea, wine. ASP

2-METHY-3- OR 5- OR 6-(FURFURYLTHIO)PYRAZINE (MIXTURE OF ISOMERS) • Peanut flavoring used in beef, nuts, and peanuts. Natural occurrence in beef. See Furans. ASP

METHYLPARABEN • Methyl-p-Hydroxybenzoate. Preservative in jelly and preserves. Used in bubble baths, cold creams, eyeliners, and liquid makeup. It is an antimicrobial and preservative made of small, odorless, colorless crystals that have a burning taste. FDA residue tolerance in milk from cows treated with mastitis formulations is zero. Nontoxic in small amounts but can cause allergic skin reactions. See Methyl-p-Hydroxybenzoate. GRAS

2-METHYLPENTANOL • Colorless flavoring with a pungent odor. ASP

4-METHYL-2,3-PENTANEDIONE • Flavoring. ASP. See Valeric Acid.

2-METHYL-2-PENTENOIC ACID • Flavoring. See Valeric Acid. ASP

METHYL-2-PENTENAL, 2-, 4- • Flavoring. See Valeric Acid. ASP

4-METHYL-3-PENTEN-2-ONE • Flavoring. See Valeric Acid. ASP

4-METHYL PENTYL-1,3-DIOXOLANE • Colorless to pale yellow liquid with a mild, fruity, pearlike odor. The JECFA found no safety concern at current levels of intake when used as a flavoring agent. ASP

6-METHYLPHENETHYL ALCOHOL • A synthetic berry, rose, melon, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Phenethyl Alcohol. ASP

METHYL-4-PHENYLBUTYRATE • Synthetic fruity flavoring used in floral, fruit, tropical fruit. See Benzene. ASP

METHYL PHENYL DISULFIDE • Flavoring. Natural occurrence in cocoa, meat, roasted meat, peanut, roasted peanut. Used in meat, mustard, and radish. EAF

3-METHYL-3-PHENYL GLYCIDIC ACID ETHYL ESTER • Flavoring. See Phenoic Acid and Ester. ASP

4-METHYL-1-PHENYL −2-PENTENAL • Synthetic flavoring with a pungent taste. ASP

METHYL PHENYL SULFIDE • Flavoring. See Methyl Phenyl Disulfide. EAF

2-METHYLPIPERDINE • Synthetic seafood flavoring used in cereal, cheese, corn chips, fish, and seafood. See Piperdine. EAF

METHYLPOLYSILICONE • An oily liquid used as an antifoaming agent, in fruit juices, and during winemaking and sugar refining. It is also used to prevent spattering in frying fats and oils. ASP

METHYL PROPANETHIOATE • Flavoring. Colorless liquid; fruity, milklike aroma. EAF

2-METHYL-1-PROPANETHIOL • Flavoring with tomato ketchup. Cheesy odor. Used in baked goods, cheese, seasoning, confections, cheese, fish oil.

2-METHYL-2-(METHYLDITHIO)PROPANAL • Synthetic flavoring. EAF

METHYL PROPENYL DISULFIDE • Pale yellowish mobile liquid flavoring with powerful, penetrating, sulfuraceous-herbaceous, oniony odor.

METHYL PROPYL TRISULFIDE • Flavoring found in allium, cocoa, and fenugreek and used in Camembert cheese, cheddar cheese, chocolate cocoa, fenugreek, garlic, onion, scallion. Irritant. Not for fragrance use. ASP

2-METHYLPYRAZINE • Nutty flavoring used in beef, nut, peanut. Occurs naturally in beef and peanut. See Pyrazine. ASP

METHYLPROTOCATECHUIC ALDEHYDE • See Vanillin. ASP

METHYL PROPIONATE • Methyl Propanoate. Methyl Propylate. Propanoic Acid Methyl Ester. Propionic Acid Methyl Ester. Used as an odor and flavor additive in apple, banana, cheese, cheddar cheese, coffee, currant, black currant, durian, feyoa, grape, brandy, guava, melon, watermelon, muskmelon, cantaloupe, papaya, plum brandy, and strawberry. Occurs naturally in apple, banana, brandy, apple brandy, cheese, cheddar cheese, coffee, honey, cooked pork, pork, and strawberry. Can be irritating to the skin. See Propanoic Acid.

3-METHYL-5-PROPYL-2-CYCLOHEXEN-1-ONE • Celery Ketone. Flavoring additive. The JECFA's latest evaluation in 2002 found the ADI (see) acceptable and had no safety concern at current levels of intake when used as a flavoring agent.

METHYL PROPYL DISULFIDE • Methyl Dithiopropane. Propyl Methyl Disulfide. A fragrance and flavoring used in garlic, mustard, onion, potato, radish, and tomato. Occurs naturally in beef, brassica oleracea, cabbage, chive, fenugreek, garlic, leek, onion, peanut, potato, and shallot.

2-METHYLPROPYL-3-METHYLBUTYRATE • 2-Methylpropyl 3-methylbutyrate. 2-Methylpropyl 3-methylbutanoate. Isobutyl isovalerate. Flavoring. At the latest JECFA (see) evaluation in 1997, it was given a temporary ADI (see).

2-METHYL-4-PROPYL-1,3-OXATHIANE • Flavoring found in passion fruit. Has a sulfurous, fatty, fruity-green, tropical fruit, grapefruit taste. It decreases tastes of spices and increases tastes of "alliaceous," "minty," tomato leaf flavorings.

2-(1-METHYLPROPYL)THIAZOLE • Flavoring. Colorless liquid with a raw, green, herbaceous odor.

METHYL 2-PYRROLYL KETONE • Woody odor used in herbal, smoke and wood. See Ketone. ASP

2-METHYL-3-TETRAHYDROFURANTHIOL • Flavoring that occurs naturally in beef. Clear liquid; roasted meat, sulfurous onion aroma.

7-METHYL-4,4A,5,6-TETRAHYDRO-2(3H)-NAPHTHALENONE • Insecticide.

2-METHYLTETRAHYDROTHIOPHEN-3-ONE • Flavoring agent. Latest evaluation by the JECFA in 1999 found its ADI acceptable with no safety concern at current levels of intake when used as a flavoring.

4-METHYL-5-THIAZOLE ETHANOL • Sweet, nut, soybean, meaty flavoring used in nutty food, meats, and sweet food.

2-METHYLTHIOACETALDEHYDE • Flavoring agent. The JECFA's latest evaluation was in 1999 and found the ADI (see) was acceptable with no safety concern at current levels of intake when used as a flavoring agent.

3-(METHYLTHIO)BUTANAL • Flavoring colorless to pale yellow liquid with green, musky, buchu odor. Used in potato. Not evaluated by the JECFA as yet.

4-(METHYLTHIO)BUTANOL • Flavoring sulfide with an onion, garlic taste, with a sulfury, potato, or green vegetable odor. Last evaluated by the JECFA in 2000. No ADI (see) was set but the committee said there was no safety concern. A thioether, it is involved in the production of specific compound classes, including agricultural chemicals, property-enhancing additives, pharmacological drugs, chemical resistant polymers, detergents, and rubber antioxidants.

1-, 4-, −3- (METHYLTHIO)-2-BUTANONE • Sweet, sulfurous, fruity flavor like arrowhead. The JECFA has no safety concern. Butanone is produced in large quantities. Nearly half of it is used in paints and other coatings because it will quickly evaporate. It dissolves many substances and is used as a solvent in processes involving gums, resins, cellulose acetate, nitrocellulose coatings, vinyl films, and as a denaturing agent for denatured alcohol, glues, and as a cleaning agent. It is not considered a large health threat.

(+/-)-3-(METHYLTHIO)HEPTANAL • Flavoring with a clear, colorless liquid. Cooked brown and roasted aroma. Safety not evaluated but FEMA (see) considers it GRAS as a flavoring but should not be used as a fragrance.

3-(METHYLTHIO)-1-HEXANOL • Methyl mercapto-1-hexanol. Flavoring for apple, cabbage, coffee, garlic, green, meat, melon, onion, passion fruit, and tomato.

Occurs naturally in passion fruit. Skin irritant. Oral toxicity not identified.

3-METHYLTHIOHEXENAL • Flavoring found in nature. Used in butter, citrus fruit, tropical fruit, grass, green. Oral toxicity not investigated. Skin irritant.

3-(METHYLTHIO)HEXYL ACETATE • Synthetic flavoring. The JECFA has no safety concern but has not investigated toxicology. See Methane and Hexanoic Acid.

2-(METHYLTHIO)METHYL-2-BUTENAL • Synthetic flavoring smells like burnt matches, cooked cabbage, or roasted onions. Not recommended for fragrance. Oral and skin toxicity not determined.

3-(METHYLTHIO)METHYLTHIOPHENE • Sulfur-containing flavoring. Clear, colorless liquid that tastes like cooked, brown, and roasted dairy aroma. A thiazole (see) derivative.

4-(METHYLTHIO)-2-OXOBUTANOIC ACID • Animal feed. See Butanoic Acid.

4-(METHYLTHIO)-2-PENTANONE • See Pentanoic Acid.

5-METHYL-2-THIOPHENECARBOXALDEHYDE • Flavoring ingredient found in bread and meat. See Thiozole.

o-(METHYLTHIO)PHENOL • Flavoring. See Phenol.

1-METHYLTHIO-2-PROPANONE • Flavoring. See Thiazole.

METHYLTHIO 2-(PROPIONYLOXY)PROPIONATE • Flavoring agent. Latest evaluation the JECFA in 1999. ADI (see) acceptable. The committee has no safety concern at current levels of intake when used as a flavoring agent.

3-(METHYLTHIO)PROPYL ACETATE • Flavoring. Colorless liquid with fatty, estery odor. Natural occurrence in apple beer whiskey and wine. Irritating to the skin.

3-METHYLTHIOPROPYL ISOTHIOCYANATE • Colorless to yellow liquid; radishlike, irritating aroma.

2-METHYL-3-TOLYLPROPIONALDEHYDE (MIXED O-,M-,P-) • Synthetic flavoring.

12-METHYLTRIDECANAL • Listed as "nature-identical" flavoring to be used in meat cooked flavors, fruit flavors.

3-METHYL-1,2,4-TRITHIANE • A nature-identical ingredient found naturally occurring in stewed beef, lamb, red deer, pork, chicken, and turkey; contributes a stewed beef juice flavor. Used to give an aroma to quick cook meats.

2-METHYLUNDECANAL • A synthetic flavoring additive, colorless, with a fatty odor. Used in a variety of foods. ASP

METOLACHLOR • An odorless, preemergent herbicide. FDA residue tolerances are 0.02 ppm in cattle, goats, sheep, hog fat, meat by-products, and

in eggs; 0.05 ppm as residue in cattle, goat, hog, sheep liver; 0.1 ppm as residue in corn grain and cottonseed; 0.3 ppm as residue in sorghum grain; 0.2 ppm as residue in soybean; 2 ppm as residue in or on sorghum forage, fodder; and 8 ppm as residue in or on corn forage or fodder.

METOSERPATE HYDROCHLORIDE • An animal drug used in chicken. The FDA limits residue to 0.02 ppm in chicken. Crystals from benzene and cyclohexane.

Used as a sedative. Poisonous by ingestion.

METSULFURON METHYL • A pre- and postemergent herbicide. FDA tolerances for residue in or on grain, green forage, hay, straw of barley and wheat, 0.05 to 20 ppm; 0.1 ppm as a residue in meat and meat by-products of cattle, hogs, and sheep; and 0.05 ppm as a residue in milk.

MEXICAN SAGE • See Oregano.

MG • The abbreviation for milligram, a unit of mass or weight in the metric system equal to one-thousandth (0.001) of a gram (0.035 ounces).

MG/KG • Milligrams per kilogram.

MG/KG BW • Milligrams per kilogram of body weight.

MG/KG/DAY • Milligrams per kilogram per day.

MG/L • Milligrams per liter.

MIBOLERONE • Crystalline solid used as an animal feed drug. A male hormone, it is used in dog food to increase growth. Caused adverse reproductive effects and birth defects in experimental animals.

MICHELLA ALBA EXTRACT • Flavoring from an Asian tree related to the magnolia. EAF

MICRO-ALGAL OIL (ULKENIA SP.) • For use as a direct food ingredient not to be combined with any other added oil that is a significant source of EPA or DHA. The company withdrew its notification for GRAS status in 2004.

MICROCAPSULES • Used for flavoring oils, these tiny vessels contain gelatin, arabinogalactan, silicon dioxide, glutaraldehyde, and octanal (see all).

MICROCRYSTALLINE CELLULOSE • Used in frozen desserts. No longer listed as GRAS. Limited in standardized products. See Cellulose.

MICROCRYSTALLINE WAX • Obtained from crude oil, subsequent to the removal of paraffin. Its characteristics resemble those of the natural waxes closely, including its high melting point, high viscosity, flexibility at low temperatures, and high cohesion and adhesion. It is used as a substitute for other waxes in laminating paper and foils. E

MICROPARTICULATED PROTEIN PRODUCT • Thickener and texturizer in frozen dessert products. May not be used to replace milk fat in standardized frozen desserts. GRAS. NIL

MIEHEI or MUCOR PUSILLUS • Enzyme used to clot milk for making cheese.

MILFOIL • See Yarrow.

MILK • Milk may be a hidden ingredient in cream of rice, macaroni, filled candy bars, Ovaltine, junket, prepared flours, frankfurters, and other sausages. Some people are allergic to milk. See also Nonfat Dry Milk. The FDA ruled, starting January 1, 1998, that lower-fat milk products must follow the same criteria as most other foods labeled “low fat.” This means that such products as 2 percent milk, which contains about 5 grams of fat per serving, cannot be labeled “low fat” because the fat content is more than 3 grams per serving, which is the upper limit permitted in food products labeled “low fat.” Actually, 2 percent milk has two-thirds the fat of whole milk. Milk with zero fat can be called “fat free” or “nonfat” instead of “skim,” and 1 percent milk is “low fat.” Whole milk normally contains 3.25 percent milkfat or 8 grams of fat per serving (a serving is defined as 1 cup). Cows' milk is not recommended by the American Academy of Pediatrics for children under one year old. Babies fed with whole milk receive inadequate amounts of vitamin E, iron, and essential fatty acids. These babies also receive too much protein, sodium, and potassium, whose levels may be too high for the body of a baby. In addition, proteins and fats of whole milk are more difficult to digest and to be absorbed by a baby. Feeding babies with breast milk or iron-fortified formula, along with juices and solid foods suitable for their age, during the first year of life, provides more balanced nutrition. Skim milk or 2 percent (low fat) should not be included in the diet of a child under one year, because it provides too much protein, potassium, and sodium, but not enough calories for the growing child. Children also need fat for proper growth and development, including brain development.

MILK-CLOTTING ENZYME FROM ASPERGILLUS ORYZAE RECOMBI-

NANT • Fungi additive used to tenderize meat and make cheese. Although it involves genetic alteration, the FDA has no safety concerns about it. EAF

MILK-CLOTTING ENZYME FROM BACILLUS CEREUS • Used to clot milk in cheese making. NUL

MILK-CLOTTING ENZYME FROM ENTOTHIA PARASÍTICA, MUCOR PUSILLUS • Used to clot milk for cheese making. ASP

MILK-DERIVED LACTOFERRIN • See Lactoferrin. GRAS

MILK POWDER, WHOLE, ENZYME MODIFIED • Enzyme-modified milk powder may be prepared with GRAS enzymes from reconstituted milk powder, whole milk, condensed or concentrated whole milk, evaporated milk, or milk powder. The lipolysis is maintained at a temperature that is optimal for the action of the enzyme until appropriate acid development is attained. The enzymes are then inactivated. The resulting product is concentrated or dried. ASP

MILLET EXTRACT • An extract of the seeds of Panicum miliaceum.

MILLIGRAM (mg) • A metric unit of weight equal to one-thousandth of a gram (see). Food labels list cholesterol and sodium in milligrams (mg) per serving.

MILO STARCH • See Modified Starch. GRAS

MIMOSA, ABSOLUTE • Acacia decurrens. Black Wattle Flowers. Reddish yellow solid with a long-lasting, pleasant odor resembling ylang-ylang. Derived from trees, shrubs, and herbs native to tropical and warm regions. Mimosa droops and closes its leaves when touched. A natural flavoring additive used in raspberry and fruit flavorings for beverages, ice cream, ices, candy, and baked goods. May produce allergic skin reactions. ASP

MINERAL OIL • White Oil. A mixture of refined liquid hydrocarbons (see) derived from petroleum. Colorless, transparent, odorless, and tasteless. It is used as a defoaming component in the processing of beet sugar and yeast; as a coating for fresh fruits and vegetables; a lubricant and binder for capsules and tablets, supplying small amounts of flavor in spice condiments and vitamins. Also employed as a lubricant in food-processing equipment; a dough-divider oil; pan oil; and a lubricant in meatpacking plants. It is also used in confectionery as a sealant. When heated, it smells like petroleum. May inhibit absorption of digestive fats and it has a mild laxative effect. A human cancer-causing additive by inhalation. Causes birth defects if inhaled by humans and also causes testicular tumors in the fetus. An eye irritant. FDA tolerances include: 200 ppm in dried fruits and vegetables from use as a releasing additive in drying pans; less than 0.095 percent in meat from use as hot melt coating; less than 0.10 percent in egg white solids; and less than 0.06 percent as a releasing additive, binder, and/or lubricant in or on capsules or tablets containing concentrates

of flavors, spices, condiments, and nutrients intended for addition to food. The JECFA (see) requested in June 1998 that studies of the compositional factors in mineral oils that influence their absorption and toxicity be done in rats for at least one year. In addition, a one-year study of the potential effects on the immune system was requested. ASP

MINTLACTONE • Flavoring additive. See Pennyroyal Oil. EAF

MISC • The FDA abbreviation for miscellaneous.

MITICIDE • Pesticide to kill tiny mites.

MITOCHONDRIA • Principal energy source of the cell. Mitochondria convert nutrients into energy as well as doing many other specialized tasks, including manufacturing proteins such as collagen and keratin as well as cell repair.

MIXED BETA-GLUCANASE AND XYLANASE ENZYME PREPARATION FROM HUMICOLA INSOLENS • Used in the brewing industry as an enzyme for clarifying beer. Based on the information provided by Novozymes, as well as other information available to the FDA, the agency has no questions at this time regarding Novozymes's conclusion that mixed β-glucanase and xylanase enzyme preparation is GRAS under the intended conditions of use.

MIXED CARBOHYDRASE and PROTEASE ENZYME PRODUCTS • Enzymes. See Enzymes. GRAS

ML • The abbreviation for maximum level.

MOCA • Bis Amine. Curalin M. Packaging adhesive prohibited from indirect addition to human food from food contact surface. IARC, EPA Genetic Toxicology Program, and Community Right-to-Know List (see all) were concerned about this additive. Moderately toxic by ingestion. Caused cancer and tumors in experimental animals.

MODIFIED CELLULOSE • See Cellulose Gums.

MODIFIED FIBERS • Bran and cotyledon-source cereal fibers receive minimal processing compared with the concentrated, modified fibers. For the most part, the modified versions also come from cereal grains, but they are categorized separately because they are so different. Typically, these fibers are noncaloric, contain 90 percent or more total dietary fiber, are very bland, and have a very light color. Water-absorption properties are typically improved.

MODIFIED HOP EXTRACT • Flavoring in Beer. See Hops.

MODIFIED SEA SALT • Salts derived from seawater with a reduced sodium chloride content.

MODIFIED STARCH • Ordinary starch that has been altered chemically to modify such properties as thickening or jelling. Babies have difficulty digesting starch in its original form. Modified starch is used in baby food on the theory that it is easier to digest. Questions about safety have arisen because babies do not have the resistance of adults to chemicals. Among chemicals used to modify starch are propylene oxide, succinic anhydride, 1-octenyl succinic anhydride, aluminum sulfate, and sodium hydroxide (see all). On the FDA top priority list for reevaluation since 1980. Nothing new reported by the FDA since.

MOENOMYCIN • Bambermycin. Menomycin. An antibiotic produced by Streptomyces roseoflavus used as an animal feed drug for poultry, calves, and swine. An eye and skin irritant. Moderately toxic by ingestion.

MOLASSES, CONCENTRATE • Dark-colored, thick liquid drained off from raw cane or beet sugar. The ingredient is kosher since it is neither meat nor dairy. Used in steak and barbecue sauces and in animal feed. GRAS. EAF

MOLASSES EXTRACT • Saccharum officinarum. Extract of sugarcane, a thick, brown, viscid syrup. Separated from raw sugar in the successive processes of sugar manufacture and graded according to its quality. It is a natural flavoring additive for candy, baked goods, ice cream, and medicines. GRAS. ASP

MOLECULAR SIEVE RESINS • Used in processing to trap small unwanted particles. NUL

MOLLUSCICIDE • Pesticide that kills snails and slugs.

MOLYBDENUM • A dietary supplement. The dark gray, powdered mineral is a trace element in animal and plant metabolism. Resembles chromium and tungsten in many of its properties. Low toxicity.

MONENSIN • A broad-spectrum antibiotic, obtained from the actinomycete Streptomyces cinnamonensis and used chiefly as an additive to beef cattle feed. Antibiotic used for animals to speed growth. Not to be used in horses because of its toxicity in this species. Large doses in cattle and normal doses in horses cause sudden death due to heart failure. Signs include jugular engorgement, fluid retention, and nausea. Monensin also increases chances of nitrite poisoning occurring in ruminants fed on high-nitrate rations. See pages 383–384.

MONOAMINE OXIDASE • MAO. An enzyme that acts in the nervous system to break down certain types of neurotransmitters (chemical messengers sent between nerve cells) such as dopamine, norepinephrine, and serotonin (see all).

MONOAMINE OXIDASE INHIBITOR MEDICATIONS • MAOIs. A class of antidepressant medications usually prescribed for people who have certain forms of depression with symptoms including an increase in weight, appetite, or sleep. MAOIs may also be used for cases of mixed anxiety and depression, depression accompanied by pain, panic disorder, posttraumatic stress disorder, and bipolar depression. The drug works by raising the level of neurotransmitters by preventing their destruction by enzymes. People taking MAOIs must adhere to a special diet because of the interaction of the medications with certain foods. Foods that contain tyramine such as cheese, yogurt, sour cream, beef or chicken livers, and red wines should be avoided. The combination of MAOIs and tyramine can shoot up blood pressure to dangerous levels. Symptoms include headache, increased or decreased heart rate, nausea and vomiting, sweating, fever or cold clammy skin, and chest pain.

MONARDA SPECIES • See Horsemint Leaves Extract.

MONESIN • Antibiotic isolated from Streptocyces cinnamonensis. Used in feed to combat parasites and fungus infections. It is also used to increase weight gain in cattle. FDA residue limits are 0.05 ppm in edible tissues of cattle, 1.5 ppm in muscle tissue of chicken and turkey, 3 ppm as residue in skin with fat of chicken and turkey, and 4.5 ppm as residue in liver of chicken. Used as a medicated block for cattle, in liquid feed for cattle, and in goat feed.

4-MONOAMINOPHOSPHATIDE • See Lecithin.

MONOAMMONIUM GLUTAMATE • Potassium salt from glutamic acid (see), a natural amino acid (building block of protein). Commercially prepared from molasses by bacterial fermentation. Also prepared from vegetable protein, such as gluten, or soy protein. Glutamic acid and glutamates are present in all proteins. Free glutamates are present in high concentrations in ripened cheese, breast milk, tomatoes, and sardines. Used as a flavor enhancer. Glutamic acid and glutamates have the specific umami taste and enhance many other flavors, thereby reducing the amounts of salt needed in a product. Potassium glutamate is mainly used in low-salt (low-sodium) products. Acceptable daily intake (ADI) has not been determined but it may not be used in products intended for children under twelve weeks. GRAS. ASP. E

MONOAZO COLOR • A dye made from diazonium and phenol, both coal-tar derivatives. See Coal Tar.

MONOBASIC CALCIUM PHOSPHATE • Sequestrant. GRAS

MONOCALCIUM ORTHOPHOSPHATE • Acidity regulator, flour treatment, firming additive, texturizing agent, raising agent, anticaking additive, moisture-retention agent. See Phosphate.

MONOCALCIUM PHOSPHATE • Calcium Phosphate. Monobasic. Buffer and neutralizing additive in self-rising cereal flours or meals. The FDA allows residues of up to 0.75 parts per 100 parts of flour; 4.5 parts including sodium bicarbonate per 100 parts of cereal product; 75 percent in phosphated flour, in self-rising cereal flours or meals; in fruit butters, jellies, and preserves; 0.1 percent in finished product of canned vegetables. See Calcium Phosphate. GRAS

MONOCHLORACETIC ACID • Chloroacetic Acid. MCA. A preservative and adhesive. Any amount in beverages and other food will be considered adulterated by the FDA. BAN

MONO- AND DIGLYCERIDES • Monosodium phosphate derivatives are multipurpose food additives. They are synthesized from mono- and diglycerides obtained from edible sources by reaction with phosphorus pentoxide. They are used in foods as emulsifiers (to obtain a uniform texture), lubricants and release agents (to prevent sticking), and surface-active agents (to modify liquid foods). These additives receive an "NS" rating because they may be synthesized from animal sources. They are considered GRAS as emulsifiers, lubricants, and surface-active agents in dairy product analogs and soft candy when used in accordance with good manufacturing practices. NS (see) NUL. Sodium sulfoacetate derivate is an ingredient in margarine. This additive receives an NS rating because it may be synthesized from animal sources. The ingredient requires rabbinic supervision to be authorized as kosher because it may be obtained from meat and dairy origins. ASP

MONO- AND DIGLYCERIDES, DIACETYLTARTARIC ACID ESTERS • Mixed glycerol esters of mono- and diacetyltartaric acid and fatty acids of food fats. Made by the interaction of diacetyltartaric anhydride and mono- and diglycerides. The commercial product often consists of mixtures of the product described above with mono-and diglycerides. The esters range in appearance from sticky, viscous liquids through a fatlike consistency to yellow waxes that hydrolyse in moist air to liberate acetic acid. Used as an emulsifier. The JECFA (see) Emulsifier Committee first assessed the health safety of this compound, and considered only its use as an emulsifier in food generally. The committee set a temporary ADI of 25 mg/kg bw for general food uses. ASP

MONO- AND DIGLYCERIDES, ESTERS • Synthetic fats, produced from glycerol (see), natural fatty acids and other organic acids (acetic, lactic, tartaric, citric). The fatty acids are mainly from plant origin, but also fats of animal origin may be used. The product generally is a mixture of different components, with a composition similar to partially digested natural fat esterified with other natural acids. Used as emulsifiers and stabilizers in many products. ADI not determined. No known side effects. The products are first digested to the individual acids and the fats. The body metabolizes all components as it does to the normal acids and natural fat. The individual components of the mono- and diglycerides are also produced normally in the body when digesting normal fat. Although mainly vegetable oils are used, the use of animal fat (including pork) cannot be excluded. Several groups, such as vegans, Muslims, and Jews thus avoid these products. Only the producer can give detailed information on the origin of the fatty acids. Chemically the fatty acids from vegetable or animal origin are identical.

MONO- AND DIGLYCERIDES, ETHOXYLATED • This additive is synthetically produced from mono- and diglycerides obtained from edible sources. It is used as an emulsifer to obtain a uniform texture for yeast-leavened bakery products, cakes, cake mixes, vegetable oil, toppings, icing, icing mixes, frozen desserts, and milk substitutes. If this ingredient is in a product, its name will appear on the label. This ingredient may not be used in foods at levels exceeding established good manufacturing practice as defined by the FDA. These concentration levels are as follows: yeast-leavened bakery products, by weight of flour .50 percent; cakes and cake mixes, by weight of dry ingredients .50 percent; whipped vegetable toppings and topping mixes, by weight of finished product .45 percent; icing and icing mixes, by weight of finished icing .50 percent; frozen desserts, by finished weight .20 percent; artificial dried creamers, by weight of finished water-fat emulsions .40 percent. This additive receives an NS rating because it may be synthesized from animal sources. ASP

MONO- and DIGLYCERIDES of FATS or OILS • Mono- and diglycerides of edible fat-forming acids used as emulsifiers in oleomargarine. See Glycerides. GRAS. E

MONO- AND DIGLYCERIDES, LACTIC ACID ESTERS AND SODIUM AND CALCIUM SALTS • See Mono- and Diglycerides, Diacetyltartaric Acid Esters. ASP

MONO- AND DIGLYCERIDES, MONOSODIUM PHOSPHATE DERIVATIVES • See Mono- and Diglycerides, Diacetyltartaric Acid Esters. ASP

MONO- AND DIGLYCERIDES, SODIUM SULFOACETATE DERIVATIVES • See Mono- and Diglycerides, Diacetyltartaric Acid Esters. ASP

MONOETHANOLAMINE • Used in flume water for washing sugar beets prior to slicing. See Ethanolamine. ASP

MONOGLYCERIDES, ACETYLATED • Lipids that are fatty-acid esters of glycerol (see) and acetlylated used as an emulsifier. ASP

MONOGLYCERIDE CITRATE • Aids the action of and helps dissolve antioxidant formulations that retard rancidity in oils and fats. See Citrate Salts for toxicity. ASP

MONOGLYCERIDES DISTILLED • Used to treat mastitis in dairy animals.

MONOGLYCERIDES OF FATTY ACIDS • Stabilizers in shortenings. See Fatty Acids.

MONOGLYCEROL CITRATE • A preservative. See Glycerols.

MONOISOPROPYL CITRATE • A sequestrant and plasticizer and antioxidant aid used in fats, lard, meat, oleomargarine, packaging materials, sausage, and shortening. See Isopropyl Citrate. GRAS. NUL

MONOMENTHYL GLUTARATE, L- FLAVORING AGENT • Latest evaluation in 2004 was that the ADI was acceptable. There are no safety concerns at current levels of intake when used as a flavoring agent. EAF

MONOMENTHYL SUCCINATE • Flavoring that is used as a "cooling ingredient" because it releases menthol (see). EAF

MONOMER • A molecule that by repetition in a long chain builds up a large structure or polymer (see). Ethylene, the gas, for instance, is the monomer of polyethylene (see).

MONOMETHYLTIN • MMT. An organotin widely used as a heat stabilizer in PVC and CPVC piping, which results in its presence in drinking water supplies. Organotin-stabilized PVC is used in water pipes and in food-packaging applications. Concern for neurotoxicity produced by organotin exposure during development has been raised by published findings of a deficit on a runway learning task in rat pups perinatally exposed to MMT.

MONOPOTASSIUM GLUTAMATE • Flavor enhancer and salt substitute used on meat. In the EPA Genetic Toxicology Program (see). Mildly toxic by ingestion. Human systemic effects by ingestion: headache. See Glutamate. GRAS. ASP. E

MONOPOTASSIUM PHOSPHATE • A derivative of edible fat. Used as an emulsifying additive in food products and as a buffer in prepared cereal. Cleared by the USDA's Meat Inspection Department to decrease the amounts of cooked-out juices in canned hams, pork shoulders, pork loins, chopped hams, and bacon. Monosodium phosphate is a urinary acidifier. GRAS.

MONOSACCHARIDE LACTATE CONDENSATE • The condensation product of sodium lactate and the sugars glucose, fructose, ribose, glucosamine, and deoxyribose.

MONOSODIUM GLUTAMATE • See MSG.

MONOSODIUM METHYLARSONATE • Arsonate Liquid. Weed-E-Rad. An herbicide used on animal feed and cottonseed hulls. FDA residue limit is 0.9 ppm in cottonseed hulls when used for animal feed. Arsenic and its compounds are on the Community Right-to-Know List and in the EPA Genetic Toxicology Program (see both). Moderately toxic by ingestion. A skin and eye irritant. The MTD (maximum tolerated dose) is the highest dose of a chemical that does not alter the life span or severely affect the health of an animal. Only one of several forms of free glutamate used in foods. Free glutamate may also be present in a wide variety of other additives, including hydrolyzed vegetable proteins, autolyzed yeast, hydrolyzed yeast, yeast extracts, soy extracts, protein isolate, "spices," and "natural flavorings." The food additives disodium inosinate and disodium guanylate are useful only in synergy with MSG-containing ingredients and provide a likely indicator of the presence of MSG in a product. For this reason, FDA considers labels such as "No MSG" or "No Added MSG" to be misleading if the food contains ingredients that are sources of free glutamate, such as hydrolyzed protein.

MONOSTARCH PHOSPHATE • A modified starch (see). The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. E

MONOTERPENES • Found in parsley, carrots, broccoli, cabbage, cucumbers, squash, yams, tomatoes, eggplant, peppers, mint, basil, citrus fruits, they have some antioxidant properties. Have been found to inhibit cholesterol production and aid protective enzyme activity.

MONOUNSAT FAT • The listing on food labels for monounsaturated fat (see).

MONOUNSATURATED FATS • The saturation of fat refers to the chemical structure of its fatty acids. Saturated fats, which are hard at room temperature—lard, suet, and butterfat are examples—consist primarily of fatty acids that contain a full load of hydrogen atoms. Monounsaturated fatty acids, however, can accept two additional hydrogen atoms. Fats that contain primarily monounsaturated fatty acids are liquid at room temperature but may become thickened when refrigerated. Polyunsaturated fats, which are liquid at room temperature, remain so even in the refrigerator and consist mainly of fatty acids that can hold four or more additional hydrogen atoms. Examples of polyunsaturated fats are safflower and corn oil.

Examples of monounsaturated fats are olive oil, rapeseed oil, cashew oil, and avocado oil. Once thought to be neutral, monounsaturated fats may be beneficial for blood cholesterol levels. This concept evolved from epidemiological studies of populations who have a diet high in monounsaturated and a lower artery disease rate than populations eating a high saturated fat diet. Some even suggest that monounsaturated fats may be even better than polyunsaturates in preventing heart disease. Monounsaturated fats are manufactured normally by the body and are believed to be less likely to have some of the side effects thought to occur with polyunsaturates.

MONTAN WAX FATTY ACIDS OXIDATIVELY REFINED, POLYHYDRIC ALCOHOL DIESTERS • Permitted for coating on foods. See Fatty Acids. EAF. E

MORANTEL • Paratect. Suiminth. A worm medicine used to treat cattle that leaves residues in beef and milk. The FDA limits residues to 1.2 ppm to 4.8 ppm in cattle and to 0.4 ppm in milk.

MORELLONE • See 3-Benzyl-4-Heptanone.

MORPHOLINE • Salt Fatty Acid. Coating on fresh fruits and vegetables. Broad industrial uses. A cheap solvent for resins, waxes, and dyes. Also used as a corrosion inhibitor, antioxidant, plasticizer, viscosity improver, insecticide, fungicide, local anesthetic, and antiseptic. Irritating to the eyes, skin, and mucous membranes. It may cause kidney and liver injury and can produce sloughing of the skin. See Diethanolamine for potential cancer hazard. NIL

MORPHOLINE FATTY ACID SALTS • See Morpholine. NUL

MORPHOLINE STEARATE • A coating and preservative. See Morpholine.

MOS • The abbreviation for margin of safety.

MOSCHUS MOSCHIFERUS • See Musk Tonquin.

MOUNTAIN ASH EXTRACT • The extract from the berries of a European tree or shrub, Sorbus aucuparia, used as an antioxidant. High in vitamin C, it has been used by herbalists to cure and prevent scurvy and to treat nausea.

MOUNTAIN MAPLE BARK • See Mountain Maple Extract. EAF

MOUNTAIN MAPLE EXTRACT • Acer spicatum lam. Extract from a tall shrub or bushy tree found in the eastern United States. Used in chocolate, malt, and maple flavoring for beverages, ice cream, ices, candy, and baked goods. NUL

MOUNTAIN MAPLE EXTRACT SOLID • Acer spicatum. Flavoring that occurs in mountain maple tree sap; used in baked goods and candy. ASP

MOXIDECTIN • Cydectin. Antibacterial used for treatment and control of infections and infestations of certain internal and external parasites. The FDA allows an 0.5 percent solution as a pour-on for beef and nonlactating dairy cattle at 500 micrograms per kilogram of body weight. The ADI (see) is 4 mg/kg/day and residue tolerance in cattle is 50 ppb in muscle and 200 ppb in liver.

MPI • The abbreviation for maximum permissible intake. A limit established by EPA, usually expressed as mg/day for a 60 kg person, which is used to determine the level of pesticide residues permitted on crops for human consumption.

MSG • Monosodium Glutamate. Accent. Zest. The monosodium salt of glutamic acid (see), one of the amino acids. Occurs naturally in seaweed, sea tangles, soybeans, and sugar beets. Used to intensify meat and spice flavorings in meats, condiments, pickles, soups, candy, and baked goods. Believed responsible for the so-called Chinese restaurant syndrome in which diners suffer from chest pain, headache, and numbness after eating a Chinese meal. Causes brain damage in young rodents and brain damage effects in rats, rabbits, chicks, and monkeys. Baby-food processors removed MSG from baby-food products. Depression, irritability, and other mood changes have been reported. On the FDA list of additives needing further study for mutagenic, teratogenic, subacute, and reproductive effects. Studies have shown that MSG administered to animals during the neonatal period resulted in reproductive dysfunction when both males and females became adults. Females treated with MSG had fewer pregnancies and smaller litters, while males showed reduced fertility. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that although no evidence in the available information on it demonstrates a hazard to the public at current use levels, uncertainties exist and require that additional studies be conducted. In 1995, a report from the Federation of American Societies for Experimental Biology (FASEB), an independent body of scientists that advises the FDA, identified two groups of people who may develop a condition, "MSG symptom complex." One group is those who may be intolerant to MSG when eaten in large quantities. The second is a group of people with severe, poorly controlled asthma. In addition to being prone to MSG symptoms, these people may suffer temporary worsening of asthmatic symptoms after consuming MSG. The MSG dosage that produced reactions ranged from 0.5 grams to 2.5 grams. This report made the FDA propose that foods containing significant

The MSG dosage that produced reactions ranged from 0.5 grams to 2.5 grams. This report made the FDA propose that foods containing significant amounts of free glutamate (not bound in protein along with other amino acids) declare glutamate on the label. In 2008, a new study reported people who use MSG as a flavor enhancer in their food are more likely than people who don't use it to be overweight or obese, even though they have the same amount of physical activity and total calorie intake, according to a University of North Carolina at Chapel Hill School of Public Health. The study was published in the August 2008 issue of the journal Obesity.

MSG is only one of several forms of free glutamate used in foods. Free glutamate may also be present in a wide variety of other additives, including hydrolyzed vegetable proteins, autolyzed yeast, hydrolyzed yeast, yeast extracts, soy extracts, protein isolate, "spices," and "natural flavorings." The food additives disodium inosinate and disodium guanylate are useful only in synergy with MSG-containing ingredients and provide a likely indicator of the presence of MSG in a product. For this reason, FDA considers labels such as "No MSG" or "No Added MSG" to be misleading if the food contains ingredients that are sources of free glutamate, such as hydrolyzed protein. In 1993, FDA proposed adding the phrase "contains glutamate" to the common or usual names of certain protein hydrolysates that contain substantial amounts of glutamate. For example, if the proposal were adopted, hydrolyzed soy protein would have to be declared on food labels as "hydrolyzed soy protein (contains glutamate)." GRAS status has continued since 1980 as tests are reputedly being completed and evaluated. ASP

MUCILAGE • A solution in water of the sticky principles of vegetable substances. Used as a soothing application to the mucous membranes.

MUCOSA • Mucous membrane lining the digestive tract.

MUCOUS MEMBRANES • The thin layers of tissues that line the respiratory and intestinal tracts and are kept moist by a sticky substance called mucous. These membranes line the nose and other parts of the respiratory tract, and are found in other parts of the body that have communication with air.

MUGWORT • The extract of the flowering herb Artemisia absinthium. See Wormwood and Sesquiterpene Lactones.

MUIRA PUAMA EXTRACT • A wood extract used as an aromatic resin and fat.

MULBERRY EXTRACT • An extract of the dried leaves of various species of Moms, which produces a purplish black dye. It is also a potential hydrocolloid (see).

MULLEIN FLOWERS • The flowers from common mullein, Verbascum thapsus. Used as a flavoring in alcoholic beverages only. ASP

MUSHROOM EXTRACT • The extract of various species of mushrooms used as an oil and plasticizer.

MUSK • The dried secretion from preputial follicles of the northern Asian small hornless deer, which has musk in its glands. Musk is a brown, unctuous, smelly substance associated with attracting the opposite sex and is promoted by stores for such purposes. As musk ambrette it is used in fruit, cherry, maple, mint, nut, black walnut, pecan, spice, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, pudding, and chewing gum. Musk tonquin is used in fruit, maple, and molasses flavorings for beverages, ice cream, ices, candy, baked goods, and syrups. As musk ketone it is used in chewing gum and candy. At one time musk was a stimulant and nerve sedative in medicine. Can cause allergic reactions. GRAS

MUSK AMBRETTE • Found to have neurotoxic properties. This was first discovered in 1967 when mice were fed varying levels of musk ambrette. Since dietary consumption of musk ambrette is generally very low, the impact was discounted and no assessment was made of exposures from fragranced products. In 1985, after studies were published on the neurotoxic effect and it was determined that the musk ambrette was readily absorbed through the skin, the fragrance industry recommended that musk ambrette not be used in direct skin contact products. Musk ambrette had been used in fragranced products before the 1920s. It reportedly damages the myelin, the covering of nerve fibers. It can cause photosensitivity (see) and contact dermatitis. Musk ambrette is still used in food but not in cosmetics. ASP

MUSK KETONE • Among the nitro musks, musk ketone (MK) as a synthetic compound with a typical musk odor is widely used in cosmetics and is permitted as a food additive. Exposure to it, experiments in animals and with human cells indicate, might increase the susceptibility to health hazards caused by carcinogens in humans. ASP

MUSK TONQUIN • Moschus moshieferus. Derived from Siberian deer musk. At the posterior part of its abdomen, there is a small sac situated immediately under the skin, which opens a little in front of the preputial orifice, and which is filled with a thick fluid, abounding particularly in the rutting season. This fluid, in the dried state, is musk. It is removed from the animal in its sac and dried in this state for exportation. Synthetic musk tonquin is on the American market. GRAS. EAF

MUSTARD • Black, Brown, and Red. Pulverized dried, ripe seeds of the mustard plant (Brassica nigra) grown in Europe and Asia and naturalized in the United States. Used in mustard and spice flavorings for condiments (5,200 ppm) and meats (2,300 ppm). Used as an emetic. It has an intensely pungent odor that can be irritating. It is a strong skin blisterer. Can cause allergic reactions. May cause a sensitivity to light. On the FDA list of products to be studied for possible mutagenic, teratogenic, subacute, and reproductive effects. GRAS. ASP

MUSTARD • Yellow and White. The pulverized dried, ripe seeds of the mustard plant (Brassica alba) grown in Europe and Asia and naturalized in the United States. Used in sausage and spice flavoring for beverages, baked goods, condiments (8,200 ppm), meats, and pickles (3,800 ppm). Used as an emetic. See Mustard, Black, for toxicity. GRAS. ASP

MUSTARD FLOUR • Made from the preground seeds and is quite hot. It is used as a base in prepared mustards and many barbecue rubs. ASP

MUSTARD OIL • See Allyl Isothiocyanate. ASP

MUSTARD, ORIENTAL • As the name implies, oriental mustard originated in China. This seed is golden yellow in color with seed diameter about 2 mm. Volatile oil is present at approximately 1 percent, which gives oriental mustard a hot pungent taste with an inherent bitter note. Protein content is lower than in yellow mustard and there are no gums present in the bran. ASP

MUTAGEN • An agent that causes a permanent genetic change in a cell other than that which occurs during normal genetic recombination. A substance that induces mutation (see).

MUTAGENIC • Having the power to cause mutations. A mutation is a sudden change in the character of a gene that is perpetuated in subsequent divisions of the cells in which it occurs. It can be induced by the application of such stimuli as radiation, certain food chemicals, or pesticides. Certain food additives such as caffeine have been found to "break" chromosomes.

MUTAGENICITY • The ability of a substance to produce a detectable and heritable change in genetic material that may be transmitted to the offspring of affected individuals through germ cells (germinal mutation) or from one cell generation to another within the individual (somatic mutation).

MUTATION • A change in the genetic material of the cell structure that is passed from one generation to the next.

MYCLOBUTANIL • A systemic fungicide used on fruits. The FDA limits residue to 5 ppm in apple or grape pomace for feed; 10 ppm in grapes and raisins; 25 ppm in raisin waste; 0.05 ppm residue in meat, fat, and meat by-products of cattle, goats, hogs, poultry, and sheep; 0.3 ppm residue in liver of cattle, goats, hogs, poultry, and sheep; 0.02 ppm in eggs.

MYCOBUTANOL • A fungicide. The FDA allows 5 ppm residue in apples; 10 ppm residue in grapes; 10 ppm residue in raisins; 25 ppm in raisin waste; 0.05 ppm in meat, fat, and meat by-products of cattle, goats, hogs, poultry, and sheep; and 0.3 ppm residue in liver of cattle, goats, and hogs.

MYCOPROTEIN • A food made by continuous fermentation of the fungus Fusarium gramineurum. The fungus is grown in a large fermentation tower to which oxygen, nitrogen, glucose, minerals, and vitamins are continually added. After harvesting, the fungus is heat treated to reduce its RNA content to JECFA recommended levels before being filtered and drained. The resulting sheet of fungal mycelia is mixed with egg albumen, which acts as a binder. Flavoring and coloring may also be added. The mycoprotein is then textured to resemble meat, before being sliced, diced, or shredded. A range of food products based on mycoprotein have been manufactured and sold in Europe. The line of mycoprotein products includes burgers, fillets, and nuggets; deli slices; and ready-to-eat meals in chilled and/or frozen formats. Mycoprotein is claimed to be a source of protein, fiber, biotin, iron, and zinc, and is low in saturated fat. The FDA said in 2008 it has no questions about it. GRAS

MYRCENE • A synthetic flavoring additive that occurs naturally in galbanum oil, pimenta oil, orange peel, palma rosa oil, and hop oil. Pleasant aroma. Used in fruit, root beer, and coriander flavorings for beverages, ice cream, ices, candy, and baked goods. A moderate skin and eye irritant. Found to cause birth defects in experimental animals. ASP

MYRISTALDEHYDE • A synthetic citrus and fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

MYRISTIC ACID • Used in shampoos, shaving soaps, and creams. A solid organic acid that occurs naturally in butter acids (such as nutmeg butter to the extent of 80 percent), oil of lovage, coconut oil, mace oil, cire d'abeille, in palm seed fats, and in most animal and vegetable fats. Used in butter, butterscotch, chocolate, cocoa, and fruit flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. A human skin irritant. Causes mutations in laboratory animals. ASP

MYRISTYL ALCOHOL • See Fatty Alcohols. ASP

MYROXYLON • See Balsam Peru.

MYRRH • Extract. Gum. Oil. One of the gifts of the Magi, it is a yellowish to reddish brown, aromatic bitter gum resin that is obtained from various trees, especially from East Africa and Arabia. Used by the ancients as an ingredient of incense and perfumes and as a remedy for localized skin problems. The gum is used in fruit, liquor, tobacco, and smoke flavorings for beverages, baked goods, ice cream, ices, candy, chewing gum, and soups. The oil is used in honey and liquor flavorings for beverages, ice cream, ices, candy, and baked goods. The gum resin has been used to break up intestinal gas and as a topical stimulant. EAF

MYRTENOL • Flavoring. A constituent of myrtle oil, it is the unsaturated primary alcohol. See Myrtle Oil. The JECFA (see) said it has no safety concern. ASP

MYRTLE LEAVES • Myrtus communis. The extract of the leaves of Myrtus communis, a European shrub, used as a flavoring in alcoholic beverages only. There is no reported use of the chemical and there is no toxicology information available. NUL

MYRTENYL ACETATE • Flavoring. The JECFA said it has no safety concern. NUL

MYRTLE OIL• Myrtus communis. A native of the Mediterranean, the plant has been a symbol of innocence for many centuries. In fact, Aphrodite, the Greek goddess of beauty and love, apparently found refuge in a myrtle bush after she was created as a beautiful nude woman. Steam distillation is used on the leaves, twigs, and flowers. The most important constituents of myrtle oil (up to 0.8 percent in the leaves) are myrtenol, myrtenyl acetate, limonene (23 percent), linalool (20 percent) (see all). It is used in folk medicine and reportedly relieves cramps. Used as a flavoring. Popular in aromatherapy and is said to be antibacterial. Myrtle should not be confused with wax myrtle (Myrica cerífera) or bog myrtle (Myrica gale) whose essential oils are toxic. EAF

MYRTRIMONIUM BROMIDE • See Quaternary Ammonium Compounds.

NAPHTHA • Obtained from the distillation of petroleum, coal tar, and shale oil. It is a solvent in color additive mixtures for shell eggs without penetration of color to interior of shell. It is a common dilutent (see). Found naturally in fossil fuels like coal and oil, it is produced when these fuels are burned and when tobacco or wood is burned. It has a strong odor that smells like tar or mothballs. Naphtha is an imprecise term because various fractions of petroleum may be called that. Among the common naphthas that are used as solvents are coal tar/naphtha and petroleum/naphtha. Naphthas are used as solvents for asphalts, road tars, pitches, paints, dry-cleaning fluids, in cleansing compounds, engraving and lithography, rubber cements, and naphtha soaps. Causes upper respiratory tract irritation. Although allowed as a food additive, there is no current reported use of the chemical, and, therefore, although toxicology information may be available, it is not being updated, according to the FDA. However, a search will show that many food additives, particularly synthetic flavorings, are derived from naphtha. NUL

NAPHTHALENE • A coal-tar (see) derivative. Used to manufacture dyes, solvents, fungicides, smokeless powder, lubricants, as a moth repellent, and a topical and internal antiseptic. Although you can be exposed to naphthalene from eating or drinking contaminated food and water, we are assured by the FDA these are not common sources of exposure. The amount of naphthalene found in food, however, is unknown. You can also be exposed if you touch clothes or blankets that have come into contact with naphthalene. Once inside the body, it can damage red blood cells (e.g., children who eat mothballs made with naphthalene can damage their red blood cells). It also changes into other chemicals and leaves the body through urine in just a matter of days. Animal studies showed that giving animals 2,300 parts per million (ppm) to 20,400 ppm of naphthalene in their food from 1 to 10 days (short term) reduced the litters of pregnant female mice, caused death in mice, increased the liver weight in rats, and caused cataracts in rabbits. Other symptoms of exposure include nausea, vomiting, diarrhea, and blood in the urine. Eating or breathing naphthalene caused cataracts in some animals, but it is not clear if it will have the same effect on humans. Cataracts can cloud vision, making it difficult to see. Naphthalene is one of seven high-quantity chemicals on the EPA's high-priority hazardous substance list and has been cited among toxic chemicals in use needing reduction. In one year, the total amount of napththalene produced is more than 10.2 million pounds—15 percent of all priority chemicals reported.

2-NAPHTHALENTHIOL • Derived from naphthalene (see), it has a disagreeable odor. It is used in the manufacture of food additives. ASP

6-NAPHTHYL ANTHRANILATE • A synthetic fruit and grape flavoring additive for beverages, ice cream, ices, baked goods, and candy. ASP

6-NAPHTHYL ETHYL ETHER • White crystals with an orange-blossom odor. Used in perfumes, soaps, and flavoring. ASP

6-NAPHTHYL ISOBUTYL ETHER • Fragarol. Flavoring. The JECFA says there is no safety concern but the EPA considers it a mutagen. See a-Pinene. ASP

6-NAPHTHYL METHYL ETHER • White crystals with a menthol odor. Used to perfume soaps. A synthetic berry, fruit, honey, and nut flavoring additive for beverages, ice cream, ices, chewing gum, candy, and baked goods. ASP

NARASIN • An antibiotic in broiler chicken feed that is used to combat parasites and as a growth stimulant. It is derived from Streptomyces aureofaciens. See Antibiotics. ASP

NARINGIN EXTRACT • Naringin is in the flowers, fruit, and rind of the grapefruit tree. Most abundant in immature fruit. Extracted from grapefruit peel. Used in bitters, grapefruit, and pineapple flavorings for beverages, ice cream, ices, and liquors. GRAS. ASP

NASTURTIUM EXTRACT • The extract of the leaves and stems of Tropaeolum majus. A member of the mustard family, it has pungent, tasty leaves. It is very rich in vitamins A and C as well as containing vitamins B and B2. It is soothing to the skin and supposedly has blood-thinning factors and increases the flow of urine.

NAT • The FDA abbreviation for natural.

NATAMYCIN • See Pimaricin. ASP

NATIONAL HEALTH and NUTRITION EXAMINATION SURVEY • NHANES. A series of surveys that include information from medical history, physical measurements, biochemical evaluation, physical examination, and dietary intake of population groups within the United States. The U.S. Department of Health and Human Services conducts the NHANES approximately every five years.

NATIONAL TOXICOLOGY PROGRAM • NTP. Under the aegis of the National Institute of Environmental Health Sciences, the NTP tests chemicals for all federal agencies upon request. The program's staff also tests for cancer-causing additives.

NATURAL • The Federal Trade Commission requires that food advertised as “natural” may not contain synthetic or artificial ingredients and may not be more than minimally processed. For example, minimal processing includes such actions as washing or peeling fruits or vegetables; homogenizing milk; canning, bottling, and freezing food; baking bread; aging and roasting meats; and grinding nuts. It does not include processes that, in general, cannot be done in a home kitchen and involve certain types of chemicals or sophisticated technology; for example, chemically bleached foods will not qualify as minimally processed. They still may contain MSG (see) and other natural substances you may wish to avoid but are not specifically listed.

NATURAL COLORS • See Colors, Natural.

NATURAL FLAVORINGS • Obtained by physical processes—such as distillation and solvent extraction or by the use of enzyme action to obtain material of the plant or animal origin—that may result in unavoidable but unintentional changes in the chemical structures of the components of the flavorings. The material obtained may be unprocessed, or processed for human consumption, by traditional food preparation—drying, roasting, and fermentation. Natural flavoring complexes include the essential oil, essence, or extractive, protein hydrolysate distillate, or any product of roasting, heating, or enzyme action.

NATURAL GAS • A mixture of hydrocarbons obtained in petroleum-bearing areas. Its composition is 85 percent methane, 10 percent ethane, with the rest made up of propane, butane, and nitrogen. Used in making formaldehyde and other petrochemicals. NUL

NATURE IDENTICAL • Demand for nature-identical flavors in Central and Eastern Europe (CEE) remains strong, as lower prices override the Western clamor for all things natural and organic. This has not happened, however, mainly because of the price difference between natural or organic ingredients and nature-identical flavors. Although it depends on what the flavor is, in extreme cases, the price difference could be as much as two to three times more.

N-BUTANE • See Butane.

NDGA • Illegal antioxidant. See Nordihydroguaiaretic Acid.

NDO • Nondigestible Oligosaccharide. Short-chain carbohydrates that are not digested in the small intestine and enter the large intestine unaltered. May stimulate beneficial, or sometimes harmful, bacteria. If beneficial, they can be considered prebiotic (see). NECROSIS • Death of one or more cells, or a portion of tissue or organ, resulting from irreversible damage.

NEO-DHC • See Dihydrochalcones.

NEMATICIDE • Pesticide that gets rid of nematodes and worms.

NEOFOLINONE • Occurs naturally in oil of lavender, orange leaf (absolute), palma rosa oil, rose, neroli, and oil of petitgrain. Used in citrus, honey, and neroli flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and puddings.

NEOHESPERIDINE DIHYDROCHALCONE • Synthetic flavoring used in baked goods, beverages, breakfast cereals, cheese, chewing gum, condiments, egg products, fats/oils, fish products, frozen dairy, fruit ices, gelatins, gravies, hard candy, imitation dairy, instant coffee/tea, jams, meat products, milk products, nut products, grains, poultry, processed fruits, reconstituted vegetables, seasonings, snack foods, soft candy, soups, sugar substitutes, and sweet sauces. Declared GRAS by FEMA (see). See Dihydrochalcones. EAF. E

(d)-NEOMENTHOL • A flavoring additive that occurs naturally in Japanese mint oil. Used in mint flavorings for beverages, ice cream, candy, and baked goods. See Menthol for toxicity. ASP

NEOMYCIN SULFATE • Biosol Veterinary. Otobiotic. Neomix Sulfate. Bactine First Aid Antibiotic. Campho-Phenique Triple Antibiotic Ointment. Mycitracin Plus Pain Reliever. Mycifradin. Myciguent. Neosporin Ointment. Neosulf. Introduced in 1951, it is one of the most widely used antibiotics for humans. The oral form is used to treat infectious diarrhea caused by Escherichia coli (see). Among potential adverse reactions: headache, lethargy, ear problems, nausea, vomiting, kidney dysfunction, skin rashes, and hypersensitivity reactions. Interacts with Cephalothin, dimenhydri-nate, oral anticoagulants (decreases vitamin K), diuretics, Cisplatin, methoxyflurane, and other aminoglycoside antibiotics. In animals it is used as a drug to treat cattle. FDA residue limitations are 0.25 ppm in calves and 0.15 ppm in milk.

NEOTAME • The FDA approved this sugar substitute in 2002. It is claimed to be about eight thousand times sweeter than table sugar. Neotame, unlike many other sugar substitutes, is heat stable and may be used in cooking and baking. The U.S. FDA announced its general use approval of neotame as a nonnutritive sweetener and flavor enhancer. The FDA has approved neotame for general use in foods, except for meat and poultry. It is a free-flowing, water-soluble, white crystalline powder that can be used as a tabletop sweetener. At this time, neotame is not available directly to consumers; instead, it is being used in several hundred different food products, often blended with other synthetic sweeteners. As an additive, it is used in foods and beverages, including but not limited to, chewing gum, carbonated soft drinks, refrigerated and nonrefrigerated ready-to-drink beverages, gelatins, puddings, jams and jellies, processed fruits and fruit juices, toppings, syrups, frozen desserts and fillings, yogurt-type products, baked goods, and candies. In determining the safety of neotame, the FDA reviewed data from more than 113 animal and human studies. The safety studies were designed to identify possible toxic, cancer-causing, reproductive, or neurological effects. From its evaluation of the neotame database, the FDA concluded the sweetener is safe for human consumption. Some eminent scientists, however, are wary about this sweetener as they were about another produced by the same company, aspartame (see)—labeling it, as they did aspartame, as toxic and carcinogenic.

Neotame, like aspartame, contains aspartic acid, phenylalanine, and a methyl ester. Neuroscientists have found, in animal studies, that aspartic acid and glutamic acid load on the same receptors in the brain, cause identical brain lesions and neuroendocrine disorders, and act in an addictive fashion. People who are sensitive to processed free glutamic acid (MSG) experience similar reactions to aspartame. Neotame is chemically similar to aspartame, but it is broken down differently in the human digestive system. Foods containing neotame do not need to include a warning for people with phenylketonuria, or PKU, as is required for foods containing aspartame. Both neotame and aspartame are made by the NutraSweet Company in Illinois. ASP

NEQUINATE • An animal drug used to treat chickens. FDA residue limitation is 0.1 ppm in chickens. A coccidiostat (see) is added to chicken feed to inhibit or delay the onset of coccidiosis, a common and serious disease of many species that involves intestines and lungs. It has been reported in individuals with AIDS.

NEROL • A primary alcohol used in perfumes, especially in rose and orange blossom scents. Occurs naturally in oil of lavender, orange leaf, palma rosa oil, rose, neroli, and oil of petitgrain. It is colorless, with the odor of rose. Used in citrus, neroli, and honey flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, and chewing gum. Similar to turpentine in toxicity. ASP

NEROLI BIGARADE OIL • Used chiefly in cologne and in perfumes. Named for the putative discoverer, Anna Maria de La Trémoille, princess of Nerole (1670). A fragrant, pale yellow essential oil obtained from the flowers of the sour orange tree, Citrus aurantium. Used in berry, orange, cola, cherry, spice, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. GRAS. ASP

NEROLIDOL • A sesquiterpene alcohol. A straw-colored liquid with an odor similar to rose and apple. Occurs naturally in balsam Peru and oils of orange flower, neroli, sweet orange, and ylang-ylang. Also made synthetically. Used in flavoring. See Nerol. ASP

NEROSOL • See Nerol.

NERYL ACETATE • A synthetic citrus, fruit, and neroli flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

NERYL BUTYRATE • A synthetic berry, chocolate, cocoa, citrus, and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

NERYL FORMATE • Formic Acid. A synthetic berry, citrus, apple, peach, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Formic Acid for toxicity. ASP

NERYL ISOBUTYRATE • A synthetic citrus and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

NERYL ISOVALERATE • A synthetic berry, rose, and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

NERYL PROPIONATE • A synthetic berry and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

NETSON • See Acimeton.

NETTLES • A troublesome weed, with stingers, it has a long history and was used in folk medicine. Its flesh is rich in minerals and plant hormones. Used to make tomatoes resistant to spoilage, to encourage the growth of strawberries, and to stimulate the fermentation of humus. Hemp belongs to the nettle family.

NEURAL TUBE DEFECT • In simple terms, a neural tube defect (NTD) is a malformation of the brain or spinal cord (neurological system) during embryonic development. Infants born with spina bifida, where the spinal cord is exposed, can grow to adulthood but usually suffer from paralysis or other disabilities. Babies born with anencephaly, where most or all of the brain is missing, usually die shortly after birth. These NTDs make up about 5 percent of all U.S. birth defects each year. If all women of childbearing age consumed sufficient folic acid (either through diet or supplements), 50 percent to 70 percent of birth defects of the brain and spinal cord could be prevented, according to the U.S. Centers for Disease Control and Prevention. A leading CDC authority refers to folic acid as “the sleeping giant of preventative medicine” for its potential to eliminate much of the risk of NTDs—if only it were consumed in the right quantities by the right people at the right time.

NEURON • The basic nerve cell of the central nervous system containing a nucleus within the cell body, an axon (a trunklike projection containing neurotransmitters), and dendrites (spiderlike projections that send and receive messages).

NEUROTENSIN • A peptide of thirteen amino acid derivatives that helps to regulate blood sugar by its effects on a number of hormones, including

NEUROTENSIN • A peptide of thirteen amino acid derivatives that helps to regulate blood sugar by its effects on a number of hormones, including insulin and glucagon. It is also thought to play a part in pain suppression.

NEUROTOXICANTS • Exposure to chemical substances can cause adverse effects on the nervous system (neurotoxicity). Chemicals toxic to the central nervous system can induce confusion, fatigue, irritability, and other behavioral changes. Exposure to methyl mercury and lead cause central nervous system toxicity and can also cause degenerative diseases of the brain (encephalopathy). Chemicals toxic to the peripheral nervous system affect how nerves carry sensory information and motor impulses from the brain to the rest of the body. The organic solvents carbon disulfide, n-hexane, and trichloroethylene can harm the peripheral nervous system, resulting in weakness in the lower limbs, tingling in the limbs (paresthesia), and loss of coordination. Other commonly used potential nerve damagers are phenol, creosol, propane, safrole, sodium fluoride, methyl benzoate, and many others.

NEUROTOXICITY • The ability of a substance to destroy nerve tissues or affect behavior.

NEUROTOXIN • Any substance that is capable of destroying or adversely affecting nerve tissue.

NEUROTRANSMITTERS • Molecules that carry chemical messages between nerve cells. Neurotransmitters are released from a nerve cell, diffuse across the minute distance between two nerve cells (synaptic cleft), and bind to a receptor at another nerve site.

NEUTRALIZING ADDITIVE • A substance, such as ammonium bicarbonate or tar-taric acid (see both), used to adjust the acidity or alkalinity of certain foods. See pH.

NEW • The U.S. Food and Drug Administration's designation that there is reported use of the substance and that an initial toxicology literature search is in progress.

NHANES • The abbreviation for National Health and Nutrition Examination Survey (see).

NIACIN • Nutrient. Nicotinic Acid. Nicotinamide. White or yellow crystalline powder, it is an essential nutrient that participates in many energy-yielding reactions and aids in the maintenance of a normal nervous system. It is a component of the vitamin B complex. Added to prepared breakfast cereals, peanut butter, baby cereals, enriched flours, macaroni, noodles, breads, rolls, cornmeal, corn grits, and farina. Niacin is distributed in significant amounts in liver, yeast, meat, legumes, and whole cereals. Recommended daily intake is 18 to 19 milligrams for men and 13 to 15 milligrams for women. Nicotinic acid is a component of the vitamin B complex. GRAS. ASP

NIACINAMIDE • Nicotinamide. Vitamin B3. A dietary supplement. Also used as a skin stimulant. A white or yellow crystalline, odorless powder used to treat pellagra, a vitamin-deficiency disease, and in the assay of enzymes for substrates. No known skin toxicity. GRAS. ASP

NIACINAMIDE ASCORBATE • A complex of ascorbic acid (see) and niacinamide (see). Used as a dietary supplement. See Niacin.

NICARBAZIN • Used as an aide to aid in the prevention of intestinal coccidiosis (see) in broiler chickens. Since 1998 the incidence of nicarbazin residues in chicken detected by British National Standards Agency sampling has fallen from a level of 25.5 percent to 9.7 percent in 2006 (in the majority of cases the residues are found only in the liver samples). Although this reduction is welcome, and current residue levels are not a significant risk to consumers, the Food Standards Agency believes that further work is needed to tackle the incidence and levels of such residues, which are largely due to poor feed management practices on farms. The JECFA (see) concluded that there was an absence of certain toxicological studies in support of nicarbazin; however, the other data available provided sufficient information to overcome most of these deficiencies. It was noted that nicarbazin has been used in veterinary medicine in many countries for over forty years. On the basis of this long history of use and the fact that use is restricted to starter rations in broiler chickens, the committee considered that an ADI (see) could be supported. The committee established an ADI of 0–400 µg/kg bw on the basis of the NOEL (see) of 200 mg/kg bw per day in the study of developmental toxicity using a safety factor of 500, chosen to account for the limitations in the database. Other reports have cited nicarbazin as causing mottling of the egg yolk and lowered egg production in laying hens and noted that excessive dosing causes incoordination, severe weakness, and loss of weight. The FDA residue limitations are 4 ppm in uncooked muscle, liver, skin, and neck of chickens.

NICKEL • Metal that occurs in the earth. Lustrous, white, hard metal that is used as a catalyst for the hydrogenation (see) of fat. Nickel may cause dermatitis in sensitive individuals and ingestion of large amounts of the soluble salts may cause nausea, vomiting, and diarrhea. Food is the major source of nickel exposure, with an average intake for adults estimated to be approximately 100 to 300 micrograms per day. GRAS. A number of nickel compounds cause cancer, including nickel acetate, nickel chloride, nickel hydroxide, and nickel carbonate. See Nickel Sulfate. ASP

NICKEL SULFATE • Occurs in the earth's crust as a salt of nickel. It has a sweet, astringent taste. Used as a mineral supplement. It acts as an irritant and causes vomiting when swallowed in larger doses. Its systemic effects include blood vessel, brain, and kidney damage, and nervous depression. Also listed as a cancer-causing agent by inhalation. The lethal dose varies widely. The dose in guinea pigs is 62 milligrams per kilogram.

NICOTINAMIDE • Nutrient. GRAS. See Niacin.

NICOTINAMIDE-ASCORBIC ACID COMPLEX • A dietary supplement in mul-tivitamin preparations. NIL

NICOTINIC ACID • See Niacin.

NIGER GUTTA • Ficus platyphylla. The coagulated latex from a tree that is mixed with chicle (see) to make chewing gum. ASP

NIL • The U.S. Food and Drug Administration's designation that although listed as added to food, there is no current reported use of the substance, and therefore, although toxicology information may be available in PAFA (see), it is not being updated.

NIOSH • The abbreviation for the National Institute of Occupational Safety and Health. Congress set up this institute in 1970 to play a key role in helping protect workers and their health on the job. The agency was to conduct occupational-health research; to inspect manufacturers' plants at employers' and workers' requests, and for its own studies; and to recommend standards for safe exposure to hazardous substances. NIOSH is supposed to work closely with OSHA, the organization responsible for setting the legally permitted exposures to hazards in the workplace. NIOSH, through its investigations into plant conditions and studies of already available data, provides OSHA with the scientific background needed to determine these rules. When a workplace crisis arises, the two agencies often work in tandem to find out how the workers were harmed and to help the industry correct the problem. Under the law, NIOSH documents summarizing its findings about a hazard should be used by OSHA to help in setting health and safety regulations for the industry.

NISIN PREPARATION • Crystals from Streptococcus lactis used as a preservative and antimicrobial additive in cheese spreads, semolina, clotted cream, and tapioca puddings and similar products. Also used in surface treatment of hard, semihard, and semisoft cheese, and dried and cured sausages. The FDA limits residue to 250 ppm in the finished product. It is also used in canned vegetables and fruit. The European Parliament said in 2003 that nisin should not be used because it could cause resistance to antibiotics in humans. This review should be undertaken now, and as long as the safety of these additives cannot be scientifically guaranteed, they should be banned. GRAS. ASP. It is still E.

NÍSPERO • Sapodilla. An evergreen tree that often reaches a height of sixty feet or more. In southern Mexico, this species is tapped for its ingredient for chewing gum. EAF

NITAPYRIN • An insecticide. The FDA limits residues in cottonseed to 1.0 ppm; in the fat, meat, and meat by-products of cattle, goats, hogs, poultry, and sheep to 0.05 ppm.

NITARSONE • A feed additive.

NITER • See Nitrate.

NITRATE • Potassium and Sodium. Potassium nitrate, also known as saltpeter and niter, is used as a color fixative in cured meats. Sodium nitrate, also called Chile saltpeter, is used as a color fixative in cured meats. Both nitrates combine with natural stomach saliva and food substances (secondary amines) to create nitrosamines—powerful cancer-causing additives. Nitrosamines have also been found in fish treated with nitrates. Researchers at the Michael Reese Medical Center's Department of Pathology in Chicago induced cancer in mice by giving single doses of one three-thousandth (0.3 microgram) of a gram of nitrosamine for each gram of the animal's weight. This is in contrast to the way other researchers have induced cancer in laboratory animals with nitrosamines by using repeated small doses or single large doses. The tumors that developed were analogous to human liver tumors. Nitrosamines caused pancreatic cancer in hamsters, similar to human pancreatic cancers. Nitrates have caused deaths from methemoglobinemia (it cuts off oxygen to the brain). Because nitrates are difficult to control in processing, they are being used less often. However, they are still employed in long curing processes, such as for country hams, as well as dried, cured, and fermented sausages. In the early 1970s, baby-food manufacturers voluntarily removed nitrates from their products. The U.S. Department of Agriculture, which has jurisdiction over meats, and the FDA, which has jurisdiction over processed poultry, has asked manufacturers to show that the use of nitrates is safe. Efforts to ban nitrates have failed because manufacturers claim there is no good substitute for them. (However, there are effective additives, including vitamin C.) Nitrates change into nitrites on exposure to air. Our major intake of nitrates in foodstuffs comes primarily from vegetables or water supplies that are high in nitrate content, or from nitrates used as additives in meat curing. Nitrates are natural constituents of plants. They occur in very small amounts in fruits but are high in certain vegetables—spinach, beets, radishes, eggplant, celery, lettuce, collards, and turnip greens—as high as more than 3,000 ppm. The two most important factors responsible for large accumulations of nitrates in vegetables are the high levels of fertilization with nitrate fertilizers and the tendency of the species to accumulate nitrate. Nitrites and/or nitrates are food additives when combined in curing premixes with spices and/or other flavoring or seasoning ingredients that contain or constitute a source of secondary or tertiary amines, including but not limited to essential oils, disodium inosinate, disodium guanylate, hydrolysates of animal or plant origin (such as hydrolyzed vegetable protein), oleoresins of spices, soy products, and spice extractives. Such food additives may be used only after the establishment of an authorizing food additive regulation. A food additive petition supported by data demonstrating that nitrosamines are not formed in curing premixes containing such food additives is required to establish safety. ASP

NITRITE • Potassium and Sodium. Potassium nitrite is used as a color fixative in the multibillion-dollar-a-year cured-meat business. Sodium nitrite has the peculiar ability to react chemically with the myoglobin molecule and impart red-bloodedness to processed meats, to convey tanginess to the palate, and to resist the growth of Clostridium botulinum spores. It is used as a color fixative in cured meats, bacon, bologna, frankfurters, deviled ham, meat spread, potted meats, spiced ham, Vienna sausages, smoke-cured tuna fish products, and in smoke-cured shad and salmon. In 2008 Danisco launched two new cultures of Staphylococcus carnosas (see) combined with Staphylococcus carnosas vitulinus. The producer claims the cultures can give meats the same color, flavor, and shelf life as those cured with nitrite salts—but allowing for all-natural claims to be made on the label. Nitrite combines with natural stomach and food chemicals (secondary amines) to create nitrosamines, powerful cancer-causing additives. The U.S. Department of Agriculture, which has jurisdiction over processed meats, and the FDA, which has jurisdiction over processed poultry, asked manufacturers to show that the use of nitrites was safe and that nitrosamines were not formed in the products as preliminary tests showed in bacon. Processors claimed there was no alternate chemical substitute for nitrite. They said alternate processing methods could be used, but the products would not look or taste the same. Baby-food manufacturers voluntarily removed nitrites from baby foods in the early 1970s. The FDA found that adding vitamin C to processed meats prevents or at least retards the formation of nitrosamines. In May 1978, the USDA announced plans to require bacon manufacturers to reduce their use of nitrite from 150 to 120 ppm and to use preservatives that retard nitrosamine formation. Processors would have been required to keep nitrosamine levels to 10 ppm under the interim plan. But in August 1978 a new concern about nitrite was raised. The USDA and the FDA issued a joint announcement that the substance had been directly linked to cancer by a Massachusetts Institute of Technology study. That work was later disputed. In 1982, amyl and butyl nitrites used by homosexual men were linked to Kaposi's sarcoma and other abnormalities of the immune system. Researchers at the Michael Reese Medical Center linked infinitesimal amounts of nitrite to cancer in young laboratory mice, especially in the liver and lungs. Dr. Koshlya Rijhsinghani and her colleagues gave single doses of one three-thousandth (0.3 microgram) of a gram of nitrosamine for each gram of the animal's weight. This method differs from the way other researchers have induced cancer in mice with nitrosamines by repeated small doses of single large doses. Nitrosamines also produce cancer in hamsters similar to pancreatic cancers in humans. In 1980, the FDA revoked its proposed phase-out because manufacturers said there was no adequate substitute for nitrites. In 1977, Germany banned nitrites and nitrates except in certain species of fish. However, a Committee on Nitrite and Alternative Curing Additives in Food, formed by the National Research Council in the United States, concluded that there was no single additive or process that could replace nitrite completely: “Several chemical and physical treatments appear to be comparable in inhibiting outgrowth of Clostridium botulinum spores in types of meat products but none confers the color and flavor that consumers have come to expect in nitrite-cured meats.” Until the all-purpose additive comes along or until consumer preference changes, the best compromise probably will be continued use of nitrite in conventional amounts with vitamins C and E added to block formation of nitrosamines, or the use of smaller amounts of nitrite in combination with biological acidification, irradiation, or the chemicals potassium sorbate, sodium hypophosphite, or fumarate esters, the committee said. To reduce nitrosamines in bacon, the U.S. Department of Agriculture requires meat packers to add sodium ascorbate or sodium erythorbate (vitamin C) to the curing brine. This offers only a partial barrier because ascorbate is soluble in water and its activity in fat is limited. Vitamin E, however, inhibits nitrosation in fatty tissues. The committee suggested that both C and E be added to provide more complete protection. After carefully considering all the evidence presented, the National Toxicology Program Board of Scientific Counselors, which undertook a review at the request of the FDA, voted unanimously in May 2000 that the evidence showed that sodium nitrite does not cause cancer in male rats, male mice, or female rats. While they found “equivocal evidence” in the forestomachs of female mice, the scientists have determined that the finding is not relevant to human health because humans do not have forestomachs. The advocates for this additive say this comprehensive review by NTP shows that sodium nitrite does not cause cancer in laboratory animals, even when they are fed massive doses throughout the animals' lifetime. A second action occurred in the state of California, where a panel of independent expert toxicologists reviewing almost one hundred scientific publications about sodium nitrite voted that the evidence does not show that sodium nitrite causes developmental or reproductive toxicity. If found by the committee to be harmful, sodium nitrite would have been listed under the state's Proposition 65 law, which was enacted to protect citizens against known cancer-causing agents and reproductive toxicants. In 2003, the FDA put in abeyance (see) a request by the U.S. Department of Commerce to permit sodium nitrite in white fish. If you must eat nitrite-laced meats, it still would be wise to include a food or drink high in vitamin C at the same time—for example, orange juice, grapefruit juice, cranberry juice, or lettuce. ASP

NITRO- • A prefix denoting one atom of nitrogen and two of oxygen. Nitro also denotes a class of dyes derived from coal tars. Nitro dyes can be absorbed through the skin. When absorbed or ingested they can cause a lack of oxygen in the blood. Chronic exposure may cause liver damage. See FD and C Colors.

NITROCELLULOSE • Any of several esters (see) obtained as white fibrous flammable solids by adding nitrate to cellulose, the cell walls of plants,

Used in food processing and in skin protective creams, nail enamels, and lacquers.

NITROFURANS • Nitrofuran antibiotics have been banned in Europe but are administered to poultry in New Zealand. Some shrimp and prawns from Southeast Asia, and freshwater catfish from Canada, have been found to have nitrofuran residues. Nitrofurans are a group of chemicals that are banned for use in Europe, the United States, and Canada in food-producing animals. Consumption of foods contaminated with nitrofurans may pose a human health risk related to the inherent tox-icity of the drug and the potential to cause allergies and cancer. However, a number of flavorings are derived from furans (see).

NITROFURAZONE • Aldomycin. Furacillin. Coxistat. Nitrofurazone. A once widely used antibiotic in animal feed for pigs and poultry. The FDA withdrew permission for its use in 1991. A human sensitizer. IARC review and EPA Genetic Toxicology Program (see both). Potential adverse reactions include kidney toxicity, redness, itching, burning, water retention, severe blistering, and allergic skin rash. It is also listed as a cancer-causing agent. Banned in animal feed.

3-([5-NITROFURFURYLIDENE] AMINO)2-OXAZOLIDONE • Bifuron. Cor-izium. Diafuron. Enterotoxon. Furazone. Furazolidone. Furoxone. A widely used antiprotozoal (see) drug in animals, particularly for pigs. It is also a human medication for diarrhea and enteritis caused by Giardia lamblia and Vibrio cholerae. Taken by mouth, it works inside the intestines to counteract cholera, colitis, and/or diarrhea caused by the bacteria. Potential adverse reactions include joint pain, fever, itching, skin rash or redness, nausea, vomiting, diarrhea, stomach pain, headache, and sore throat. Severe high blood pressure and other side effects may occur if combined with MAO inhibitors (see), ephedrine, and tricyclic antidepressants with this drug. Severe high blood pressure and other undesirable side effects may occur if the following are eaten or drunk while taking this drug: aged cheese, caviar, yeast or protein extracts, fava or broad beans; smoked or pickled meat, poultry, or fish; fermented sausages (bologna, pepperoni, salami, summer sausage) or other fermented meat; or any overripe fruit. You should not drink dark beer, red wine, sherry, or liqueurs. If the human medication is taken, the above foods and drinks are to be avoided for at least two weeks after stopping furazolidone. The FDA says that residues must be zero in meat sent to market, but who can do adequate testing for its presence all the time? See Nitrofurazone.

NITROGEN • A gas that is 78 percent by volume of the atmosphere and essential to all living things. Odorless. Used as a preservative for cosmetics, in which it is nontoxic. In high concentrations, it can asphyxiate. Toxic concentration in humans is 90 ppm; in mice, 250 ppm. GRAS. ASP. E

NITROGEN OXIDES • Nitric Oxide. Nitrogen Dioxide. Nitrogen Trioxide. Nitrogen. We are all exposed to small amounts of nitrogen oxides in the air around us. Higher exposure may occur by burning wood or kerosene or near gas stoves or if you smoke. Exposure to high levels of nitrogen oxides can damage the respiratory airways. Contact with the skin or eyes can cause burns. Nitrogen oxides are used in the production of nitric acid, lacquers, dyes, and other chemicals. Nitrogen oxides are also used in rocket fuels, nitration of organic chemicals, and the manufacture of explosives. Low levels of nitrogen oxides in the air can irritate the eyes, nose, throat, and lungs, possibly causing individuals to cough and experience shortness of breath, tiredness, and nausea. Exposure to low levels can also result in fluid buildup in the lungs one or two days after exposure. Breathing high levels of nitrogen oxides can cause rapid burning, spasms, and swelling of tissues in the throat and upper respiratory tract, reduced oxygenation of body tissues, a buildup of fluid in the lungs, and death. Skin or eye contact with high concentrations of nitrogen oxide gases or nitrogen dioxide liquid can cause serious burns. It is not known if exposure to nitrogen oxides will result in reproductive effects in humans. Families with indoor gas stoves, space heaters, or indoor cigarette smoke can minimize indoor exposure to nitrogen oxides by periodically allowing fresh outdoor air into the home. Farm families should not allow children to play near silos that contain silage. Nitrogen oxides are used as bleaching additives for cereal flour; nitrogen dioxide is a deadly poison gas. Short exposure may cause little pain or discomfort but several days later, fluid retention and inflammation of the lungs can cause death. About 200 ppm can be fatal. There is no reported use of the chemical and there is no toxicology information available, according to the FDA. ASP

3-NITRO-4-HYDROXYPHENYLARSONIC ACID • Roxarsone. Tufts of pale yellow needles used to control intestinal infections and to improve growth and feed efficiency. FDA limits are 0.5 ppm as arsenic in muscle meat and eggs of chickens as residue; 2 ppm as arsenic in edible by-products, turkey, and swine; 0.5 ppm as arsenic in muscle tissue and by-products other than liver and kidney. See Arsenic.

NITROMIDE with SULFANITRAN • A feed additive used in chicken feed. Both ingredients are antibacterials. FDA tolerance is zero residue for nitromide in uncooked edible chicken.

4-NITROPHENYLARSONIC ACID • Nitarsone. An animal feed drug used to combat intestinal parasites chiefly affecting turkeys, chickens, and other birds. The FDA says the feed additive is not to be used at a level in excess of the amount reasonably required to accomplish the intended effect. An arsenic compound, it is on the Community Right-to-Know List (see). Poison by ingestion. See Arsenic.

NITROSYL CHLORIDE • Nonexplosive, very corrosive, reddish yellow gas, intensely irritating to the eyes, skin, and mucosa. Used as a bleaching additive for cereal flour. Inhalation may cause pulmonary edema and hemorrhage. NIL

NITROUS OXIDE • Laughing Gas. A whipping additive and a propellant for dairy and vegetable fat toppings in pressurized containers. Slightly sweetish odor and taste. Colorless. Used in rocket fuel. Less irritating than other nitrogen oxides but narcotic in high concentrations and it can asphyxiate. GRAS. ASP. E

NNS • FDA abbreviation for nonnutritive sweetener.

NOAEL • No-Observed-Adverse-Effect Level. See NOEL.

NOBELITIN • A substance found in citrus fruit that has been found to have anticancer properties in laboratory studies.

NOEL • NEL. Test results that show a given dose of a substance has a no observed effect level or sometimes called a no-observed-adverse-effect level (NOAEL). The safety factor usually has a value of one hundred in the case of NOEL derived from long-term animal studies, on the assumption that humans are ten times as sensitive as the test animals used and that there is a tenfold range of sensitivity within the human population. The NOEL has been used interchangeably with the NEL (no-effect level). However, there is a distinction that is based on the interpretation of the occurrence of an effect. An NEL denotes that at a particular dose, there was absolutely no effect. In reality, an effect may have occurred but went undetected for a variety of reasons. Thus, the more accepted terminology is the NOEL, which indicates that while an effect was not observed under a particular set of test conditions, it does not preclude the possibility that some effect may have occurred.

NONACOSANE • White solid flavoring occurs naturally and has been identified within several essential oils. It can also been prepared synthetically. A hydrocarbon (see), it has been reported to be a component of a pheromone (see) and evidence suggests it plays a role in the chemical communication of several insects, including the female Anopheles stephensi mosquito.

NONADIENAL • Cucumber Aldehyde or Alcohol. A flavoring additive used in various foods. A moderate skin irritant. ASP

(E,Z)-2,6-NONADIEN-1-OL ACETATE • Flavoring declared GRAS by FEMA (see). EAF

NONADIEN-1-OL and (E)-3-(Z)-6-NONADIEN-1-OL • Sex attractant for butterflies and moths. Clear, colorless liquid with a fruity aroma also used as a flavoring. ASP. GRAS by FEMA (see). EAF

g-NONALACTONE • Aldehyde C-18. Prunolide. Coconut Aldehyde. From coconut. A synthetic berry, coconut, fruit, and nut flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and icings. Also for beer and wine. See Coconut. ASP

NONANAL • Pelargonic Aldehyde. Colorless liquid with an orange-rose odor. A synthetic flavoring that occurs naturally in lemon oil, rose, sweet orange oil, mandarin, lime, orris, and ginger. Used in lemon and fruit flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts. A severe skin irritant. See Aldehyde. ASP

1,3-NONANEDIOL ACETATE • Colorless to slightly yellow mixture of isomers used in synthetic berry and fruit flavorings for beverages, ice cream, ices, candy, and baked goods. See Nonanoic Acid and Acetic Acid. ASP

1,4-NONANEDIOL DIACETATE • Synthetic flavoring with a fresh, green cucumber odor. NIL

NONANNOYL 4-HYDROXY-3-METHOXY BENZYLAMIDE • Perlargonyl Vanillylamide. A synthetic spice flavoring additive for candy, baked goods, and condiments.

NONANOIC ACID • Pelargonic Acid. Nonoic acid. Nonglic Acid. Occurs in the oil of pelargonium plants such as the geranium. Used in berry, fruit, nut, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and shortenings. Used in sanitation. Can be very irritating to the skin. ASP

NONANOL • Nonanaldehyde. Pelargonaldehyde. Clear brown liquid characterized by a rose-orange odor. Insoluble in water. Found in at least twenty essential oils, including rose and citrus oils and several species of pine oil. It has a strong fruity or floral odor and is used in flavors and perfume. Can cause skin and eye irritation; it is a strong irritant. The JECFA says there is no safety concern at current levels of intake when used as a flavoring agent. See Nonamonic Acid and Nonyl Alcohol. ASP

2-NONANONE • Flavoring that occurs naturally in beer, butter, carnation, bleu cheese, cheddar cheese, Gorgonzola cheese, coconut, potato chip, rice, cooked rice, rue plant, and strawberry and is used in mountain ash, butter, carnation, cheese, cheddar cheese, clove, coconut, earth humus fat, green, herbal, lavender, pineapple, rose, tea rose rue, strawberry. The JECFA in last evaluation in 1998 found there was no safety concern at current levels of intake when used as a flavoring agent.

3-NONANON-1-YL-ACETATE • A synthetic berry, rose, fruit, and cheese flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

2-NONENAL • See Isoamyl Nonanoate. ASP

NONEN-1-OL • Colorless to pale yellow liquid flavoring with a melon pearlike aroma useful in pear and melon compositions. See Nonanoic Acid. ASP

NONFAT DRY MILK • The solid residue produced by removing the water from defatted cows' milk. Comparisons between whole and dry milk: 100 grams fluid whole milk contains 68 calories; 87 grams of water; 3.5 grams of protein; 3.9 grams of fat; 0.7 gram of ash; 4.9 grams of carbohydrates; 118 milligrams of calcium; 93 milligrams of phosphorus; 0.1 milligram of iron; 50 milligrams of sodium; 140 milligrams of potassium; 160 international units of vitamin A; 0.04 milligram of vitamin B1; 0.17 milligram of B2; 0.1 milligram of nicotinic acid; and 1 milligram of vitamin C. Total calories for one cup of milk is 166. Nonfat dry milk has 362 calories per 100 grams; 3.5 grams of water; 35.6 grams of protein; 1 gram of fat; 7.9 grams of ash; 52 grams of total carbohydrates; 1,300 milligrams of calcium; 1,030 milligrams of phosphorus; 0.6 milligrams of iron; 77 milligrams of sodium; 1,130 milligrams of potassium; 40 international units of vitamin A; 0.35 milligrams of vitamin B1; 196 milligrams of vitamin B2; 1.1 milligrams of nicotinic acid; and 7 milligrams of vitamin C. The total calories for a tablespoon of dry nonfat milk is 28. See Milk.

NONNUTRITIVE SWEETENERS • Sugar substitutes that contain no calories. Saccharin and aspartame (see both) are examples.

NONVOLATILE • Will not vaporize or become a gas.

NONYL ACETATE • An ester produced by the reaction of nonyl alcohol and acetic acid (see). Pungent odor suggestive of mushrooms but when diluted it resembles the odor of gardenias. Used for beverages, ice cream, ices, candy, and baked goods. EAF

NONYL ALCOHOL • Nonalol. A synthetic flavoring, colorless to yellow with a citronella oil odor. Occurs in oil of orange. Used in butter, citrus, peach, and pineapple flavorings for beverages, ice cream, ices, candy, and chewing gum. Also used in the manufacture of artificial lemon oil. In experimental animals it has caused central nervous system and liver damage. ASP

NONYL CARBINOL • See 1-Decanol.

NONYL ISOVALERATE • A synthetic fruit and hazelnut flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

y-NONYL LACTONE • Yellowish to almost colorless liquid with a coconutlike odor. Used in flavors. See Nonyl Alcohol.

NONYL NONANOATE • Nonyl Pelargonate. Liquid with a floral odor used in flavors, perfumes, and organic synthesis. See Nonyl Alcohol.

NONYL OCTANOATE • Synthetic flavoring. An oily liquid with a sweet, rose, mushroom odor. NIL

NONYLPHENOL • Identified as a priority hazardous substance by the European Union. See Phenols.

NOOTKATONE • From a cypress tree grown in northwest Washington State and British Columbia. It is named after the Nootka people who populated the area. It smells like cedar and is used in flavorings. ASP

NOPINENE • See fc-Pinene.

NOPOL • Flavoring that occurs naturally in carrots. Used as an additive in alpine bouquet, balsam, citrus, fir, green grass, pine, and woody flavorings. Can irritate the skin.

NORBIXIN • From the seeds of Bixa orellana used in a suspension of vegetable oil for coloring in food. See Annatto. E

NORDIHYDROGUAIARETIC ACID • NDCA. An antioxidant used in bril-liantines and other fat-based cosmetics. Occurs in resinous exudates of many plants. White or grayish white crystals. Lard containing 0.01 percent NGDA stored at room temperature for nineteen months in diffuse daylight showed no appreciable rancidity or color change. It was used as an antioxidant in prepared pie-crust mix, candy, lard, butter, ice cream, and pressure-dispensed whipped cream. Canada banned the additive in food in 1967 after it was shown to cause cysts and kidney damage in a large percentage of rats tested. The FDA removed it from the GRAS list in 1968 and prohibited its use in products over which it has control. The U.S. Department of Agriculture, which controls antioxidants in lard and animal shortenings, banned it in 1971. BAN

NOREPINEPHRINE • Noradrenaline. A hormone released by the adrenal gland, it possesses the ability to stimulate epinephrine but has minimal inhibitory effects. It has little effect on the lungs' smooth muscles and metabolic processes and differs from epinephrine in its effect on the heart and blood vessels.

NORFLURAZON • An herbicide used in feed and hops used for animal feed. FDA tolerance limits are 1 ppm in dried citrus molasses, 3 ppm in citrus pulp, and 0.1 ppm in milk, fat, meat, and meat by-products of cattle, goats, hogs, poultry, and sheep.

NORVALINE • A protein amino acid (see) soluble in hot water and insoluble in alcohol. See Valeric Acid.

NOTE • A distinct odor or flavor. Top note is the first note normally perceived when a flavor is smelled or tasted; usually volatile and gives “identity.” Middle or main note is the substance of the flavor, the main characteristic. Bottom note is what is left when top and middle notes

identify. Middle or main note is the substance of the flavor, the main characteristic. Bottom note is what is felt when top and middle notes disappear. It is the residue when the aroma or flavoring evaporates.

NOVALURON • Rimon. A newer pesticide chemical belonging to the class of insecticides called insect growth regulators (IGR) called benzoylphenyl ureas. IGRs slowly kill the insects over a period of a few days by disrupting the normal growth and development of immature insects. It is registered for the control of whiteflies, thrips, leafminers, and other foliar-feeding insect pests of ornamental plants grown in greenhouses. Novaluron is expected to reduce the reliance on organophosphates, such as acephate, diazinon, chlorpyrifos, and dimethoate; carbamates, such as (carbaryl and bendiocarb); and pyrethroids, such as bifenthrin and cyfluthrin. Novaluron has low mammalian acute toxicity and has low risk to the environment and nontarget organisms. Additional uses of novaluron for the control of insect pests on food crops was being prepared for filing at this writing. Canada granted it full registration for the Colorado potato beetle and European corn borer on potatoes and codling moth and Oriental fruit moth on apples. Canadians say exposure to novaluron may occur through diet (food and water) or when handling and applying the product. When assessing health risks, two key factors are considered: the levels at which no health effects (NOEL) occur and the levels to which people may be exposed. Novaluron enters the environment when used as an insecticide on potatoes and apples and is slightly persistent in soil and sediments The EU (see) expressed its reservations about this chemical because it felt there was a possibility of accumulation in animal tissues and milk. The WHO concluded there was no evidence of cumulative toxicity or of serious pathological change identified in any species in repeated administration tests. There was no evidence of cancer-causing potential in rats or mice. At high doses, the red blood cells were identified as the primary target of novaluron toxicity, with secondary effects apparent in the spleen and less commonly in the liver. An increased bodyweight gain was noted at higher doses in rats, mice, and dogs but no pathological change was identified to correlate with this. The mechanism of the effects on red blood cells has not been explained but it is thought that it is probable novaluron causes oxidative damage to the mature red blood cell. There was no evidence of decreased production of red blood cells and, in fact, production of red blood cells increased to compensate for the loss of cells in circulation.

NOVATONE • See Acetanisole.

NOVOBIOCIN • Albamycin. An antibiotic from Streptomyces niveus, it is used in animal feed for beef, chicken, duck, and turkey. FDA residue limitations are 0.1 in milk, 1 ppm in cattle, chickens, turkeys, and ducks. Moderately toxic by ingestion.

NS • The abbreviation for an animal product that has not been determined kosher (see) by rabbinic supervision.

NTP • The abbreviation for National Toxicology Program (see).

NUCLEIC ACIDS • Originally isolated from the cell nuclei, they are carriers and mediators of genetic information. There are two types, DNA (deoxyribonucleic acid) and RNA (ribonucleic acid). DNA has one less oxygen molecule in its component sugar ribose and is double stranded. The messages carried by DNA are carried out by RNA. The two types are components of all cells so that any food in which cells are concentrated are rich sources of nucleic acids. Organ meats, poultry, and fish are examples. Butter, fat, fruits, milk, nuts, vegetables, and carbohydrates are low in nucleic acids. See Purines, Disodium Guanylate, and Disodium Inosinate.

NUCLEOTIDE • A fundamental building block of nucleic acids—DNA and RNA—occurring in living cells. Some are important coenzymes (see). A nucleotide consists of a base (one of four chemicals: adenine, thymine, guanine, and cytosine) plus a molecule of sugar and one of phosphoric acid.

NUL • The U.S. Food and Drug Administration's designation that there is no reported use of the substance and there is no toxicology information available in PAFA (see).

NUTMEG • Myristica fragrans. Nutmeg is not a nut, but the kernel of an apricotlike fruit. A natural flavoring extracted from the dried ripe seed of Myristica fragrans. Used in cola, vermouth, sausage, eggnog, and nutmeg flavorings for beverages, ice cream, ices, baked goods (2,000 ppm), condiments, meats, and pickles. The oil is used in loganberry, chocolate, lemon, cola, apple, grape, muscatel, rum, sausage, eggnog, pistachio, root beer, cinnamon, dill, ginger, mace, nutmeg, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, condiments, meats, syrups, and icings. In common household use since the Middle Ages, nutmeg is still a potentially toxic substance. Ingestion of as little as three whole seeds or 5 to 15 grams of grated spice can cause flushing of the skin, irregular heart rhythm, absence of salivation, and central nervous system excitation, including euphoria and hallucinations. GRAS. ASP

NUTMEG OLEORESIN • Nutmeg is the dried, ripe seed, and mace is the dried aril that envelops the shell containing the seed of trees of Myristica species, principally Myristica fragrans. The ground seed is the spice nutmeg; the ground arillus is the spice mace. Oil of nutmeg and oil of mace are the essential oils obtained by steam distillation of nutmeg and mace, respectively. Nutmeg and mace owe their characteristic aroma to these essential oils. Mace oleoresin is a butterlike product obtained by pressing. A similar product, nutmeg butter, can be pressed from nutmeg (see). ASP

NUTR • The FDA abbreviation for nutrient.

NUTRACEUTICALS • One term used to describe substances in or parts of a food that may be considered to provide medical or health benefits.

NUTRASWEET • See Aspartame.

NUTRIENT CONTENT CLAIM • Descriptor. A claim on a food product that directly or by implication characterizes the level of a nutrient in the food such as “low fat” or “high in oat bran.” Nutrient content claims are also known as descriptors.

NUTRITIVE SWEETENERS • The sweetness of nutritive sweeteners varies. They may be anywhere from 25 percent to 100 percent as sweet as table sugar. They often are combined with nonnutritive sweeteners to provide certain products an even sweeter flavor. Nutritive sweeteners do not contribute to dental caries because bacteria does not convert them to acids. As a result, they are valuable in chewing gums, breath mints, and other products that remain in the mouth for extended periods of time. Nutritive sweeteners include sugar alcohols, such as sorbitol, manitol, and xylitol. They can affect blood sugar levels but are absorbed slowly and incompletely and do not require much insulin to be metabolized. This makes them good alternatives to table sugar for people with diabetes. D-taglose (see) is another type of nutritive sweetener. Used in limited amounts, nutritive sweeteners typically do not cause discomfort. However, many people experience side effects when consuming large amounts. Symptoms may include flatulence, abdominal discomfort, and diarrhea. For this reason, nutritive sweeteners are considered to be a less attractive sweetener than nonnutritive sugar substitutes. Artificial nutritive sweeteners have from .02 to 3 calories per gram while table sugar has 4 calories per gram.

NUTRS • FDA abbreviation for nutritive sweetener.

NUTTY CYCLOHEXENONE • Flavoring that occurs naturally in clam, coffee, filbert, katsuobushi, mentha pulegium oil, and wild rice. Used in bread, caramel clam, coffee, hazelnut, walnut, and rice. Has been reported to have adverse behavioral effects in rats and on testicles. See Cyclohexenone.

NYSTATIN • Mycostatin. Nadostine. Nilstat. Nystex. O-V Statin. Yellow to light tan powder with a cereallike odor, it is used in animal feed for poultry and pigs. The FDA requires zero residue in eggs, swine, and poultry. Antifungal medication introduced in 1954. It is used in human medicine to treat oral, vaginal, and intestinal infections caused by Candida albicans (Moniliales) and other Candida species. Potential adverse reactions include nausea, vomiting, and diarrhea. Skin applications may cause occasional contact dermatitis from preservatives in some formulations. Nystatin is in the EPA Genetic Toxicology Program. Moderately toxic by ingestion. Causes birth defects in experimental animals.

OAK BARK EXTRACT • Quercus alba. Oak Chip Extract. The extract from the white oak used in bitters and whiskey flavorings for beverages, ice cream, ices, candy, whiskey (1,000 ppm), and baked goods. Contains tannic acid (see) and is exceedingly astringent. The Indians used it in a wash for sore eyes and as a tonic. ASP

OAK CHIPS, WHITE, EXTRACT • See Oak Bark Extract. ASP

OAKMOSS, ABSOLUTE • Any one of several lichens, Evernia spp., that grow on oak trees and yield a resin for use as a fixative (see) in perfumery. Stable green liquid with a long-lasting characteristic odor. Soluble in alcohol. Used in fruit, honey, and spice flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, condiments, and soups. A common allergen in aftershave lotions. ASP

OAKMOSS, CONCRETE • Evernia prunasti. Oakmoss concrete is prepared by hydrocarbon solvent extraction of the lichen Evernia prunasti collected mainly from oak trees in Yugoslavia, France, Italy, Corsica, Morocco, Hungary, and various central European countries. The lichen is often soaked in lukewarm water twenty-four hours prior to extraction. Oakmoss concrete is a solid, waxy, dark green mass with a phenolic woody, slightly tarlike but delicate and pleasant odor, reminiscent of seashore, forest, bark, wood, green foliage, and tannery. Strong sensitizing potential. See Oakmoss, Absolute. EAF

OAK WOOD, ENGLISH • Quercus robur. Used as a coloring in alcoholic beverages only. ASP

OAT BRAN • The broken coat of oats, Avena sativa. See Oats and Oat Flour.

OAT EXTRACT • The extract of the seeds of oats, Avena sativa. See Oat Flour.

OAT FLOUR • Flour from the cereal grain that is an important crop grown in the temperate regions. Slight odor; starchy taste.

OAT GUM • A plant extract used as a thickener and stabilizer in foods and cosmetics. Also an antioxidant in butter, creams, and candy up to 1.5 percent. It is used as a thickener and stabilizer in pasteurized cheese spread and cream cheese. In foods, it can cause an allergic reaction including diarrhea and intestinal gas. NUL

OATMEAL • Meal obtained by grinding of oats from which the husks have been removed.

OATS • Whole grain oats contain more soluble fiber than other whole grains such as wheat, corn, or rye. They contain more protein and lipids than other grains. Oats contain naturally occurring phytochemicals that have been associated with protection from a variety of chronic diseases. Whole grains contain naturally occurring phyto-estrogens, which have been linked to decreased risk of hormone-related diseases such as breast cancer. Oats were discovered to lower cholesterol in 1963. They are also a good source of selenium, iron, calcium, manganese, magnesium, zinc, and copper.

OBESITY or OVERWEIGHT • Although precise definitions vary among experts, overweight has been traditionally defined as 10 to 20 percent above an optimal weight for height, derived from statistics. Some scientists argue that the amount and distribution of an individual's body fat is a significant indicator of health risk and therefore should be considered in defining overweight. Abdominal fat has been linked to more adverse health consequences than fat in the hips or thighs. Thus, calculations of waist-to-hip ratio are preferred by some health experts to help determine if an individual is overweight.

OCHRATOXIN A • OTA. A toxin produced by Aspergillus ochraceus and Penicillium verrucosum that is one of the most abundant food-contaminating myco-toxins in the world. Human exposure occurs mainly through consumption of improperly stored food products, particularly contaminated grain and pork products, as well as coffee, wine grapes, and dried grapes. The toxin has been found in the tissues and organs of animals, including human blood and breast milk. It is potentially carcinogenic to humans and can cause immunosuppression and immunotoxi-city. PTWI (see) of 100 ng/kg bw was retained by the JECFA (see), despite new data showing potential harm to the kidney. The current estimate of overall dietary exposure to ochratoxin A from cereals, based mainly on European data, is about 8–17 ng/kg bw per week, based on processed cereals, compared with 25 ng/kg bw per week in the previous evaluation, based on raw cereals. The current estimates are well below the PTWI. Contamination levels in the majority of raw cereal samples were below 5 ug/kg. Due to the very small number of samples contaminated above the highest proposed limit of 20 ug/kg, such an ML (see) would have very limited impact compared with no ML. The committee concluded that the use of an ML of 5 or 20 ng/kg would be unlikely to have an impact on dietary exposure to ochratoxin A. The committee was unable to reach a conclusion regarding the situation in developing countries, due to the lack of adequate data to consider.

OCIMENE • Often found naturally as mixtures of the various forms in vegetables and fruits. The mixture is an oil with a pleasant odor that is used in flavoring. Has an aroma reminding one of citrus, licorice, anise, citrus, and lime. See Basil Extract. ASP

OCIMUM BASILICUM • See Basil Extract.

OCOTEA CYMBA RUM OIL • An oil obtained by steam distillation from the wood of a Brazilian tree. Used chiefly as a source of safrole (see), a natural oil, and as a substitute for sassafras (see).

OCTADECANOIC ACID and OCTADECATRIENOIC ACID • Abracol S.L.G. Dermagine. Distearin. Orbon. Stearic Acid, Monoester with Glycerol. Pure white or cream-colored, waxlike solid used as a coating additive, emulsifier, lubricant, solvent, and texturizer in baked goods, shortening, fruits, ice cream, nuts, peanut butter, puddings, and whipped toppings. See Stearic Acid. ASP

9-OCTADECENOIC ACID • See Oleic Acid.

1-OCTADECANOL • See Stearic Acid.

9-OCTADECENAL • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. EAF

OCTADECYLAMINE • Used as a boiler water additive for packaging sterilization only. ASP

OCTADIEN • Has a sweet rose odor. See Gerianol. EAF

OCTAFLUOROCYCLOBUTANE • A nonflammable gas. A refrigerant, propellant, and aerating additive in foamed or sprayed food products. Used alone or in combination with carbon dioxide or nitrous oxide (see both). Nontoxic when used alone. NIL

OCTAHYDROCOUMARIN • One of the newer flavoring additives. See Coumarin. ASP

OCTALACTONE • D and G. See Lactic Acid. ASP

OCTANAL • Octanaldehyde. Found in many essential oils (see) including a number of citrus oils, it is a colorless to light yellow liquid with an orange odor. It is used as a flavoring additive in many foods. Mildly toxic by ingestion. ASP

2,3-OCTANEDIONE • A flavoring determined GRAS by FEMA (see). EAF

OCTANOIC ACID • Colorless, oily liquid with a bad odor derived from coconut, it is used as an antimicrobial additive in other food additives and as a defoaming additive, flavoring additive, and lubricant. It is used in baked goods, soft candies, cheese, fats, frozen dairy desserts, gelatins, meat

products, oils, packaging materials, puddings, and snack foods. Mildly toxic by ingestion and a skin irritant, it has caused mutations in experimental animals. FDA residue limits are 0.0013 percent in baked goods; 0.04 percent in frozen dairy desserts; 0.005 percent in meat products; 0.005 percent in soft candies; 0.016 percent in snack foods; and 0.001 percent in other food categories when used in accordance with good manufacturing practices. GRAS as an indirect additive. See Caprylic Acid. ASP

N-OCTANOIC ACID • Preservative and other miscellaneous uses. Can be up to 0.013 percent in baked products, 0.04 percent in cheeses, 0.005 percent in fats and oils, 0.016 percent in snack foods, 0.001 percent in all other food categories. Used in a lye peeling solution for fruits and vegetables and is a component of sanitizing solution. GRAS in cheese wraps. See Caprylic Acid.

1-OCTANOL • Caprylic Alcohol. Used in the manufacture of flavorings. Occurs naturally in oil of lavender, oil of lemon, oil of lime, oil of lovage, orange peel, and coconut oil and has a penetrating, aromatic scent. May cause skin rash. ASP

3-OCTANOL • Colorless liquid with a strong nutty odor; used as a flavoring additive in various foods. It is a moderate skin and eye irritant. ASP

2-OCTANONE • A synthetic fruit and cheese flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-OCTANONE • A synthetic flavoring that occurs naturally in oil of lavender. Used in citrus, coffee, peach, cheese, and spice flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

1-OCTEN-3-OL • A synthetic fruit and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, condiments, and soups. ASP

OCTEN ACETATE • Flavoring. Colorless liquid; fruity aroma. See Caprylic Acid. ASP

OCTEN BUTYRATE • Flavoring. Colorless liquid; fruity aroma. See Butanoic Acid. ASP

1-OCTENYL SUCCINIC ANHYDRIDE • A starch modifier for food starch incorporating up to 3 percent of the weight of the product. Limited to 2 percent in combination with aluminum sulfate (see).

OCTODECANOIC ACID • See Stearic Acid.

OCTOXYNOL • Waxlike emulsifiers, dispersing additives, and detergents derived from phenol (see) and used as a surfactant. The numbers from −1 to −70 after the additive signify the viscosity.

OCTYL ACETATE • Acetic Acid. Octyl Ester. A colorless liquid with an orange-jasmine scent, it is used as a flavoring additive in various foods. Moderately toxic by ingestion. ASP

OCTYL ALCOHOL, SYNTHETIC • Caprylic Alcohol. Colorless, viscous liquid soluble in water and insoluble in oil. Used as a solvent in the manufacture of food additives. Occurs naturally in the oils of lavender, lemon, lime, lovage, orange peel, and coconut. It has a penetrating aromatic scent. Moderately toxic by ingestion. A skin irritant. Has caused mutations in experimental animals. NUL n-OCTYL BICYCLOHEPTENE DI CARBOXIMIDE • Dimethyl Carbate. Pyrodone. Octacide 264. A widely used insecticide in various foods. FDA residue tolerance is 10 ppm. Moderately toxic by ingestion and skin contact. Has caused adverse reproductive effects in experimental animals. Large doses can cause central nervous system stimulation followed by depression.

OCTYL BUTYRATE • Butyric Acid. A synthetic strawberry, butter, citrus, fruit, cherry, melon, peach, pineapple, pumpkin, and liquor flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

OCTYL FORMATE • Formic Acid. A synthetic flavoring, colorless with a fruity odor. Used in citrus and fruit flavorings for beverages, ice cream, ices, candy, and baked goods. See Formic Acid for toxicity. ASP

OCTYL GALLATE • A salt of gallic acid made from the tannins of nutgalls or from Penicilliun glaucum or Aspergillus niger, it is used as an antioxidant in margarine with a limit of 0.02 percent set by the FDA. Mildly toxic by ingestion. When heated to decomposition, it emits acrid smoke and irritating fumes. See Gallates. ASP. E

OCTYL HEPTANOATE • A synthetic citrus, coconut, and fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

OCTYL ISOBUTYRATE • Isobutyric Acid. A synthetic citrus, fruit, melon, peach, liquor, and wine flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

OCTYL ISOVALERATE • Isovaleric Acid. A synthetic berry, butter, citrus, apple, cherry, grape, honey, and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

OCTYL OCTANOATE • Octanoic Acid. A synthetic citrus, grape, and pineapple flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

OCTYL PHENOLS • Antioxidants, fuel oil stabilizer, intermediate for resins, fungicides, bactericides, dyestuffs, adhesives, and rubber chemicals. Identified as a high-priority hazardous substance by the EU. A reproductive hazard. See Phenol.

OCTYL PHENYLACETATE • Phenylacetic Acid. A synthetic berry, apple, banana, grape, peach, pear, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

OCTYL PROPIONATE • Propionic Acid. A synthetic berry, citrus, and melon flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

ODORLESS LIGHT PETROLEUM HYDROCARBONS • Liquids with a faint odor used as coating additives, defoamers, and in insecticide formulations for beet sugar, eggs, fruits, pickles, vegetables, vinegar, and wine. See Petroleum.

OIL OF NIOBE • See Methyl Benzoate.

OIL OF SASSAFRAS, SAFROLE FREE • This flavoring without the safrole is permitted in foods. Oil of sassafras that is used to correct disagreeable odors in cosmetics is 80 percent safrole. May produce allergic reactions in sensitive persons. Banned in foods.

OITICICA OIL • Rosewood Oil. The tree grows wild and only in Brazil. The oil is extracted from oiticica nuts. Its use is limited and is employed as a substitute for tung oil or linseed oil when the price of either of these products prohibit their use. NUL

OLEAMIDE • An additive that prevents sticking to pans. See Oleic Acid.

OLEANDOMYCIN HYDROCHLORIDE • An antibiotic produced by Streptomyces antibioticus used in animal feed for chickens, swine, and turkeys. Moderately toxic by ingestion. The FDA requires zero residue in chickens, turkeys, and swine for market.

OLEIC ACID • Obtained from various animal and vegetable fats and oils. Colorless. On exposure to air, it turns a yellow to brown color and develops a rancid odor. Used as a defoaming additive; as a synthetic butter, cheese, and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, and condiments; as a lubricant and binder in various foods; and as a component in the manufacture of food additives. It caused tumors when injected under the skin of rabbits in 3,120-milligram doses per kilogram of body weight and when painted on the skin of mice in 62-milligram doses per kilogram of body weight. GRAS. ASP

OLEIC ACID DERIVED FROM TALL OIL FATTY ACIDS • Used as a component in the manufacture of food-grade additives on fresh citrus fruit and

OLEIC ACID DERIVED FROM TALL OIL FATTY ACIDS • Used as a component in the manufacture of food grade additives on fresh extras fruit and in processing beet sugar and yeast. See Oleic Acid and Tall Oil. ASP

OLEINIC ACID • See Oleic Acid.

OLEORESIN • A natural plant product consisting of essential oil and resin extracted from a substance, such as ginger, by means of alcohol, ether, or acetone. The solvent alcohol, for example, is percolated through the ginger. Although the oleoresin is very similar to the spice from which it is derived, it is not identical because not all the substances in the spice are extracted. Oleoresins are usually more uniform and more potent than the original product. The normal use range of an oleoresin is from one-fifth to one-twentieth the corresponding amount for the crude spice. Certain spices are extracted as oleoresins for color rather than for flavor. Examples of color-intensifying oleoresins are those from paprika and turmeric.

OLESTRA • Sucrose Polyester. Olean. A fat substitute developed by Procter & Gamble that cannot be digested. It has no calories. It is aimed at replacing conventional fats in french fries and baked desserts. Used as a total replacement for fats and oils in prepackaged, ready-to-eat cookies. It is a mixture of esters (see) of sucrose (see) prepared by the reaction of sucrose with edible fatty acids (see). It occurs as a solid, soft gel, or liquid at room temperature depending on the fatty acids used. It looks, cooks, and tastes like ordinary fat, but adds no fat or calories to foods with which it is cooked. Potato chips made with Olean, for example, contain no fat and only 75 calories versus 10 grams of fat and 150 calories in regular chips. Use of olestra in foods requires addition of specific amounts of vitamins A, D, E, and K to these foods. Olestra may cause abdominal cramping and loose stools in some individuals and the FDA requires this observation to be on the labels of all foods made with olestra. Henry Blackburn, M.D., of the University of Minnesota, writing an editorial in the April 11, 1996, issue of the New England Journal of Medicine wrote he was concerned that olestra would be used for a long time by millions of people without good direct evidence that its use “would benefit them, reduce weight among the obese, prevent weight gain among those at risk for conditions associated with obesity, or reduce caloric intake substantially in representative population—all purported reasons for adding Olestra to the food supply.” He said there is no regulatory requirement as there is for drugs that the petitioner demonstrate a benefit. He said members of the committee that approved olestra expressed the view that the gastrointestinal symptoms associated with it were at most an “annoyance,” not a serious health problem, and required only a warning label on the product. He wrote that this shifts the responsibility to the public when experts knowingly approved a “gastrointestinal hazard.” The American Medical Association, on the other hand, noted that approximately 150 studies, including 43 clinical trials, had been conducted with olestra in advance of FDA approval, making it “one of the most thoroughly tested foodstuffs to come to market in America.” The FDA is amending the food additive regulations to remove the requirement for the label statement prescribed specifically for savory snack products that contain olestra. This action is in response to a petition filed by the Procter & Gamble Co., the developer of olestra. The regulation became effective August 5, 2003. The change meant that manufacturers no longer need to display the 1996 label statement on products containing olestra informing consumers that olestra may cause abdominal cramping and loose stools in some individuals, that it inhibits the body's absorption of vitamins A, D, E, and K and other nutrients, and that these vitamins have been added to compensate for olestra's effects on these nutrients. Consumers will now see an asterisk after each of these added fat-soluble vitamins listed in the ingredient statement of products containing olestra. The asterisk will reference the statement, “Dietarily insignificant.” The FDA approved olestra in 1996 for use in savory snacks like potato chips, cheese puffs, and crackers. As part of that approval, the FDA required manufacturers to add vitamins A, D, E, and K to olestra-containing foods to compensate for olestra's effects on these fat-soluble vitamins. The FDA still requires manufacturers to continue adding vitamins A, D, E, and K to such products. As promising as that sounds, olestra and similar fat substitutes that may come along in the future raise new concerns: What effect can they have on the gastrointestinal system if they are not absorbed? Can they affect absorption of fat-soluble vitamins? Can they interfere with absorption of other nutrients or with drugs? What particular effects might they have on people with conditions that affect nutrition, such as intestinal disease? Unlike other food additives, which make up only a minute amount of the diet, fat substitutes, such as olestra, have the potential to make up a substantial portion of the diet because they replace fat, a major dietary component. This raises another concern: how best to determine if there are possible toxic effects from such fat substitutes. The usual method for studying toxicity of food additives—giving upward of one hundred times the likely human intake of the substance to laboratory animals—is impractical for fat substitutes like olestra. It is not possible to feed laboratory animals the large amount of fat substitutes that would be required to conduct a traditional toxicology test as is done with other food additives to determine safety. EAF

OLIBANUM EXTRACT • Frankincense Extract. The extract of Boswellia carteri of various species. The volatile, distilled oil from the gum resin of a plant found in Ethiopia, Egypt, and Arabia. It was one of the gifts of the Magi. It is used in cola, fruit, and spice flavorings for beverages, ice cream, ices, candy, and baked goods. EAF

OLIBANUM, GUM • The dried, gummy exudation obtained from various species of Burseraceae trees. The main species are Boswellia carteri, Boswellia frererana, Boswellia papyrifera, and many others. Main producing countries are Somalia, Ethiopia, southeast Arabia, and India. It is used as a thickener and stabilizer in beverages, candies, chewing gums, confectioneries, dairy products, gelatins, nut products, puddings, and canned vegetables. Recent studies have found positive influence of olibanum on rheumatism. In classical Indian medicine, gum olibanum is used as an antiinflammatory remedy. EAF

OLIBANUM OIL • Boswellia spp. Processed olibanum gum (see). EAF

OLIBANUM, RESINOID • Processed olibanum gum (see). See also Frankincense. EAF

OLIVE OIL • A monounsaturated fat (see). Superior to mineral oils in penetrating power. It is a pale yellow or greenish fixed oil obtained from ripe olives grown around the Mediterranean Sea. May cause allergic reactions. Has been reported to be beneficial to blood cholesterol. A polyphenol from olives may protect against macular degeneration associated with age or the damaging effects of chemicals in tobacco smoke, suggests a study reported in the Journal of Neurochemistry. According to the study, the potential benefits of hydroxytyrosol (HTS) for eye health, demonstrated in an in vitro lab study using cells from the human retina, with mitochondria—the cells' power stations—were shown to benefit most.

OMEGA-3 FATTY ACIDS • Found in fish oils, reported to lower fats in the blood and thus reduce the risk of coronary artery disease. The FDA had denied a claim for omega-3 fatty acids in reducing the risk of coronary heart disease because studies relating fish intake and risk of coronary heart disease were “conflicting and inconsistent.” The FDA said the most compelling evidence was a well-controlled study that showed fish consumption may reduce the chance of death from a second heart attack. However, these studies did not establish that the effects were due specifically to omega-3 fatty acids. Data revealed that omega-3 may raise blood LDL (the bad kind of cholesterol) of people with high blood fats and may interfere with blood glucose control in diabetics. In 2008, both omega-3 and fish intake were associated with cancer risk reduction in the colon and rectum, according to findings by researchers from Harvard and Columbia University published in the journal Cancer Epidemiology, Biomarkers & Prevention. See Fish Oil.

OMEGA-6 • The potential of omega-6 in the role of improving behavior is overshadowed by the better-known omega-3 fatty acids. Excessive amounts of omega-6 polyunsaturated fatty acids (PUFA) however, and a very high omega-6/omega-3 ratio found in today's Western diets, promote the pathogenesis of many diseases, including cardiovascular disease, cancer, and inflammatory and autoimmune diseases, whereas increased levels of omega-3 PUFA (a low omega-6/omega-3 ratio) exert suppressive effects, according to a number of studies. A lower ratio of omega-6/omega-3 fatty acids is more desirable in reducing the risk of many of the chronic diseases of high prevalence in Western societies, as well as in the

developing countries, that are being exported to the rest of the world, according to A.P. Simopoulos of the Center for Genetics, Nutrition and Health, Washington, D.C. in a report in Biomedicine & Pharmacotherapy, in October of 2002.

ONION EXTRACT • Extract of the bulbs of onion, Allium cepa, discovered in Asia. Used in meat, onion, and spice flavorings for beverages, ice cream, ices, baked goods, condiments, meats, and pickles. Skin irritant. When heated to decomposition, it emits acrid smoke and irritating fumes. GRAS

ONION OIL • Allium cepa. A volatile oil with a strong and permanent odor. ASP

OPOPANAX GUM • Bisabol. An odorous, myrrh-type gum resin from southern European or African herbs. Once used in medicine. Now used as a flavoring. EAF

OPOPANAX OIL • An odorous gum resin formerly used in medicine and believed to be obtained from Hercules allheal. A fragrance ingredient. EAF. See Opopanax Gum.

OPOPANAX TINCTURE • Bisabolmyrrh. A natural flavoring substance. A tincture is the product that results from solvent extraction. In an extraction, alcohol, water, or a mixture of both is passed through a substance and then collected and purified to produce the desired product. See Opopanox Gum. EAF

ORANGE B • Dull orange crystals derived from coal tar. Coloring for casing of frankfurters and sausages. The color additive was limited to not more than 150 ppm by weight of finished food. In 1978, the FDA said use could result in exposure of consumers to beta-naphthylamine, a known cancer-causing additive. Although it was permanently listed by the FDA, the only manufacturer of it stopped making it. See FD and C Colors. ASP

ORANGE BITTER, FLOWERS and PEEL • Essential oil is used as a flavoring. GRAS. ASP

ORANGE BLOSSOMS • Orange blossoms, absolute, is a natural flavoring derived from the fruit of the bitter plant species. Used in citrus and fruit flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. The flowers provide a natural flavoring extract for citrus and cola flavorings for beverages (2,000 ppm). The orange leaf extract is used as a natural fruit flavoring for beverages, ice cream, ices, and baked goods. Orange peel bitter oil is expressed from the fresh fruit and is used in orange and fruit flavorings for beverages, ice cream, ices, candy, gelatin desserts, chewing gum, and liquors. GRAS. ASP

ORANGE CRYSTALS • See Methyl b-Naphthyl Ketone.

ORANGE ESSENCE • Natural flavoring. See Orange Oil. ASP

ORANGE EXTRACT • Citrus sinesis. A natural flavoring substance. It has an orange odor and a somewhat bitter, astringent taste. EAF

ORANGE FLOWER, BITTER OIL • See Nerol. ASP

ORANGE JUICE • Fruit juice obtained by squeezing, pressing, or otherwise crushing the interior of an orange. EAF

ORANGE LEAF • See Orange Blossoms. ASP

ORANGE OIL, DISTILLED OR TERPENELESS • Sweet Orange Oil. Citrus sinensis. Yellow to deep orange, highly volatile, unstable liquid with a characteristic orange taste and odor expressed from the fresh peel of the ripe fruit of the sweet orange plant species. Used in orange and fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. A study reported in the Journal of Food Science in 2008 adds to the belief that orange essential oils could prove useful in the formulation of all-natural and organic ingredients that live up to food safety standards. Inhalation or frequent contact with oil of orange, however, may cause severe symptoms such as headache, dizziness, and shortness of breath. May cause allergic reaction in the hypersensitive. ASP

ORANGE PEEL, BITTER OIL • See Orange Blossoms. ASP

ORANGE PEEL, SWEET EXTRACT • From the fresh rind of the fruit. Sweetish, fragrant odor; slightly bitter taste. Used in orange and ginger ale flavorings for beverages, ice cream, ices, candy, and baked goods. GRAS. ASP

ORANGE PEEL, SWEET OIL (TERPENELESS) • From the fresh rind of the fruit. Sweetish, fragrant odor; slightly bitter taste. Used in orange and fruit flavoring for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and puddings. ASP

ORANGE, SWEET and LEAF, FLOWER, PEEL • Used as a flavoring. See Orange Blossoms and Orange Oil. ASP

OREGANO • Mexican Oregano. Mexican Sage. Origanum. The wild marjoram (see) plant, but spicier, ordinarily found in Eurasia. Used in loganberry, cherry, sausage, root beer, and spice flavorings for beverages, baked goods, condiments (2,800 ppm), and meats. See Origanum Oil for toxicity. GRAS. ASP

ORGANIC • The term usually means produce grown without pesticides, herbicides, or synthetic fertilizers on land that has been free of such chemicals for one to seven years. It also means animals supposedly not subject to antibiotics, hormones, or other additives.

ORGANOPHOSPHATES • Compounds containing phosphorus that belong to several groups, including phospholipids or phosphatides, which are widely distributed in plants and animals. (lecithin is an example); esters of phosphinic and phosphonic acids, which are used as plasticizers, insecticides, resin modifiers, and flame retardants; pyrophosphates, which are the basis for many insecticides that inhibit cholinesterase, an enzyme necessary for nerve transmission (tetraethyl pyrophosphate [TEPP], which is highly toxic, was developed during World War II as a biological weapon); and the phosphoric esters of glycerol, glycol, and other fatty alcohols that are used in fertilizers. Organophosphates, pesticides, and insecticides can be extremely toxic. They can kill quickly or slowly depending on the amount of exposure. Most are easily absorbed through the skin, eyes, stomach, and lungs. Among the organophosphate pesticides in use are azinphosmethyl, carbophenothion, demeton, diazinon, dichlorvos, dicrotophos, dimethoate, endothion, EPN, fen-sulfothion, fenthion, Hinosan, methyl demeton, methyl parathion, mevinphos, mipafox, monocrotophos, naled, parathion, phorate, phosphamidon, Phostex, tetraethyl pyrophosphate (TEPP), thiometon, and trichlorfon. Organophosphorous compounds are now being studied for delayed neurotoxicity.

ORGANOTIN • Widely used as heat stabilizers in PVC and CPVC piping, which results in their presence in drinking water supplies. Suspected of being a neurotoxin. Organotin compounds are very effective biocides. Unfortunately they are also very toxic to aquatic organisms such as mollusks (oysters, mussels, etc.) acting as endocrine disruptors (see).

ORIGAN • See Oregano.

ORIGANOL • See 4-Carvomenthenol.

ORIGANUM OIL • Lippia spp. The volatile oil is obtained by steam distillation from a flowering herb. Yellowish red to dark brown, with a pungent odor. Used in vermouth, sausage, root beer, and spice flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. A teaspoonful can cause illness, and less than an ounce has killed adults. GRAS. ASP

ORIZANOL • The ester of ferulic acid and terpene alcohol widely found in plants used in flavorings. See Cinnamate.

ORMETOPRIM • A coccidiostat (see) feed additive. The FDA tolerance for residue in edible tissues of chickens, ducks, turkeys, salmoids, and catfish is 0.1 ppm. Sulfadimethoxine/ormetoprim, a frequent combination, is a potentiated sulfa drug used to treat infected wounds and susceptible

bacterial infections of the skin and urinary tract.

L-ORNITHINE • An amino acid used in the body for the production of L-arginine, L-proline and polyamines. Body builders and age-worried individuals have swallowed the idea that L-ornithine, along with arginine, may promote muscle-building activity in the body by increasing levels of anabolic hormones such as insulin and growth hormone. L-ornithine is also said to increase the metabolism of fat and is therefore promoted for weight regulation and loss. The recommended dosage of L-ornithine is dependent on the age, body weight, and medical condition of the patient and should be determined by a clinician or dietitian only. EAF

ORRIS CONCRETE, LIQUID, OIL • Iris florentina l. Orris Root Oil. White Flag. Love Root. Made from the roots of the plant. Yellowish, semisolid, and fragrant oil. Distilled for use in raspberry, blackberry, strawberry, violet, cherry, nut, and spice flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and icings. See Orris Root Extract. ASP

ORRIS ROOT EXTRACT • Obtained from dried orris root. Has an intense odor and is used in perfumery. Used in chocolate, fruit, nut, vanilla, and cream soda flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Causes frequent allergic reactions. ASP

ORTHOPHENYL PHENOL • Preservative. See Phenol. E

ORTHOPHOSPHATE • A salt of phosphoric acid (see).

ORYZALIN • Surflan. Dirimal. An herbicide used in peppermint and spearmint. The FDA limits it to 0.1 ppm in peppermint and spearmint oil.

OSHA • Occupational Safety and Health Administration, U.S. Department of Labor. An agency that establishes workplace safety and health regulations.

OSMANTHUS, ABSOLUTE • A widely distributed genus of evergreen shrubs or trees, family Oleaceae. Used in flavoring. ASP

OSTEOPOROSIS • A skeletal disease in which the bones lose mass and density, the pores in bones enlarge, and the bones generally become fragile. Osteoporosis often is not diagnosed until a fracture occurs, most commonly in the spine, hip, or wrist. The National Osteoporosis Foundation says about 1.5 million such fractures occur each year in the United States.

OTC • The abbreviation for over-the-counter medications and personal care products.

OTHER CARBS • The listing for other carbohydrates on food labels. See Carbohydrates.

OURICURY WAX • The wax exuded from the leaves of a Brazilian palm tree. The hard brown wax has the same properties and uses as carnauba wax (see).

OXALIC ACID • Occurs naturally in many plants and vegetables, particularly in the Oxalis family; also in many molds. Some plants such as rhubarb, spinach, and amaranthus are high in it. Oxalic acid has the ability to bind some metals such as calcium and magnesium and has therefore been suspected of interfering with the metabolism of these minerals.

OXAMYL • A pesticide. The FDA residue tolerance in pineapple bran is 6 ppm.

OXAZOLINE • A series of synthetic waxes that are versatile and miscible with most natural waxes and can be applied to the same uses.

OX BILE • Oxgall. Emulsifier from the fresh bile of male castrated bovines.

Brownish green or dark green; viscous. Characteristic odor. Bitter, disagreeable taste. Used in dried egg whites up to 0.1 percent. GRAS. ASP

OXFENDAZOL • Crystals from chloroform and methanol, it is used in a suspension to kill worms in cattle. FDA tolerance is 0.8 ppm in cattle liver.

OXIDES OF NITROGEN • Used as a bleaching additive in flour. See Nitrogen.

OXIDIZED POLYETHYLENE • The resin produced by exposing polyethylene (see) to air. It is used as a protective coating or component of protective coatings for fresh avocados, bananas, beets, coconuts, eggplant, garlic, grapefruit, lemons, limes, mangoes, muskmelons, onions, oranges, papaya, peas (in pods), pineapple, plantain, pumpkin, rutabaga, squash (acorn), sweet potatoes, tangerines, turnips, watermelon, Brazil nuts, chestnuts, filberts, hazelnuts, pecans, and walnuts (all nuts in shells). E

OXIDIZED STARCH • See Modified Starch. E

OXIDIZED TALLOW • A defoaming component used in yeast and beet sugar production in reasonable amounts required to inhibit foaming. See Tallow Flakes.

OXIDIZER • A substance that causes oxygen to combine with another substance. Oxygen and hydrogen peroxide are examples of oxidizers.

OXIRANE (CHLOROMETHYL)-, POLYMER WITH AMMONIA, REACTION PRODUCT • Food-processing additive to make a product more alkaline. NUL

3-OXOBUTANAL, DIMETHYL ACETAL • Artificial flavoring. NIL

3-OXODECANOIC ACID GLYCERIDE • Artificial flavoring. NUL

3-OXODODECANOIC ACID GLYCERIDE • Artificial flavoring. NUL

3-OXOHEXADECANOIC ACID GLYCERIDE • Artificial flavoring. NUL

3-OXOHEXANOIC ACID DIGLYCERIDE • Artificial flavoring. NUL

3-OXOOCTANOIC ACID GLYCERIDE • Artificial flavoring. NUL

2-OXOPENTANEDIOIC ACID • Synthetic flavoring. The JECFA (see) says there is no safety concern. EAF

2-OXO-3-PHENYLPROPIONIC ACID • Synthetic flavoring. EAF

3-OXOTETRADECANOIC ACID GLYCERIDE • Synthetic flavoring. NUL

OXYFLUORFEN • Orange solid used as an herbicide in cottonseed oil, mint oil, and soybean oil. Limitation of 0.25 ppm in the oils.

OXYGEN • Nonmetallic gas used in the manufacture of food additives. E

OXYSTEARIN • A mixture of the glycerides (see) of partially oxidized stearic acids (see) and other fatty acids (see). Occurs in animal fat and used chiefly in manufacture of soaps, candles, cosmetics, suppositories, pill coatings. Tan, waxy. Used as a crystallization inhibitor in cottonseed and soybean cooking. In salad oils up to 0.125 percent. Also used as a defoamer in the production of beet sugar and yeast. The Select Committee of the Federation of American Societies for Experimental Biology advising on food additives recommended further study of this additive. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that while no evidence in the available information on it demonstrates a hazard to the public at current use levels, uncertainties exist, requiring that additional studies be conducted. GRAS status has continued since 1980 while tests were being completed and evaluated. ASP

OXYTETRACYCLINE • An antibiotic substance used in feed to increase growth and found in edible tissue of chickens and turkeys. The FDA permits a residue in the birds of up to 3 ppm in liver and 1 ppm in uncooked muscle, fat, and skin of chickens and turkeys. It is used in combination with carbomycin (see) in the drinking water of chickens. It is used in tablet form for cattle. Because it is an antimicrobial, it may cause sensitivity to

carbonyem (see) in the drinking water of chickens. It is used in tablet form for cattle. Because it is an antimicrobial, it may cause sensitivity to light, nausea, inflammation of the mucous membranes of the mouth, and diarrhea. See Antibiotics.

OZOKERITE • Ceresin. A naturally occurring waxlike mineral; a mixture of hydrocarbons. Colorless or white when pure; horrid odor. Upon refining, it yields a hard, white, microcrystalline wax known as ceresin (see). An emulsifier and thickening additive used in lipstick and cream rouge.

OZONE • A colorless gas or dark blue liquid used as an antimicrobial additive in bottled water and in the treatment, storage, and processing of foods, including meat and poultry. Under the EPA Genetic Toxicology Program (see). Toxic effects are from inhalation. GRAS. EAF

P-4000 • 5-Nitro-2-propoxyaniline. Substance that is four thousand times sweeter than sugar without an aftertaste. Used in some European countries but banned in the United States because of potential toxic effects. BAN

PABA • See Para-Aminobenzoic Acid.

PACKAGING • Food packaging materials, such as plastic containers, cans, and candy boxes, are subject to regulation as food additives under the FD&C Act because of the possibility that they may leach their chemical constituents into the food product and become indirect additives. Among them are antimycotics, antioxidants, driers, drying oils as components of finished resins, plasticizers, release agents, stabilizers, and substances used in the manufacture of paper and paperboard. Some of the more troubling are acrylonitrile copolymers and resins, sodium nitrate and potassium nitrate, various cobalts, and borax or boric acid for use in adhesives, sizes, and coatings. Then there are a number of polyvinyls and formaldehyde (see all). Plastic tends to migrate into fatty foods, especially hot ones, so such wrapped foods should be kept out of the sun and out of the microwave. Try to buy water and juices in glass containers instead of plastic ones. As for cans, imported foods may be sealed by soldering containing lead. If the seams are bumpy, they might be soldered with lead. Also many cans sold in the market have plastic coatings with chemicals you may not want leaching into your food. Packaging chemicals have been found in breast milk, according to recent studies, and some packaging chemicals are in people's blood worldwide. As regulators and consumers become more aware of chemicals leaching from packaging, the situation should improve. There is no way to avoid packaging unless you grow your food yourself.

PADI • The abbreviation for provisional acceptable daily intake (see).

PAFA • Stands for the U.S. Food and Drug Administration's Priority-based Assessment of Food Additives.

PAH • The abbreviation for a group of chemicals called polycyclic aromatic hydrocarbons. PAHs are often found together in groups of two or more. They can exist in more than one hundred different combinations, but the most common are treated as a group of fifteen. PAHs are found naturally in the environment but they can also be man-made. Exposure to other PAHs can occur by eating foods grown in contaminated soil or by eating meat or other food that is grilled. Grilling and charring food actually increases the amount of PAHs in the food. Individuals who work in a plant that makes coal tar or that uses petroleum or coal or makes or uses wood preservatives could be exposed to anthracene (see) and other PAHs. See Polycyclic Aromatic Hydrocarbons.

PALATINOSE • A sugar substitute. See Isomaltulose.

PALATONE • See Maltol.

PALE CATECHU • See Catechu Extract.

PALM KERNEL OIL • The oil from the fruit of the oil palm Elaeis guineensis. A fatty solid with a sweet, nutty flavor. Used as a coating additive, emulsifying additive, and texturizer in confectionery products and margarine. GRAS

PALM OIL • Palm Butter. Palm Tallow. Yellow-brown, buttery, edible solid at room temperature. Oil palms are native to central Africa and Malaysia. A fatty mass with a faint violet odor. Used as a shortening, as a substitute for tallow, and in making soaps and ointments.

PALM OIL GLYCERIDE • See Palm Oil.

PALMA ROSA OIL • Geranium Oil. The volatile oil obtained by steam distillation from a variety of partially dried grass grown in East India and Java. Used in rose, fruit, and spice flavorings for ice cream, ices, candy, and baked goods. Believed as toxic as other essential oils, causing illness after ingestion of a teaspoonful and death after ingestion of an ounce. A skin irritant. GRAS

PALMAMIDE MEA • A mixture of ethanolamides of the fatty acids derived from palm oil (see).

PALMITAMIDE • A substance that keeps food from sticking to a container. Used in packaging material. See Palmitic Acid.

PALMITATE • Salt of palmitic acid (see) occurs in palm oil, butter fat, and most other fatty oils and fats.

PALMITIC ACID • A mixture of solid organic acids obtained from fats consisting chiefly of palmitic acid with varying amounts of stearic acid (see). It is white or faintly yellow and has a fatty odor and taste. Palmitic acid occurs naturally in allspice, anise, calamus oil, cascarilla bark, celery seed, butter acids, coffee, tea, and many animal fats and plant oils. It forms about 21 percent of cows' milk. Obtained from palm oil, Japan wax, or Chinese vegetable tallow. Used in butter and cheese flavorings for seasoning preparations and in processing fresh citrus fruit and other foods. ASP

PALMITOYL HYDROLYZED ANIMAL PROTEIN • See Hydrolyzed Protein.

PALMITOYL HYDROLYZED MILK PROTEIN • The condensation product of palmitic acid chloride and hydrolyzed milk protein. See Hydrolyzed and Milk.

PAMTA • The abbreviation for the Preservation of Antibiotics for Medical Treatment Act of 2007 (see).

PANCREATIC EXTRACT • See Pancreatin.

PANCREATIN • Hi-Vegi-Lip. Pancreatin Enseals. A preparation of pancreatic hormones used to aid digestion of starches, fats, and proteins. Potential adverse reactions include nausea and diarrhea. Antacids may negate pancreatin's beneficial effects. Should be used cautiously in people who are allergic to pork. GRAS. NUL

PANSY EXTRACT • The extract obtained from Viola tricolor. Flavoring in alcoholic beverages only. Also used as a coloring in cosmetics. NUL

PANTHENOL • Dexpanthenol. Vitamin B Complex Factor. A viscous, slightly bitter liquid used as a medicinal supplement in foods to aid digestion and in liquid vitamins. It is good for human tissues.

d-PANTOTHENAMIDE • Vitamin B Complex. Vitamin B5. Made synthetically from the jelly of the queen bee, yeast, and molasses. Cleared as a source of pantothenic acid in foods for special dietary use. Pantothenic acid (common sources are liver, rice bran, and molasses) is essential for metabolism of carbohydrates, fats, and other important substances. Nerve damage has been observed in patients with low pantothenic acid. It helps release energy from carbohydrates in the breakdown of fats. Children and adults need from 5 to 10 milligrams per day. See Calcium Pantothenate. NIL

PANTOTHENIC ACID • Vitamin B5. A necessity in human diets. It helps metabolize fats and proteins. Nontoxic.

d-PANTOTHENYL ALCOHOL • The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. See Calcium Pantothenate. NUL

PANTOTHENYL ETHYL ETHER • The ethyl ether of the B vitamin panthenol (see).

PANTOTHENYL ETHYL ETHER ACETATE • The ester of acetic acid and the ethyl ether of the B vitamin panthenol (see).

PAPAIN • A proteinase enzyme for meat tenderizing. Prepared from papaya, a fruit, and Carica papaya, grown in tropical countries. Used for

clearing beverages. Added to enriched farina to reduce cooking time. Used medically to prevent adhesions. It is deactivated by cooking, but because of its protein digesting ability it can dissolve necrotic material with disastrous results. The usual grade used in food digests about thirty-five times its weight of lean meat. It may cause allergic reactions. Has caused birth defects in experimental animals. GRAS. ASP

PAPAYA • A fruit grown in tropical countries. It contains an enzyme, papain, used as a meat tenderizer and medicinally to prevent adhesions. It is deactivated by cooking. Because of its protein-digesting ability, it can dissolve necrotic (dead) material. It may cause allergic reactions. See Papain.

PAPRIKA • The finely ground pods of dried, ripe, sweet pepper, Capsicum annuum. The strong, reddish orange powder is used in sausage and spice flavorings for baked goods, condiments, meats, and soups. The oleoresin (see) is used in fruit, meat, and spice flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. Both paprika and paprika oleoresins are used as red coloring. Permanently listed since 1966 for use in foods consistent with good manufacturing practices. They do not require certification. GRAS. ASP. E

PAPRIKA OLEORESIN • Used as a color additive. See Paprika. GRAS. ASP

PARA-AMINOBENZOIC ACID • The colorless or yellowish acid found in vitamin B complex. It is used medicinally to treat arthritis. However, it can cause allergic eczema (see) and sensitivity to light in susceptible people, whose skin may react to sunlight by erupting with a rash, sloughing, and/or swelling.

PARABENS • Butylparaben. Heptylparaben. Methylparaben. Propylparaben. Para-hydroxybenzoate. The parabens are the most commonly used preservatives in the United States as a preservative in surface treatment of dried meat products, cereal- or potato-based snacks and coated nuts, etc. The parabens have a broad spectrum of antimicrobial activity—relatively nonirritating, nonsensitizing, and nonpoisonous—and are stable over the pH (see) range. The typical paraben preservative system contains 0.2 percent methyl- and 0.1 percent propylparaben. Methyl- and propylparaben are esters of parahydroxybenzoic acid. Neither occurs in nature. In foods, parabens function as preservatives that prevent the growth of molds and yeasts. They are used in baked goods, sugar substitutes, artificially sweetenedjams, mincemeats, milk preparations, soft drinks, packaged fish, meat, poultry, jellies, fats, oils, and frozen dairy desserts. Methyl- and propylparabens are used at 1,000 ppm in tomato pulp, puree, ketchup, pickles, and relishes. It had been reported that methylparaben caused birth defects in offspring of mice and rats fed 550 milligrams per kilogram of body weight daily during pregnancy, and in hamsters fed 300 milligrams under the same conditions. The European Parliament said in 2003 that parabens should be reevaluated because they have been found to cause cell proliferation in the forestomach and developmental toxicity. In April 2003, the Scientific Committee on Food notes that in the event that the parabens are still used in food, the committee cited its statement of October 2000, that the temporary acceptable daily intake (ADI) should be withdrawn if no further data are submitted. As these data have not been submitted in the last thirty months, the conditional authorization for parabens should be withdrawn. Then in 2004, a study published in the Journal of Applied Toxicology (2004, 25:5) reported parabens are a cause for concern. British researchers found traces of it in twenty women who had breast tumors. It is believed parabens act like the female hormone estrogen. In high levels, estrogen can cause some women to develop breast cancers. There were also reports that parabens may contribute to the notable drop in sperm count in European men. There is pressure by some members of the EU and scientists in other countries to ban the use of parabens in underarm deodorants, in particular, and in foods, if possible. See Methylparaben, Butylparaben, and Propyl-p-hydroxyrenzoate.

PARAFFIN AND SUCCINIC DERIVATIVES SYNTHETIC • Coating on fresh citrus, muskmelons, and sweet potatoes. See Paraffin Wax and Succinic Acid. ASP

PARAFFIN WAX • Used as a defoaming component in yeast and sugar beet production. Used in chewing-gum bases. Not digested or absorbed in the intestines. Used to cover food products. A component of chewing-gum base. Obtained from the distillate of wood, coal, petroleum, or shale oil. Easily melts over boiling water. Pure paraffin is harmless to the skin, but the presence of impurities may give rise to irritations and eczema. Many paraffin waxes contain cancer-causing agents. See also Wax. ASP

PARAFORMALDEHYDE • Preservative used to control fungus in maple-tree tap holes. There is a residue limit of 2 ppm of formaldehyde in maple syrup. See Formaldehyde.

PARALDEHYDE • Made from acetaldehyde (see). Used in processing food additives. It is a sedative and hypnotic that can be habit forming. Used in baked goods, beverages, breakfast cereal, chewing gum, confectionery frostings, egg products, fats and oils, fruit ices, hard candy, instant coffee, milk products, seasonings, and soft candy. Declared GRAS by FEMA (see). EAF

PARAMIPHOS-METHYL • A pesticide. The FDA allows a residue of 60 ppm in or on rice hulls and 50 ppm in or on rice milling fractions and in or on wheat milling fractions.

PARAQUAT • Defoliant and herbicide used in animal feed for goats, cattle, swine, and lambs. The FDA limits residue to up to 0.2 ppm in dried hops, 3 in mint hay, 6 in sunflower seed hulls. Paraquat is in the EPA Genetic Toxicology Program (see). Poison by ingestion and skin contact. Causes ulceration of the digestive tract, diarrhea, vomiting, renal damage, jaundice, edema, hemorrhage, lung damage, and death from suffocation. When heated to decomposition, it emits toxic fumes.

PARATHION • A deep brown to yellow liquid, it is an organophosphate (see) insecticide and acaricide. Highly toxic by skin contact, inhalation, or ingestion. It interferes with the transmission of nerve signals. Repeated exposure may, without warning, be increasingly hazardous. See Organophosphates.

PARMESAN CHEESE, REGGIANO CHEESE • A hard, dry cheese with a sharp flavor that is cured for several years. It is used as a flavoring. ASP

PARSLEY, LEAVES, OIL, and OLEORESIN • The aromatic leaves of the annual herb Petroselinum ssp., cultivated everywhere, are used in spice flavorings for beverages, meats, soups, baked goods, and condiments. Parsley oil is obtained by steam distillation of the ripe seeds of the herb. The oleoresin (see) is used in spice flavorings for condiments. Parsley may cause the skin to break out with a rash, redden, and swell when exposed to light. It may also cause an allergic reaction in the sensitive. GRAS. ASP

PARSLEY SEED OIL • See Parsley, Leaves, Oil, and Oleoresin.

PARTIALLY DELACTOSED WHEY • PDW. Used increasingly as a substitute for nonfat dry milk, which is more expensive, PDW is used in processed cheese foods and spreads. It is the result of the partial removal of lactose (see) from the milk ingredient whey (see).

PARTIALLY DEMINERALIZED and DELACTOSED WHEY • Removal of some minerals as well as lactose from whey. See Partially Delactosed Whey.

PARTIALLY HYDROGENATED VEGETABLE OIL • Used in margarine, crackers, fried foods, and baked goods. See Hydrogenation and Trans Fatty Acids.

PARVE • See Kosher.

PASSIONFLOWER • Extract of the various species of Passiflora incarnate used as a flavoring. Indians used passionflower for swellings, relieving sore eyes, and to induce vomiting. It is used as a flavoring. It has been shown that an extract of the plant depresses the motor nerves of the spinal cord. EAF

PATCHOULY OIL • Patchouli Oil. Essential oil obtained from the leaves of an East Indian shrubby mint, Pogostemon spp. Yellowish to greenish

PATCHOULY OIL • Patchouli Oil. Essential oil obtained from the leaves of an East Indian shrubby mint, Pogostemon spp. Yellowish to greenish brown liquid, with the pleasant fragrance of summer flowers. Used as a flavoring in cola, fruit, nut, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. May produce allergic reactions. ASP

PATENT BLUE V • Color. According to the JECFA (see), information on the metabolism of the color is lacking. Long-term and reproduction studies in rats did not reveal any significant toxicological effects. A long-term study in a second species is required as well as a short-term study in a nonrodent species. These have not been supplied. The previous temporary ADI (see) has been withdrawn.

PATHOGEN • Any disease-causing agent, usually applied to living agents.

PATHOGENIC • Causing or capable of disease.

PCBs • See Polychlorinated Biphenyls.

PD • Substance for which a petition has been filed but denied because of lack of proof of safety. Substances in this category are illegal and may not be used in foods. E

PEA FIBER, ORGANIC • Aimed at helping food makers meet demand for fiber-enriched products in Europe in the light of consumer campaigns. The addition of the pea fiber alongside another fiber, inulin, opens up commercial synergies. Organic pea fiber also is used as a wheat and soy fiber replacement, for products aimed at allergy sufferers. Other benefits reportedly include increasing water absorption and yields, reducing fat, and having a cholesterol-lowering effect. Pea is also an easily digestible source of protein. Pea protein reportedly has multiple benefits and is of great interest in dietary sports products because of its high levels of amino acids, glutamic acid, arginine, and lysine.

PEACH ALDEHYDE • See Undecalactone.

PEACH EXTRACT • See Peach Juice Extract.

PEACH JUICE EXTRACT • The liquid obtained from the pulp of the peach Prunus persica. It is used as a natural flavoring. Nontoxic.

PEACH KERNEL OIL • Persic Oil. A light yellow liquid expressed from the seed. Smells like almonds. Used as a natural flavoring in conjunction with other natural flavorings. GRAS. NUL

PEACH LEAVES EXTRACT • Flavoring for alcoholic beverages only. See Peach Juice Extract. NUL

PEANUT OIL • Arachis Oil. Greenish yellow, with a pleasant odor. Prepared by pressing shelled and skinned seeds of the peanut. A solvent in salad oil, shortening, mayonnaise, and confections. Also used in conjunction with natural flavorings. Peanut butter is about 50 percent peanut oil suspended in peanut fibers. It may migrate from cotton in dried food packaging. The oil acts as a mild cathartic and as a protective for the gastrointestinal tract when corrosive poisons have been swallowed. A study done by the Department of Nutrition, University of California, Davis, found in 1997 crude peanut oil caused allergic reactions in 10 percent of allergic subjects studied and should be avoided. Refined peanut oil did not pose a risk to the subjects. However, the JECFA reports that allergenicity of peanut has been inadequately tested and needs to be reevaluated. Check with your physician before trying if you are allergic to peanut oil. GRAS. ASP

PEANUT STEARINE • Natural flavoring. See Peanut Oil. GRAS. ASP

PEANUTAMIDEMEA • Loramine Wax. See Peanut Oil.

PEANUTAMIDEMIPA • A mixture of isopropanolamides of the fatty acids derived from peanut oil (see).

PECAN SHELL POWDER • A coloring additive used in cosmetics. Employed medicinally by the American Indians. It is the nut from a hickory of the south central United States with rough bark and hard but brittle wood. Edible.

PECTINASE • Enzyme used as a clarifying additive (see) in wine and juice from Aspergillus niger or Bacillus subtilis. ASP

PECTIN • Pectin is found in roots, stems, and fruits of plants and forms an integral part of such structures. Richest source of pectin is lemon or orange rind, which contains about 30 percent of this polysaccharide. Used as a stabilizer, thickener, and bodying additive for artificially sweetened beverages, syrups for frozen products, ice cream, ice milk, confections, fruit sherbets, water ices, French dressing, fruit jelly, preserves, and jams to compensate for a deficiency in natural pectin. Used in foods as a "cementing additive." Also used as an antidiarrheal medicine. GRAS. ASP. E

PEGU CATECHU EXTRACT • See Catechu Extract.

PEL • The abbreviation for permissible exposure level; OSHA air standard.

PELARGONALDEHYDE • See Nonanal.

PELARGONIC ACID • Nonanoic Acid. A synthetic flavoring additive that occurs naturally in cocoa and oil of lavender. Used in berry, fruit, nut, and spice flavorings. Used in peeling solution for fruits and vegetables. A strong irritant.

PELARGONIC ALDEHYDE • See Pelargonic Acid.

PELARGONYL VANILLYLAMIDE • See Pelargonic Acid.

PENDARE • Couma macrocarpa. Couma utilis. A flavoring from tropical South American trees. See Coumarin. ASP

PENDIMETHALIN • Prowl. Stomp. An herbicide. Has a fruity odor. It is a man-made chemical that is used primarily as an herbicide to destroy or prevent the growth of certain plants like weeds. It is also used on crops and residential lawns and ornamentals (plants that are grown for their beauty). It is used and applied in various forms, including a liquid, solid, and granular. Pendimethalin can enter your body if you breathe contaminated air or eat contaminated food. Traces of pendimethalin applied to crops can be digested. FDA tolerance is 0.1 ppm as a residue in or on corn fodder or forage, grain, potatoes, sorghum, soybeans, or sunflower seeds. Pendimethalin caused thyroid problems in male and female rats. Exposure to pendimethalin through diet is extremely low. But it has been classified as a possible cancer-causing substance. Although animal studies show that pendimethalin has a low toxicity, it is slightly toxic if you are exposed to it by eating or drinking contaminated food or water. It is also toxic if it gets in the eyes. Animal studies show that short-term exposure of animals to less than 5,000 milligrams per kilogram of pendimethalin resulted in the death of 50 percent of experimental animals according to the JECFA. Pendamethalin is on the EPA's priority list of toxic chemicals to be evaluated.

PENICILLINASE FROM BACILLUS SUBTILIS • An enzyme from a mold used in processing. NUL

PENICILLINS • Amoxicillin. Ampicillin. Azlocillin. Bacampicillin. Carbenicillin. Cloxacillin. Dicloxacillin. Methicillin. Mezlocillin. Nafcillin. Oxacillin. Penicillin G, V. Piperacillin. Ticarcillin. A group of beta-lactam antibiotics produced by several species of mold and/or semisynthetically. There are many kinds and they offer a broad clinical spectrum of activity. They act by inhibiting bacterial enzymes involved in making cell walls. Used to treat animal infections and in animal feed to prevent infections and to encourage growth, particularly in chickens, lamb, swine, turkey, pheasants, and quail. The FDA limits residues to 0.05 ppm in cattle. Limitation of zero in chickens, pheasant, quail, swine, sheep, eggs, milk, and foods in which milk has been used. Limitation of 0.01 ppm in turkeys. In EPA Genetic Toxicology Program (see). Human reproductive effects by ingestion: abortion. Human systemic effects by intramuscular route: skin rash. Has been implicated in aplastic anemia. PENICILLIUM ROQUEFORTII • Mold used to make cheeses. NUL

PENNYROYAL OIL, AMERICAN • Squaw Mint. Mosquito Plant. American Pennyroyal. European Squaw Balm. Tickweed. Hedeoma pulegiodes, Mentha pulegium, Hedeoma pulegioides. An extract of the flowering herb Mentha pulegium. Small amounts of the oil are approved by the Food and Drug Administration for use in mint flavorings for beverages, ice cream, ices, candy, and baked goods Pennyroyal has been employed since ancient days as a folk medicine to treat various minor ailments, including colic and bronchitis, but is better known for its abortion-inducing effects. Scientists are unsure exactly how pennyroyal exerts these effects, which are not consistent. It is thought that the herb causes irritation of the uterus, leading to contractions. Pennyroyal is an extremely toxic herb that has caused multiorgan failure and death. It should be avoided. The extensive toxicity of pennyroyal is due to a substance called pugelone, which is metabolized in the liver to highly toxic molecules that cause tissue damage in the internal organs. Studies in both animals and humans show that pulegone is directly toxic to the nervous system. Side effects include dizziness, hallucinations, abdominal cramps, nausea and stomach upset, and it is toxic to the liver and kidneys. No clinical studies have examined the effectiveness of pennyroyal, probably because of its high toxicity. Laboratory analysis of over-the-counter pennyroyal leaf products found contamination with low levels of bacteria, fungi, and yeast. This product is regulated by the FDA as a dietary supplement. Unlike approved drugs, supplements are not required to be manufactured under specific standardized conditions. This product may not contain the labeled amount or may be contaminated. In addition, it may not have been tested for safety. This is a dangerous herb and should not be used. ASP

PENNYROYAL OIL, EUROPEAN • Mentha pulegium. See Pennyroyal. ASP

PENTACHLOROBENZENE • Identified as priority hazardous substance by the European Union. See Pentachloronitrobensene.

PENTACHLORONITROBENZENE • Used to prevent the formation of slime in industrial waters. It is also registered as a fungicide that helps prevent or destroy the growth of fungus. It is primarily used to prevent the growth of fungi on grass, lawn flowers, ornamental crops, shrubs, and in gardens. It has agricultural uses to protect cotton and grain seeds, like barley, oats, rice, and wheat, from the growth of fungi. It can enter your body through breathing contaminated air, eating or drinking contaminated food or water, and by skin contact. Pentachloronitrobenzene can build up in the fatty tissues of animals. This means that eating beef, pork, poultry, and fish as well as dairy products can be a source of exposure. The effects of long-term exposure of pentachloronitrobenzene on humans are not known. However, animal studies show that dogs exposed to it through diet experienced liver damage. Short-term exposure to pentachlorobenzene can affect the central nervous system. Long-term exposure can affect the liver and kidneys and can cause tissue lesions. Animal studies and tests show that pentachlorobenzene can possibly cause toxic effects on human reproduction. It is on the EPA's priority list for chemicals to be studied.

PENTACHLOROPHENOL • Chloropben. Santophen. Dark-colored flakes with a characteristic odor used as a preservative in packaging materials. It is a man-made chemical. Human poison by ingestion. A suspected human cancer-causing additive. Causes birth defects in experimental animals but it is unknown if exposure will cause birth defects in humans. Skin irritant. Acute poisoning causes weakness with difficult breathing and changes in blood pressure and urinary output. Can cause death. If you are exposed to large doses of pentachlorophenol over a short period of time, or small doses over a long period, your liver, kidneys, blood, lungs, nervous system, immune system, and gastrointestinal tract could be damaged; this is based on animal studies that show increased risk of cancer to the livers and adrenal glands of mice. Pentachlorophenol was used as a biocide to kill small organisms and is now used as a wood preservative to protect wood from decay and insect attack. Although pentachlorophenol was widely used as a pesticide, its use has been restricted so that only people with special certification or a license can purchase and use it. It is not commercially available for use in your home; however, it is still used as a wood preservative to protect power-line poles, cross arms, and fence posts from decay and insect attack. It can still affect you if you breathe contaminated air, or drink contaminated water near a waste site. You could also eat contaminated food such as fish, although reportedly eating and drinking pentachlorophenol-contaminated food and water is not very common. Identified as priority hazardous substance by the European Union. FDA limit of 50 ppm in treated wood. IARC (see) is reviewing it and it is on EPA's Extremely Hazardous List, Community Right-to-Know List, and EPA Genetic Toxicology Program (see all).

PENTADECALACTONE • Angelica Lactone. Exaltolide. It is obtained from the fruit and root of a plant grown in Europe and Asia. A synthetic berry, fruit, liquor, wine, nut, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and alcoholic beverages. ASP

PENTADECANOLIDE • See Pentadecalactone.

2-PENTADECANONE • An essential oil found in wild tomatoes and in pheromones (see) of fruit flies and other insects that attract mates. EAF

PENTADESMA BUTTER • Kanya Butter. The vegetable fat extracted from the nut of Pentadesma butyracea. See Shea Butter.

PENTADIENAL • Synthetic flavoring. The JECFA (see) says there is no safety concern. ASP

PENTAERYTHRITOL ESTER OF MALEIC ANHYDRIDE MODIFIED WOOD ROSIN • Coating on fresh citrus fruit. Pentaerythritol is a resin made by treating acetaldehyde (see) with formaldehyde (see) in a solution of calcium hydroxide.

PENTAERYTHRITOL ESTER OF PARTIALLY HYDROGENATED WOOD ROSIN • Hard, amber-colored solid used as a coating for citrus fruits and in chewing-gum bases. See Rosin.

PENTANAL • See Valeraldehyde. ASP

PENTANE • The aliphatic hydrocarbon derived from petroleum. Used as a solvent. Narcotic in high doses.

2,3-PENTANEDIONE • A synthetic flavoring additive that occurs naturally in coffee. Used in strawberry, chocolate, butterscotch, butter, caramel, fruit, rum, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and puddings. ASP

2, 3-PENTANETHIOL • n-Amyl Mercaptan. A liquid with a strong, unpleasant odor used in the manufacture of food additives. Mild irritant to skin and mucous membranes. EAF

2- PENTANOIC ACID • See Valeric Acid. EAF

1-PENTANOL • Pentyl Alcohol. n-Amyl Alcohol. Liquid with a mild, pleasant odor, slightly soluble in water. Used as a solvent. Irritating to the eyes and respiratory passages, and absorption may cause a lack of oxygen in the blood. ASP

2-PENTANONE • A synthetic flavoring that occurs naturally in apples. Used in fruit flavorings for beverages, ice cream, ices, candy, and baked goods. Moderately toxic by ingestion. Mildly toxic by skin contact and inhalation. In humans, inhalation may cause headache, nausea, and irritation of the respiratory passages, eyes, and skin. ASP

4-PENTENOIC ACID 9 • A synthetic butter and fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, and margarine. ASP

1-PENTEN-3-ONE • Synthetic flavoring with a powerful, penetrating odor. ASP

2-PENTENYL ACETATE • Synthetic flavoring. A clear colorless to slightly yellow liquid with a herbaceous odor. Used in baked goods, beverages, breakfast cereals, chewing gum, frozen dairy desserts, and hard candy. Declared GRAS by FEMA (see). See Acetic Acid. EAF

PENTYL ALCOHOL • See Amyl Alcohol.

2-PENTYL-1-BUTEN-3-ONE • Synthetic flavoring. Pale yellow liquid; musty, mushroom odor. See Octanoic Acid. NIL

PENTYL BUTYRATE • See Amyl Butyrate. EAF

2-TERT-PENTYLCYCLOHEXYL ACETATE • An alcohol used in the manufacture of fragrances and flavorings. NUL

2-PENTYLFURAN • Flavoring from soybeans. ASP

PENTYL 2-FURYL KETONE • Artificial flavoring. See Furfural. ASP

2-PENTYL-3-METHYL-2-CYCLOPENTEN-1-ONE • Dihydrojasmone. Synthetic flavoring used in bergamot, citrus, fern, fougere, floral, green natural, green, and herbal scents and flavorings. See Jasmone. NUL

PENTYLAMINE • Flavoring. The JECFA (see) says there is no safety concern (conditional) at current levels of intake when used as a flavoring agent. The evaluation is conditional because the estimated daily intake is based on the anticipated annual volume of production. The conclusion of the safety evaluation of this substance was to be revoked if use levels or poundage data were not provided before the end of 2007. Suspected of being toxic to skin and sense organs. No action at this writing. EAF

2-PENTYLPYRIDINE • Synthetic flavoring on the JECFA (see) list to be evaluated. ASP

PEPPER, BLACK • A pungent product obtained from the dried, unripe berries of the East Indian pepper plant Piper nigrum. Used in sausage and spice flavorings for beverages, baked goods, condiments, meats, soups, and pickles. Black pepper oil is used in meat and spice flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. Black pepper oleoresin (see) is used in sausage and pepper flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. Pepper was formerly used as a carminative to break up intestinal gas, to cause sweating, and as a gastric additive to promote gastric secretion. Has insecticidal properties. An investigation of nitrogen-containing compounds in the basic fraction of black pepper oil and vetiver oil found that arange of compounds were identified in both oils; twenty previously unre-ported pyrazines and pyridines (see both) were observed in black pepper. GRAS. ASP

PEPPER BLACK, OIL • Piper nigrum. The oil is extracted by steam from dried unripe berries. Usually comes from India. The pepper plant produces three kinds of oil (pepper black, pepper white, and pepper green) taken from the peppercorns that sprout after the small white flowers. The pepper black oil is a green-yellow color and distilled from the dried immature peppercorns and has a hot and spicy scent. ASP

PEPPER, BLACK OLEORESIN • Piper nigrum. Yellow semisolid liquid. Biting, pungent flavor. See Pepper Black, Oil. ASP

PEPPER, CAYENNE • See Cayenne Pepper. EAF

PEPPER, RED • See Cayenne Pepper. GRAS. EAF

PEPPER TREE OIL • See Schinus Molle Oil.

PEPPER, WHITE • The pungent product obtained from the undecorticated (with the outer covering intact) ripe berries of the pepper plant. Used in sausage and spice flavorings for beverages, baked goods, condiments, meats, and soups. White pepper oil is used in spice flavorings for baked goods. White pepper oleoresin (see) is used in spice flavorings for meats. See Pepper, Black. GRAS. ASP

PEPPER, WHITE OIL • Piper nigrum. ASP

PEPPERMINT EXTRACT • See Peppermint Oil.

PEPPERMINT LEAVES • See Peppermint Oil. EAF

PEPPERMINT OIL • Mentha piperita. The oil made from the dried leaves and tops of a plant common to Asian, European, and American gardens. Used in chocolate, fruit, cordial, crème de menthe, peppermint, nut, and spice flavorings for beverages, ice cream, ices, candy (1,200 ppm), baked goods, gelatin desserts, chewing gum (8,300 ppm), meats, liquors, icings, and toppings. Peppermint has been used as a carminative to break up intestinal gas and as an antiseptic. It can cause allergic reactions such as hay fever and skin rash. Two patients who consumed large quantities of peppermint candy over a long period of time developed irregular heart rhythms. GRAS. ASP

PEPPERMINT PLANT • A hardy perennial, which can grow two to three feet tall, including the flowering spikes. This mint plant has a strong aroma of peppermint. Mint is also used for medicinal use and flavoring purposes. The fresh mint leaves are used as a flavoring in beverages and the dry leaves in hot teas. NUL

PEPSIN • A digestive enzyme found in gastric juice that helps break down protein. Allowed up to 0.1 percent by weight in enriched farina. The product, also used to aid digestion, is obtained from the glandular layer of the fresh stomach of a hog. Slightly acid taste and a mild odor. GRAS. ASP

PEPTIDE • Two or more amino acids chained together in head-to-tail links. Generally larger than simple amino acids or the monoamines, the largest peptides discovered thus far have forty-four amino acids. Neuropeptides signal the body's endocrine glands to balance salt and water. Opiate peptides can help control pain and anxiety. The peptides work with amino acids.

PEPTONES • Secondary protein derivatives formed during digestion—the result of gastric and pancreatic juices acting upon protein. Peptones are used as a foam stabilizer for beer and as a processing aid in baked goods, confections, and frostings. Determined to be GRAS in 1982. EAF

PERACETIC ACID • Peroxyacetic Acid. A starch modifier prepared from acetaldehyde (see). It is 40 percent acetic acid and highly corrosive. Acrid odor; explodes violently on heating to 110 degrees. NUL

PERCHLORATE • Both a natural and a man-made contaminant increasingly found in groundwater, surface water, and soil. Most perchlorate manufactured in the United States is used as an ingredient in solid fuel for rockets and missiles. In addition, perchlorate-based chemicals are also used in the construction of highway safety flares, fireworks, pyrotechnics, explosives, common batteries, and automobile restraint systems. Perchlorate contamination has been reported in at least forty-three states. Perchlorate greatly impacts human health by interfering with iodide uptake into the thyroid gland. In adults, the thyroid gland helps regulate the metabolism by releasing hormones, while in children, the thyroid helps in proper development. Perchlorate is becoming a serious threat to human health and water resources. Perchlorate is also found in food, dairy milk, human breast milk, and in the bodies of virtually every American. In one study, it was found that levels of the chemical in breast milk was five times that in dairy milk. For fetuses, infants, and children, disruptions in thyroid hormone levels can cause lowered IQ, mental retardation, loss of hearing and speech, and motor skill deficits. Currently there are no enforceable perchlorate safety standards but EWG (see) argues that a national safety standard should be no higher than one-tenth the EPA's currently recommended level. The Boston study also revealed almost half of the women in the study were not providing adequate levels of iodine to their infants through their breast milk. Iodine is critical to proper thyroid function and can help mitigate perchlorate's risks. The combination of high perchlorate levels and inadequate iodine concentrations in breast milk can leave infants susceptible to significant thyroid disruption, which can impede normal growth and cognitive development.

Lettuce grown in the fall and winter months in Southern California or Arizona may contain higher levels of toxic rocket fuel than is considered safe by the U.S. EPA, according to independent laboratory tests commissioned by the EWG. In tests of perchlorate in supermarket produce, 18 percent of lettuce samples contained detectable levels of perchlorate, and an average serving of these contaminated samples contained four times more than the EPA says is safe in drinking water. The EWG estimates that by eating lettuce, 1.6 million American women of childbearing age are

than the EPA says is safe in drinking water. The EWG estimates that by eating lettuce, 1.5 million American women of childbearing age are exposed daily during the winter months to more perchlorate than the EPA's recommended safe dose. The EWG's findings of perchlorate in retail produce confirm previous tests on greenhouse-grown lettuce seedlings by the EPA and field-grown vegetables by a San Bernardino, California, farm whose irrigation water supplies were contaminated by defense contractor Lockheed Martin's abandoned rocket-testing facility.

Perchlorate contaminates more than five hundred drinking water sources in twenty states, serving well over 20 million people. Among contaminated sources is the Colorado River, which not only provides drinking water for Los Angeles, Phoenix, Las Vegas, and other cities, but also irrigates 70 percent of the nation's lettuce grown from October to March. The FDA conducted an initial exploratory survey that involved the collection and analysis of samples of domestic origin (i.e., bottled water, milk, lettuce, tomatoes, carrots, spinach, cantaloupe). Produce samples (lettuce, tomatoes, carrots, spinach, and cantaloupe) were collected particularly from regions (i.e., Southern California and Arizona) where water sources were known to be contaminated with perchlorate, based on a study report of detecting perchlorate in winter lettuce grown in Southern California or Arizona (Environmental Working Group, "Suspect Salads: Toxic Rocket Fuel Found in Samples of Winter Lettuce," 2003). Bottled water and milk samples were collected from throughout the country. Bottled water was selected for the survey to obtain an initial assessment of perchlorate occurrence in source waters for bottling, while milk was sampled as a follow-up to a Texas Tech University study that found perchlorate in a small number of milk samples from Texas ("Perchlorate in Milk," Environmental Science Technology 2003, 37:4979-4981). Produce samples (lettuce, tomatoes, carrots, spinach, and cantaloupe) were selected for the survey based on their high water content, relatively high consumption, and early indications of perchlorate uptake by plants (when irrigated with perchlorate-containing water or when grown in soil that naturally contains perchlorate or that has been previously exposed to perchlorate-containing water or fertilizer). Children two years of age, with estimated average intakes ranging from 0.35 to 0.39 │Xg/kg bw/day, have the highest total perchlorate intake per kilogram body weight per day, but are below the RfD of 0.7 µg/kg bw/day recommended by the National Academy of Sciences and adopted by the EPA. Total average intake ranges for infants 6–11 months, children 6, and children 10 years of age are estimated to be 0.26 to 0.29 │Xg/kg bw/day, 0.25 to 0.28 µg/kg bw/day, and 0.17 to 0.20 µg/kg bw/day, respectively. The estimated total average intakes by the other age-gender subgroups ranged from 0.08 to 0.14 µg/kg bw/day. The FDA has not established a standard (i.e., an allowable level) for perchlorate in bottled water. It tested additional samples of individual food products collected through additional surveys, and during 2008, additional TDS samples will be analyzed for perchlorate. Information on the distribution of perchlorate in a wider variety of foods obtained from these surveys will further enhance the FDA's ability to assess the dietary exposure of U.S. consumers to perchlorate. The FDA is continuing to work with the Interagency Working Group on Perchlorate, composed of other federal agencies, including the USDA and the EPA, to evaluate the potential risk associated with perchlorate exposure.

PERFLUOROHEXANE • Used to cool or freeze chickens.

PERFLUOROOCTANOIC ACID • PFOA. An ingredient in Teflon that may be harmful to our health. PFOA is also in greaseproof wrapping for foods. In fact, it is in 95 percent of us. In the late 1990s, the EPA received information that perfluorooctyl sulfonates (PFOS) were widespread in the blood of the general population and presented concerns for persistence, bioaccumulation, and toxicity. Following discussions between the EPA and 3M, the manufacturer of PFOS, the company stopped producing these chemicals. The EPA then began to review similar chemicals, including PFOA, starting in 2000. The agency found that PFOA, like PFOS, is persistent in the environment and is in the blood of the general U.S. population. Studies indicated that PFOA can cause developmental and other adverse effects in laboratory animals. PFOA also appears to remain in the human body for a long time. Fluoropolymers impart properties, including fire resistance and oil, stain, grease, and water repellency. They are used to provide nonstick surfaces on cookware and waterproof, breathable membranes for clothing. They are employed in hundreds of other uses in almost all industry segments. "At present," the EPA says, "there are no steps that EPA recommends that consumers take to reduce exposure to PFOA because the sources of PFOA in the environment and the pathways by which people are exposed are not known." PFOA is used to line grease-resistant packaging for candy, pizza, microwave popcorn, and hundreds of other food products. DuPont was recently hit by allegations that it hid studies showing the high health risks of the chemical. The company denied the charges, but has agreed to phase out PFOA used in greaseproof wrapping for foods. The move to phase out PFOA, however, came just a month after DuPont reached a $16.5 million settlement with the EPA over the company's failure to report possible health risks associated with PFOA. The EPA has recently called on DuPont and six other corporations to voluntarily eliminate PFOA and similar substances from plant emissions and products by 2015. So far, only DuPont has agreed, but says eliminating it altogether may be impossible. Other U.S. agencies concerned with PFOA include the Centers for Disease Control and Prevention and the National Toxicology Program.

PERFLUOROOCTYL SULFONATES • PFOSs were widespread in the blood of the general U.S. population and presented concerns for persistence, bioaccumulation, and toxicity. Studies have indicated that PFOS can cause developmental and other adverse effects in laboratory animals. PFOS may remain in the human body for a long time. Following discussions between the EPA and 3M, the manufacturer of PFOS, the company stopped producing these chemicals. The EPA then began to review similar chemicals, including PFOA (see), starting in 2000. See also Teflon.

PERILLALDEHYDE • Isolated from Perilla arguta, it is used as a sweet flavoring additive. ASP

PERILLA LEAF OIL • Used as a flavoring in baked goods, beverages, chewing gum, confectionery frostings, fish products, frozen dairy, gelatins, and imitation dairy. Declared GRAS by FEMA (see). EAF

PERILLA OIL • Light yellow oil derived from the seeds of Perilla ocimoides, grown in Japan and Korea. It is used as a substitute for linseed oil and as an edible oil in Asia. It is also used in the manufacture of varnishes. There is reported use of the chemical, but it has not yet been assigned for a toxicology literature search. EAF

PERILLO • Couma macrocarpa. Cow Tree. Tropical plant native to tropical, humid Central and South America. It is used in the manufacture of chewing gum. EAF

PERILLYL ACETATE • Synthetic flavoring derived from tangerine rind. It is an almost colorless or pale yellowish oily liquid with a warm herbaceous spicy odor. ASP

PERIODIC ACID • Derived from iodine (see) and is used as an oxidizer in processing of food additives. Fixing agent for the immobilization of enzyme preparations. EAF

PERLITE • A filtering aid. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 it should continue its GRAS status with no limitations other than good manufacturing practices.

PEROXIDATION • The reactions of oxygen with fats and oils causing oxygen-dependent deterioration known as rancidity. The effects of oxygen on fats and oils, therefore, cause a variety of toxic effects and their formation is considered a pathological process in the body. Their formation can be inhibited by antioxidants, such as vitamin E.

PEROXIDE • Benzoyl, Calcium, and Hydrogen. Benzoyl peroxide is used as a bleaching additive for flours, oils, and cheese. Calcium peroxide or dioxide is odorless, almost tasteless. Used as a dough conditioner and oxidizing additive for bread, rolls, and buns. Formerly used as an antiseptic. Hydrogen peroxide (see) or dioxide is used as a bleaching and oxidizing additive, a modifier for food starch, and a preservative and bactericide for milk and cheese. Bitter taste. May decompose violently if traces of impurities are present. A strong oxidant that can injure skin and eyes. On the FDA list of additives to be studied for mutagenic, teratogenic, subacute, and reproductive effects.

PEROXYACIDS • Antimicrobial additive. Approved by the EU to clean chicken carcasses. For many decades food regulators were hesitant to endorse the use of antimicrobial substances by poultry processors. They were worried that such use of antimicrobials would mask unhygienic practices and would induce resistance of the microflora present on the surface of treated products. But the existence of outbreaks of salmonella and other infectious agents make the use wise and the antimicrobials would pose no risk. See Peracetic Acid.

PERSIC OIL • Natural flavoring. See Apricot and Peach Kernel Oil.

PERUVIAN BALSAM • See Balsam Peru. GRAS

PEST • FDA abbreviation for pesticide other than a fumigant.

PESTICIDE • Though often misunderstood to refer only to insecticides, the term pesticide also applies, according to the EPA, as "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, and any substance or mixture of substances intended for use as a plant regulator, defoliant or dessi-cant (sustains dryness) to control termites and roaches, clean mold from shower curtains, stave off crabgrass on the lawn, kill fleas and ticks on pets, and disinfect swimming pools, and so forth." Some pesticides are immediately toxic to humans. Others take a long time to produce cancer and other illnesses. You can find pesticide types classified by their target species in these pages as well as specific pesticides by name.

PETITGRAIN OIL • The volatile oil obtained from the leaves and twigs and unripe fruit of the bitter orange tree. Brownish to yellow with a bittersweet odor. Used in loganberry, violet, apple, banana, berry, grape, peach, pear, honey, muscatel, nut, ginger, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and condiments. GRAS. ASP

PETITGRAIN OIL (LEMON, MANDARIN, TANGERINE) • Fragrant essential oils from a variety of citrus trees. Used in citrus and fruit flavorings for beverages, ice cream, ices, candy, and baked goods. GRAS. ASP

PETROLATUM • Crude or Mineral Oil. Vaseline. Petroleum Jelly. Paraffin Jelly. A purified mixture of semisolid hydrocarbons from petroleum. A releasing additive and sealant for confections and bakery products. A coating for fruits, vegetables, and cheese. A defoaming additive in yeast and beet sugar production. A lubricant in meatpacking plants, and it is used in dried egg albumin. The FDA limits petrolatum to 0.15 percent in bakery products, 0.2 percent in confectionery, 0.02 percent in dehydrated fruits and vegetables, 0.1 percent in egg whites. May contain FDA-approved antioxidants. When ingested, it produces a mild laxative effect. Not absorbed but may inhibit digestion. It is generally nontoxic. ASP

PETROLEUM • Hydrocarbons. Naphtha. Waxes. A highly complex mixture of paraffinic, naphthalenic, and aromatic hydrocarbons containing some sulfur and trace amounts of nitrogen and oxygen compounds. Believed to have originated from both plant and animal sources millions of years ago. By cracking petroleum into fractions, the gases butane, ethane, and propane are obtained, as well as naphtha, gasoline, kerosene, fuel oils, gas oils, lubricating oils, paraffin wax, and asphalt (see all). A defoaming additive in processing beet sugar and yeast and a coating on cheese and raw fruits and vegetables. Used as a coating on eggshells; in froth-flotation cleaning of vegetables; as a float on fermentation fluids as in the manufacture of vinegar, wine, and pickle brine; as a component of pesticide formulations; in modified hops extract of beer; and in many other formulations. Formerly used for bronchitis, tapeworms, and externally for arthritis and skin problems. Many petroleum products are reported to be cancer-causing additives. ASP

PETROLEUM NAPHTHA • Solvent used as coating on fresh citrus. See Petroleum. NIL

PETROLEUM WAX • Antifoaming additive used in beet sugar and yeast. Used in chewing-gum base and other foods; as a coating on cheese, fruits, and vegetables; and as a component of microcapsules for spice flavor for frozen pizza. See Petroleum. ASP

PETROLEUM WAX, SYNTHETIC • Coating on cheese and raw fruits and vegetables. Also used as an antifoaming additive in beet sugar and yeast.

PFOS • PFOSs were widespread in the blood of the general population and presented concerns for persistence, bioaccumulation, and toxicity. Following discussions between the EPA and 3M, the manufacturer of PFOS, the company stopped producing these chemicals. The EPA then began to review similar chemicals, including PFOA, starting in 2000. See Perfluorooctyl Sulfonates and Teflon.

pH • The scale used to measure acidity and alkalinity. pH is the hydrogen (H) ion concentration of a solution; P stands for the power of the hydrogen ion. The pH of a solution is measured on a scale of 14. A truly neutral solution, neither acidic nor alkaline, such as water, is 7. Acid is less than 7. Alkaline is more than 7. The pH of blood is 7.3; vinegar is 2.3; lemon juice is 2.2; and lye is 13. Skin and hair are naturally acidic. Soap and detergents are alkaline. ASP

PHAFFIA • The Food and Drug Administration (FDA) amended its color additive regulations in 2000 to provide for the use of phaffia yeast as a color additive in the feed of salmonid fish to enhance the color of their flesh. In 2003, the United Kingdom register of Organic Food Standards board meeting said it could not endorse the use of phaffia yeast without further evidence of its health benefits and, ideally, a common view from the industry. EAF

a-PHELLANDRENE • A synthetic flavoring additive that occurs naturally in allspice, star anise, angelica root, bay, dill, sweet fennel, black pepper, peppermint oil, and pimenta. Isolated from the essential oils of the eucalyptus plant. Used in citrus and spice flavorings for beverages, ice cream, ices, candy, and baked goods. Can be irritating to, and is absorbed through, the skin. Ingestion can cause vomiting and diarrhea. ASP

PHENANTHRENE • Made from coal tar, the name phenanthrene is a composite of phenyl and anthracene. It provides the framework for the steroids. Used in pesticide products to increase the effectiveness of the active ingredients, make the product easier to apply, or to allow several active ingredients to mix in one solution. Solvents, emulsifiers, and spreaders fall in this category. Algacide: Kills algae. Antifolant: Used in paints and other coatings to inhibit growth of algae, barnacles, and other shellfish on the hulls of ships. Avicide kills birds. Bait substance is used to attract pests, including sugar, honey, meat, oatmeal, etc. In its pure form, it is found in cigarette smoke and is a known irritant, photosensitizing skin to light and lungs. One of the most common ways phenanthrene can enter your body is through breathing contaminated air. If you eat or drink food and water that are contaminated with PAHs, you could be exposed. Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar, or creosote where PAHs have been found. See Polycyclic Aromatic Hydrocarbons. Animal studies showed that exposing mice to PAHs (specifically benzo [a] pyrene) in food for 10 days (short-term exposure) caused birth defects. Mice exposed to benzo [a] pyrene in food for months developed problems in the liver and blood. The EPA (see) has indicated that not enough information exists to classify phenanthrene as a cancer-causing substance. It is on the EPA's priority list of chemicals to be studied.

PHENETHYL ACETATE • A fragrance and flavoring ingredient. See Acetic Acid. ASP

PHENETHYL ALCOHOL • 2-Phenethyanol. It occurs naturally in oranges, raspberries, and tea. A synthetic fruit flavoring additive that is used in strawberry, butter, caramel, floral, fruit, and honey flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts as well as in soaps and antibacterials. It is a sensitizer. It is a strong local anesthetic and has caused central nervous system injury in mice. Moderately toxic by ingestion. May have adverse reproductive effects. ASP

PHENETHYLAMINE • Stimulant in chocolate. ASP

PHENETHYL ANTHRANILATES • A synthetic butter, caramel, fruit, honey, and grape flavoring additive for beverages, ice cream, ices, candy, and

PHENETHYL ANTHRANILATES • A synthetic butter, caramel, fruit, honey, and grape flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Coal Tar. ASP

PHENETHYL BENZOATE • A synthetic fruit and honey flavoring additive for beverages, ice cream, ices, candy, chewing gum, and baked goods. See Coal Tar. ASP

PHENETHYL BUTYRATE • A synthetic butter, strawberry, caramel, floral, apple, peach, pineapple, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Coal Tar. ASP

PHENETHYL CINNAMATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, puddings, and baked goods. See Coal Tar. ASP

PHENETHYL FORMATE • Formic Acid. A synthetic berry, apple, apricot, banana, cherry, peach, pear, plum, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Coal Tar. ASP

PHENETHYL 2-FUROATE • Synthetic flavoring. NIL

PHENETHYL HEXANOATE • Synthetic flavoring. See Hexanoic Acid. ASP

PHENETHYL ISOBUTYRATE • A synthetic flavoring additive, slightly yellow, with a rose odor. Used in strawberry, floral, rose, apple, peach, pineapple, honey, and cheese flavorings for beverages, ice cream, ices, candy, and baked goods. Mildly toxic by ingestion. See Coal Tar. ASP

PHENETHYL ISOTHIOCYANATE PEITC • A naturally occurring compound found in some cruciferous vegetables. It is being studied as an agent to prevent cancer. It is added as a nutrient to some health foods. It is also widely used in baked goods, beverages, breakfast cereal, chewing gum, confectionery frostings, egg products, fats and oils, fish products, frozen dairy, gelatins, gravies, hard candy, imitation dairy, processed vegetables, seasonings, snack food, soft candy, and soups. Declared GRAS by FEMA. EAF

PHENETHYL ISOVALERATE • A synthetic apple, apricot, peach, pear, and pineapple flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. Mildly toxic by ingestion. See Coal Tar. ASP

PHENETHYL MERCAPTAN • Synthetic flavoring. EAF

1-PHENYLETHYLMERCAPTAN • A flavoring determined GRAS by FEMA (see). See Benzene.

2-PHENETHYL 2-METHYL BUTYRATE • Colorless liquid with a floral-fruity odor used as a flavoring additive in various foods. ASP

PHENETHYL OCTANOATE • Synthetic flavoring. Colorless oily liquid; mild fruity winelike odor. ASP

PHENETHYL PHENYLACETATE • A synthetic fruit and honey flavoring additive for beverages, ice cream, ices, candy, maraschino cherries, and baked goods. See Coal Tar. ASP

PHENETHYL PROPIONATE • A synthetic fruit and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Coal Tar. ASP

PHENETHYL SALICYLATE • A synthetic apricot and peach flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Coal Tar. ASP

PHENETHYL SENECIOATE • A synthetic liquor and wine flavoring additive for beverages, ice cream, ices, candy, and alcoholic beverages. See Coal Tar. ASP

PHENETHYL TIGLATE • A synthetic fruit and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Coal Tar. ASP

PHENOL • Obtained from coal tar (see), it is used in the manufacture of many food additives and processing aids. Ingestion of even small amounts of phenol may cause nausea, vomiting, circulatory collapse, paralysis, convulsions, coma, respiratory failure, and cardiac arrest. It is an antiseptic and general disinfectant. There are more than forty-eight flavorings that contain phenol or phenol derivatives. ASP

PHENOL-FORMALDEHYDE • Used in treatment of food or potable water. See Formaldehyde and Phenol. NUL

PHENOXYACETIC ACID • A synthetic fruit and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. Used to soften calluses and corns. A mild irritant. ASP

2-PHENOXYETHYL ISOBUTYRATE • A synthetic fruit flavoring, colorless, with a roselike odor. Used in beverages, ice cream, ices, candy, and baked goods. ASP

PHENYL • Prefix meaning derived from benzene (see).

PHENYL ACETATE • A synthetic flavoring additive prepared from phenol and acetic chloride. Used in berry, butter, caramel, floral, rose, fruit, honey, and vanilla flavorings for beverages, ice cream, ices, candy, and baked goods. Highly toxic. Death from 1.5 grams has been reported. EAF

PHENYLACETALDEHYDE • An oily, colorless liquid with a harsh odor. Upon dilution, emits the fragrance of lilacs and hyacinths. Derived from phenethyl alcohol (see). A synthetic raspberry, strawberry, apricot, cherry, peach, honey, and spice flavoring for beverages, ice cream, ices, candy, baked goods, and chewing gum. Less irritating than formaldehyde (see), but a stronger central nervous system depressant. In addition, it sometimes produces fluid in the lungs upon ingestion. ASP

PHENYLACETALDEHYDE 2,3-BUTYLENE GLYCOL ACETAL • A synthetic floral and fruit flavoring additive for candy. See Phenylacetaldehyde for toxicity. ASP

PHENYLACETALDEHYDE DIISOBUTYL ACETAL • Flavoring. Colorless liquid with a sweet floral, delicate green odor. See Phenyl Acetate. ASP

PHENYLACETALDEHYDE DIMETHYL ACETAL • A colorless liquid with a strong odor used as a synthetic fruit, apricot, cherry, honey, and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. Moderately toxic by ingestion. ASP

PHENYLACETALDEHYDE GLYCERYL ACETAL • Synthetic floral and fruit flavoring additive for beverages, candy, ice cream, and ices. See Phenylacetaldehyde and Acetic Acid for toxicity. ASP

PHENYLACETIC ACID • Synthetic flavoring additive that occurs naturally in Japanese mint, oil of neroli, and black pepper. Used in butter, chocolate, rose, honey, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, liquors, and syrups. Also used in the manufacture of penicillin. Moderately toxic by ingestion. Causes birth defects in experimental animals. ASP

PHENYLALANINE • L form. An essential amino acid (see) considered essential for growth in normal human beings and not synthesized by the body. It is associated with phenylketonuria (PKU), an affliction that, if not detected soon after birth, leads to mental deterioration in children. Restricting phenylalanine in diets results in improvement. Whole egg contains 5.4 percent and skim milk 5.1 percent. The FDA asked for further study of this amino acid as a food additive in 1980.

DL-PHENYLALANINE • The D form occurs naturally in microbial products. The DL form occurs in water or alcohol and has a sweetish taste. See Phenylalanine. ASP

4-PHENYL-2-BUTANOL • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

2-PHENYL-2-BUTENAL • Synthetic flavoring. See 4-Phenyl-2-Butanol. ASP

4-PHENYL-3-BUTEN-2-OL • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

4-PHENYL-3-BUTEN-2-ONE • A synthetic chocolate, cocoa, fruit, cherry, nut, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and shortenings. ASP

4-PHENYL-2-BUTYL ACETATE • A synthetic fruit and peach flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Acetic Acid for toxicity. ASP

2-PHENYL-3-CARBETHOXY FURAN • Synthetic flavoring. The JECFA concluded it may have significant toxicity. See Furyl and Furans. ASP

PHENYL CARBOXYL ISOBUTYRATE • See a-a-Dimethylbenzyl Isobutyrate. ASP

PHENYL DISULFIDE • Synthetic flavoring, clear and colorless. ASP

PHENYL 2-FUROATE • A synthetic chocolate and mushroom flavoring additive for beverages, candy, and gelatin desserts.

2-PHENYL-3(2-FURYL)-PROP-2-ENAL • Synthetic flavoring. ASP

PHENYLETHYL MERCAPTAN • The JECFA says there is no ADI (see) for this flavoring. See Mercaptans. EAF

(+/-)-1-PHENYLETHYLMERCAPTAN • Synthetic flavoring. See Mercaptans. EAF

(+/-)-2-PHENYL-4-METHYL-2-HEXENAL • Synthetic fruit flavoring. May be toxic. EAF

I-PHENYL-3-METHYL-3-PENTANOL • A synthetic fruit flavoring additive for beverages, candy, and gelatin desserts. ASP

PHENYL PELARGONATE • Liquid, insoluble in water. Used in flavors, perfumes, bactericides, and fungicides.

5-PHENYLPENTANOL • Flavoring with the aroma of carnations. The JECFA says it has no concerns about its safety. ASP

2-PHENYL-4-PENTENAL and 3-PHENYL-4-PENTENAL • In 2004, the JECFA (see) concluded there was no safety concern at current levels of intake when used as a flavoring agent. Used in tobacco flavoring and in the manufacture of acetals (see). ASP

O-PHENYLPHENOL • Synthetic flavoring. See Phenol. EAF

1-PHENYL-1,2-PROPANEDIONE • Synthetic flavoring with a strong plastic odor. ASP

1-PHENYL-1-PROPANOL • A synthetic fruit and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-PHENYL-1-PROPANOL • A synthetic flavoring that occurs naturally in tea. Used in strawberry, apricot, peach, plum, hazelnut, pistachio, cinnamon, and walnut flavorings for beverages, ice cream, ices, candy, baked goods, liqueurs, and chewing gum.

2- and 3-PHENYLPROPIONALDEHYDE • A synthetic flavoring additive, slightly yellow, with a strong floral odor. Used in berry, rose, apricot, cherry, peach, plum, and almond flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

2-PHENYLPROPIONALDEHYDE DIMETHYL ACETAL • A synthetic berry, floral, rose, fruit, honey, mushroom, nut, and spice flavoring additive for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. See Acetic Acid for toxicity.

3-PHENYLPROPYL ACETATE • A synthetic flavoring, colorless, with a spicy floral odor. Used in berry, fruit, and spice flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. Propyl acetate may be irritating to skin and mucous membranes and narcotic in high concentrations. ASP

2-PHENYLPROPYL BUTYRATE • A synthetic flavoring used in beverages, ice cream, ices, candy, and baked goods. No specific flavorings listed. ASP

3-PHENYLPROPYL CINNAMATE • Synthetic butter, caramel, chocolate, cocoa, coconut, grape, and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-PHENYLPROPYL FORMATE • Formic Acid. A synthetic currant, raspberry, butter, caramel, apricot, peach, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Formic Acid for toxicity. ASP

3-PHENYLPROPYL HEXANOATE • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

2- and 3-PHENYLPROPYL ISOBUTYRATE • A synthetic apple, apricot, peach, pear, pineapple, and plum flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-PHENYLPROPYL ISOVALERATE • A synthetic butter, caramel, apple, pear, and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

3-PHENYLPROPYL PROPIONATE • A synthetic apricot flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

1-PHENYL-3 OR 5-PROPYLPYRAZOLE • Synthetic flavoring. See Propylpyrazole. NIL

PHENYL SALICYLATE • Salol. Salicylic acid phenyl ester, Musol, Phenol salicylate, Phenyl 2-hydroxybenzoate, Salphenyl, 2-hydroxybenzoic acid phenyl ester, 2-phenoxycarbonylphenol, Seesorb 201, Seesorb K 201. A chemical substance, introduced in 1886 by Marceli Nencki of Basel, Switzerland. It can be created by heating salicylic acid with phenol (see both). It has been used as an intestinal antiseptic based on the antibacterial activity in the small intestine. It is used in food flavorings and preservatives. Skin, eye, and respiratory irritant. See Salicylates and Phenol. EAF

2-3(3-PHENYLPROPYL) TETRAHYDROFURAN • A synthetic fruit, honey, and maple flavoring additive for beverages, ice cream, ices, candy, gelatin, puddings, and chewing gum. ASP

PHEROMONES • Fatty molecules that living organisms emit in order to send messages to individuals of the same species.

PHORATE • Thimet. Vegfru. An insecticide used in animal feed. On EPA Extremely Hazardous Substances List and EPA Genetic Toxicology Program (see both). Poison by ingestion. Causes mutations in experimental animals and interferes with nerve signals.

PHOSALONE • An insecticide used to kill insects and mites. FDA residue tolerance resulting from application on dried apple pomace is 85 ppm; on dried prunes, 40 ppm; on raisins, 20 ppm; on dried citrus pulp, 12 ppm; on dried grape pomace, 45 ppm; and on tea, 8 ppm. See Organophosphates.

PHOSPHA E • A patented derivative of vitamin E that is said to have superior properties compared with its parent molecule. The producer, Phosphagenics, says “It has been shown to be better absorbed than vitamin E, both orally and through the skin, to lower cholesterol and triglycerides, prevent the formation of plaque in heart arteries, as well as having unique antiinflammatory properties.” Until now, the company has been selling the additive for use in dietary supplements and medical foods. However, the company has self-affirmed the ingredient as GRAS after an independent panel of food safety experts evaluated data related to the use of phospha E in breakfast cereals, juice beverages, and table fats with vitamin E.

PHOSPHATE • Salt of ester of phosphoric acid (see). Used as an emulsifier and texturizer and sequestering additive (see) in foods. Sodium phosphate is used in evaporated milk up to 0.1 percent of weight. Carbonated beverages contain phosphoric acid. Without sufficient phosphate there is abnormal parathyroid (gland) function, bone metabolism, intestinal absorption, malnutrition, and kidney malfunction. Chemicals that interfere with phosphate action include detergents, mannitol (see), vitamin D, and aluminum hydroxide (see), a leavening additive. Ingestion of

interfere with phosphate action include detergents, mannitol (see), vitamin D, and aluminum hydroxide (see), a leavening additive. Ingestion of large amounts of phosphates can cause kidney damage and may adversely affect the absorption of other minerals.

PHOSPHATE, AMMONIUM • Dibasic and Monobasic. See Ammonium Phosphate.

PHOSPHATE, CALCIUM HEXAMETA • See Calcium Hexametaphosphate.

PHOSPHATE, CALCIUM, MONOBASIC and TRIBASIC • See Calcium Phosphate.

PHOSPHATE, POTASSIUM • Monobasic and Dibasic. See Potassium Phosphate.

PHOSPHATED DISTARCH PHOSPHATE • The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no available evidence that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. See Modified Starches. E

PHOSPHATIDYLSERINE • PS. Used as an ingredient in milk, flavored milk, milk drinks (excluding milk, fluid), milk imitation (soy milk), milk-based meal replacement, yogurt, breakfast bars, and fruit flavored drinks at levels of 100 milligrams (mg) phos-phatidylserine per serving and in breakfast cereals and milk, fluid at 50 mg/serving. A naturally occurring phospholipid nutrient, it is essential to the functioning of all the cells of the body, but it is most concentrated in the brain. Low levels of phos-phatidylserine in the brain are associated with impaired mental function and depression. PS was only available from animal sources (brain) and occurred in commercial lecithins only in trace amounts; however, aplant source for PS has been developed. The FDA allowed the claim in 2003 for this dietary supplement that “consumption of phos-phatidylserine may reduce the risk of dementia (cognitive dysfunction) in the elderly” with the added “FDA concludes that there is little scientific evidence supporting this claim.” FDA has no questions about the notifier's request for GRAS status.

PHOSPHOLIPASE A2 ENZYME PREPARATION FROM ASPERGILLUS NIGER EXPRESSING A GENE ENCODING A PIG PHOSPHOLIPASE A2 • Use as an enzyme to hydrolyze soy and egg yolk lecithins. Used in breads, pound cake, muffins, and egg-based sauces. The producer, DSM Food Specialties, notes that only small quantities of enzymes are used in food production, that enzymes like phospholipase A2 are similar to endogenous enzymes in humans and other forms of life, and that only isolated cases report allergies to enzymes, most attributed to occupational exposures rather than sensitization to food enzymes. The FDA says it has no objection to the producer calling it GRAS. ADI “not specified” (see).

PHOSPHOLIPASE C ENZYME PREPARATION FROM PICHIA PASTORIS EXPRESSING A HETEROLOGOUS PHOSPHOLIPASE C GENE • As an enzyme in degumming vegetable oils for food use.

PHOSPHOLIPIDS • Phosphatides. Complex fat substances found in all living cells. Whereas fats are typically composed of three fatty acids, phospholipids have two fatty acids. Phospholipids are a major component of cell membranes. Lecithin is an example.

n-(PHOSPHONOMETHYL)GLYCINE • An herbicide used in animal feed, imported olives, palm oil, soybean oil, dried tea, and instant tea. The FDA's residue allowances: 30 ppm in molasses, sugarcane; 0.1 ppm in palm oil; 0.1 ppm in olives; 1 ppm in dried tea; 4 ppm in instant tea. Moderately toxic by ingestion.

PHOSPHORIC ACID • A colorless, odorless solution made from phosphate rock. Mixes with water and alcohol. A sequestering additive (see) for rendered animal fat or a combination of such fat with vegetable fat. Also used as an acidulant and flavoring in soft drinks, jellies, frozen dairy products, bakery products, candy, cheese products, and in the brewing industry. Concentrated solutions are irritating to the skin and mucous membranes. GRAS. ASP. E

PHOSPHORODITHIOATE • APPA. Kemolate. Prolate. Smidan. A widely used insecticide in cottonseed oil. FDA residue tolerance is 0.2 ppm in cottonseed. On EPA Extremely Hazardous Substance List (see). A human poison by ingestion. See Phthalates.

PHOSPHOROUS CHLORIDE • Phosphate derivative used as a starch modifier and a chlorinating additive. Intensely irritating to the skin, eyes, and mucous membranes. Inhalation may cause fluid in the lungs.

PHOSPHOROUS OXYCHLORIDE • Phosphoryl Chloride. Colorless, clear, strongly fuming vapors, used as a starch modifier and as a solvent and chlorinating additive. Inhalation may cause pulmonary edema. NUL

PHOSPHOROUS SOURCES • Calcium Phosphate. Magnesium Phosphate. Potassium Glycerophosphate. Sodium Phosphate. Mineral supplements for cereal products, particularly breakfast foods such as farina. Phosphorus was formerly used to treat rickets and degenerative disorders. White phosphorus is number nineteen on the CERCLA Priority List of Hazardous Substances (see). See Phosphate.

PHOTOSENSITIVITY • A condition in which the application or ingestion of certain chemicals, such as propylparaben (see), causes skin problems—including rash, hyperpigmentation, and swelling—when the skin is exposed to sunlight.

PHOTOTOXICITY • Toxicity resulting from sequential exposure to a photosensitizing agent and sunlight.

PHTHALATES • Salts of phthalic acid (see) used to make food packaging. Their use has increased steadily since the 1950s. By the mid-1980s, worldwide production was estimated at 2.7 million tons per year. In recent years phthalate ester emissions have become a major environmental and health concern. Many European countries—including Austria, Belgium, Denmark, England, Germany, the Netherlands, and Spain—have recommended a ban on PVC toys that contain phthalate esters. At issue are health concerns about phthalates. Phthalates also are used extensively in medical and food packaging products. Phthalate esters vary in their toxicity, but the most widely used phthalate, DEHP (di[-ethylhexyl]phthalate) has been linked in animal studies to damage in kidneys and liver and has been labeled as a probable human carcinogen. It can be passed through skin and mouth or by inhalation. Millions of pounds of DEHP have been released into land and water in the United States. Phthalate esters are now widespread environmental pollutants and concern about their use has been mounting because some of the phthalates have been shown to damage the testes and decrease sperm production. Butyl benzyl phthalate (BBP) and di-n-butyl phthalate (DBP) also act like estrogens. Phthalates in the environment are regarded as endocrine disrupters, although the Phthalate Esters Panels of the Chemical Manufacturers Association denies this. The British Ministry of Agriculture, Fisheries, and Food found that there were phthalates in infant formulas but below tolerable daily intakes (TDI) but that as "a matter of prudence phthalate levels should be reduced in infant formulae." May be cancer-causing. In 1998, a panel including a former surgeon general was formed to study the safety of phthalates. Food packaging concerns have been focused on the use of phthalate plasticizers in many inks, coatings, and packaging films. These plasticizers are used to add flexibility to resins, such as nitrocellulose. Phthalates can migrate into food from plastics, inks, or coatings. Levels greater than a few parts per million of phthalates can be transferred. Although manufacturers assure us that the leaching of phthalates into our foods is minuscule and harmless, and as scientists continue to puzzle over phthalates, it is wise not to use flexible wrap containing phthalates to cover dishes to be heated in the microwave. Wax paper in the meantime may be a better choice. On November 19, 2002, the CIR Expert Panel (see) announced its decision to not reopen the safety assessment of the dibutyl phthalate group of ingredients. The panel asked that the summary of the newly available data and a discussion of the issues be prepared for their review. That was done and the summary was approved on February 7, 2003.

PHTHALIC ACID • Obtained by oxidation of various benzene derivatives, it can be isolated from the fungus Gibberella fujikuroi. It is used in the manufacture of plastics and dyes. Moderately irritating to the skin and mucous membranes. See Phthalates.

PHTHALIC ANHYDRIDE • White crystalline needles derived from naphthalene (see). Used as a hardener for resins and a plasticizer. Also used in many dyes, chlorinated products, insecticides, and polyesters. A skin irritant. See Phthalates.

PHTHALIDE • See Phthalates. EAF

PHTHALIMIDOMETHYL-0,0-DIMETHYL • Phosmet. Wide-spectrum organophosphate insecticide and acaricides with the action of contact poisoning and stomach poisoning. Mainly used to control the pests of rice, cotton, fruit trees, vegetables, and other crops. It can also control harmful worms. The lasting results, small consumption, low cost, and effectiveness makes it popular. It is a human poison by ingestion, suspected of causing birth defects. Very hazardous.

PHYTIC ACID • Occurs in nature in the seeds of cereal grains and is derived commercially from corn. It is used to chelate heavy metals, as a rust inhibitor, in metal cleaning, and in the treatment of hard water. Nontoxic, although those allergic to corn may have a reaction.

PHYTOL ACETATE • See Phytic Acid. EAF

PHYTOCHEMICAL • Phytochemicals are substances found in edible fruits and vegetables that may be ingested by humans daily in gram quantities and that exhibit a potential for modulating the human metabolism in a manner favorable for reducing risk of cancer.

PHYTOSTANOLS • Stanols are substances that occur naturally in various plants.

Their cholesterol-lowering effects were first observed in animals in the 1950s. Since then a substantial amount of research suggests that plant stanols (usually modified into stanol esters) can help to lower cholesterol in individuals with normal or mildly to moderately elevated levels. Stanols are available in margarine spreads, salad dressings, and dietary supplement tablets. Because they are structurally similar to cholesterol, stanols (and sterols) can displace cholesterol from the "packages" that deliver cholesterol for absorption from the intestines to the bloodstream. This displaced cholesterol is then excreted from the body. This action not only interferes with the absorption of cholesterol from food, it has the additional (and probably more important) effect of removing cholesterol from substances made in the liver that are recycled through the digestive tract. Although concerns have been expressed that stanol esters might impair absorption of the fat-soluble vitamins A, D, and E, this does not seem to occur at the dosages required to lower cholesterol. Stanol esters might interfere with absorption of alpha- and beta-carotene, although some studies have found no such effect. Evidence is also conflicting whether sterols or sterol esters impair nutrient absorption. Until more is learned, it may be reasonable for people using stanol or sterol products to take a multivitamin/multimineral tablet.

PHYTOSTEROLS • Derived from oil seeds such as corn, palm, soy, rape, and sunflower. In the manufacturing process, the sterols are esterified with vegetable oil fatty acids. The fatty acids are preferentially derived from soy, sunflower, safflower, and canola. Corn, peanut, cottonseed, and palm may also be used as sources. Food-grade specifications exist for plant sterol esters. The producer, Heart Blend, uses it in ground roasted coffee and states a paper filter will result in little or no plant sterol esters in the filtered coffee beverage. The FDA says it has no questions about Heart Blend calling it safe. The JECFA (see), however, has it listed as high priority for evaluation. GRAS

PHYSTOSTEROL ESTERS AND DIGLYCERIDES • Derived from esterification of vegetable oils and fats with soy phytosterols (see). Ingredient in baked goods and baking mixes; fats and oils; frozen dairy desserts and mixes; gelatins, puddings, and fillings; grain products and pastas; gravies and sauces; hard candy; milk and milk products; soft candy, soups and soup mixes; and snack foods at a level of 0.65 gram phytosterol esters per serving. Notified FDA about GRAS status. The JECFA (see), however, has it listed as high priority for evaluation.

PICHIA PASTORIS YEAST • See Yeast.

PICKLED • Preserving food in vinegar and salt produces an acid that fights microorganisms. Among the common foods pickled are vegetables, fruits, meats, eggs, and, of course, cucumbers, pears, peaches, cabbage, onions, tomatoes, beets, and peppers. See Curing.

PICLORAM • Crystalline solid made from picolinic acid, it is used as an herbicide and defoliant. It is toxic by ingestion and inhalation. Its use has

been restricted in the United States. The FDA permits tolerances of 3 ppm in milled fractions (except flour) of barley, oats, and wheat resulting from application to the growing crop; 1 ppm in flour of barley and wheat; 0.2 ppm as residue in fat, meat by-products, and meat of cattle, goats, hogs, and sheep; 0.05 ppm as residue in milk and eggs; and 0.5 as residue in oat, barley, and wheat grains.

PICRAMIC ACID • 4,6-Dinitro-2-Aminophenol. A red crystalline acid obtained from phenol (see) and used chiefly in making azo dyes (see). Highly toxic material.

Readily absorbed through intact skin. Vapors absorbed through respiratory tract. Produces marked increase in metabolism and temperature, profuse sweating, collapse, and death. May cause skin rash, cataracts, and weight loss.

PILEWORT EXTRACT • An extract of Ranunculus ficaria, the coarse, hairy, perennial figwort of the eastern and central United States. It was once used to treat tuberculosis.

PIMARICIN • Natamycin. Natacyn. Myprozine. A fungicide produced from Streptomyces natalensis from soil near Pietermaritzburg, South Africa. It is applied to surface cuts and slices of cheese where standards permit to inhibit mold. FDA residue tolerance is 200 to 300 ppm. Moderately toxic by ingestion. Natamycin is used in human medicine and resistance is absolutely to be avoided. The European Parliament's Committee on Food said that it will review the safety and need for the use of these substances. ASP. E

PIMENTA LEAF OIL • Jamaica Pepper. Allspice. Derived from the dried ripe fruit of an evergreen shrub grown in the West Indies and Central and South America. Used in raspberry, fruit, nut, and spice flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, condiments, and meat products. Moderately toxic by ingestion. A severe skin irritant. GRAS. ASP

PINE BARK, WHITE, SOLID EXTRACT • Extract from Pinus strobus, used as a flavoring. EAF

PINE CONE EXTRACT • Extract from the cones of Pinus sylvestris. See Pine Needle Oil.

PINE MOUNTAIN OIL • See Pine Needle Oil and Pine Needle Dwarf Oil. EAF

PINE NEEDLE DWARF OIL • Pinus mugo. Pine Mountain Oil. The volatile oil obtained by steam distillation from a variety of pine trees. Used in citrus, pineapple, and liquor flavorings for beverages, ice cream, ices, candy, and baked goods. There is reported use of the chemical; it has not yet been assigned for a toxicology literature search. EAF

PINE NEEDLE OIL • Pine Mountain Oil. An extract of various species of Pinus used as a natural flavoring in pineapple, citrus, and spice flavorings. Ingestion of large amounts can cause intestinal hemorrhages. EAF

PINE SCOTCH OIL • Volatile oil obtained by steam distillation from the needles of a pine tree. Colorless or yellowish, with an odor of turpentine. Used in various flavorings for beverages, candy, and baked goods. See Turpentine for toxicity. EAF

PINE TAR • A product obtained by distillation of pinewood. A blackish brown, viscous liquid, slightly soluble in water. Used as an antiseptic in skin diseases. May be irritating to the skin. See Pine Tar Oil.

PINE TAR OIL • The extract from a variety of pine trees. A synthetic flavoring obtained from a species of pinewood. Used in licorice flavorings for ice cream, ices, and candy. Also used as a solvent, disinfectant, and deodorant. As an oil from twigs and needles. Irritating to the skin and mucous membranes. Bomyl acetate, a substance obtained from various pine needles, has a strong pine odor. It can cause nausea, vomiting, convulsions, and dizziness if ingested. In general, pine oil in concentrated form is an irritant to human skin and may cause allergic reactions. In small amounts it is nontoxic. ASP

PINEAPPLE EXTRACT • See Pineapple Juice.

PINEAPPLE JUICE • The common juice from the tropical plant. Contains a proteindigesting and milk-clotting enzyme, bromelin (see). An anti-inflammatory enzyme, it is used in cosmetic treatment creams. It is also used as a texturizer. a-PINENE • A synthetic pine oil flavoring additive that occurs naturally in angelica root oil, anise, star anise, asafetida oil, coriander, cumin, fennel, grapefruit, juniper berries, oils of lavender and lime, mandarin orange leaf, black pepper, peppermint, pimenta, and yarrow. It is the principal ingredient of turpentine (see). Used chiefly in the manufacture of camphor. Used as a food additive, it is used in lemon and nutmeg flavorings for beverages, ice cream, ices, candy, baked goods, and condiments. Also used as a chewing-gum base. Readily absorbed from the gastrointestinal tract, the skin, and the respiratory tract. It is a local irritant, central nervous system depressant, and an irritant to the bladder and kidney. Has caused benign skin tumors from chronic contact. ASP

2-PINENE • See a-Pinene.

b-PINENE • A synthetic flavoring that occurs naturally in black currant buds, coriander, cumin, black pepper, and yarrow. Used in citrus flavorings for beverages, ice cream, ices, candy (600 ppm), and baked goods (600 ppm). Also cleared for use in chewing-gum base. See a-Pinene for toxicity. ASP

PINOCARVEOL • Synthetic flavoring from pine. NIL

PINOLENIC ACID • Derived from the seeds of the Korean pine nut tree (Pinus koraiensis). It increases two hormones in the gut that sends signals to the brain, telling it you are full.

PINUS PUMILO OIL • See Pine Needle Dwarf Oil.

PIPERAZINE • Adipate and Citrate. Entacyl. Antepar. Bryrel. Pin-Tega Tabs. Pipril. Ta-Verm. Vermirex. Vermizine. An anthelmintic ingredient that paralyzes worms, causing their expulsion by normal movement of the human intestines. Adverse reactions include uncoordination, numbness, seizures, memory problems, headache, dizziness, eye problems, nausea, vomiting, diarrhea, abdominal cramps, hives, skin rashes, joint pain, fever, bronchospasm, and anemia. EAF

PIPERIDINE • A synthetic flavoring that occurs naturally in black pepper. Used in beverages, candy, baked goods, meats, soups, and condiments. Soapy texture. Has been proposed for use as a tranquilizer and muscle relaxant. ASP

PIPERINE • Celery Soda. A synthetic flavoring additive that occurs naturally in black pepper, it is used as a pungent brandy flavoring. It is also used as a nontoxic insecticide. Believed to be more toxic than the commercial pyrethrins. ASP

PIPERITENONE • A synthetic flavoring additive that occurs naturally in Japanese mint. Used in beverages, ice cream, ices, candy, and baked goods. Used to give dentifrices a minty flavor and to give perfumes their peppermint scent. NIL

PIPERONAL • Heliotropin. A synthetic flavoring and perfume additive that occurs naturally in vanilla and black pepper. White crystalline powder with a sweet floral odor. Used in strawberry, cola, cherry, rum, maple, nut, and vanilla flavorings in beverages, ice cream, ices, baked goods, gelatin puddings, and chewing gum. Ingestion of large amounts may cause central nervous system depression. Has been reported to cause skin rash. ASP

PIPERONYL ACETATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Piperonal for toxicity. ASP

PIPERONYL ALDEHYDE • See Piperonal.

PIPERONYL BUTOXIDE • Butoxide. Pyburthrin. Butocide. Widely used insecticide in animal feed, dried foods, milled fractions derived from cereal

grains, and packaging materials. It is used in combination with pyrethrins (see) in oil solutions, emulsions, powders, or aerosols. The FDA permits residues of up to 10 ppm in milled fractions derived from cereal grains, in dried foods, and in animal feed. IARC reviewing and on the Community Right-to-Know List (see both). No evidence, as yet, that it is a cancer-causing additive, but it is poisonous by skin contact. Moderately toxic by ingestion. Large doses have caused vomiting and diarrhea in humans. Has shown adverse reproductive effects in experimental animals.

PIPERONYL ISOBUTYRATE • A synthetic fruit and cheese flavoring for beverages, ice cream, ices, candy, and baked goods. See Piperonal for toxicity. ASP

PIPERONYL PIPERIDINE • See Piperine.

PIPSISSEWA LEAVES EXTRACT • Chimaphila unbellata. Love-in-Winter. Prince's Pine. Extracted from the leaves of an evergreen shrub. Used in root beer, sarsaparilla, wintergreen, and birch beer flavorings for beverages and candy. Its leaves have been used as an astringent, diuretic, and tonic. The Cree name means “to break up”—bladder stones, that is. There is reported use of the chemical. It has not yet been assigned for toxicology literature. GRAS. ASP

PISCICIDE • Pesticide to kill unwanted fish.

PLAIN CARAMEL • One of the most recent U.S. colors, it has no ammonium or sulphite compounds used in its manufacture. The product is said to be used for applications where plain caramel color, mild flavor profile, rich golden color, and/or high salt solubility are desirable. Approved by the European Union. See Caramel. E

PLANT ESTROGENS • A host of estrogens have been identified in plants. Although they are considerably less active than those in animals, chronic exposure may lead to the accumulation of levels that are active in humans.

PLANT STEROLS • Vitamin D precursors found in broccoli, cabbage, cucumbers, squash, yams, tomatoes, eggplant, peppers, soy products, and whole grains. They cause cells to differentiate. GRAS

PLANT STEROLS AND PLANT STEROL ESTERS FROM VEGETABLE OILS OR STEROLS/STANOLS FROM TALL OIL • Ingredient in margarines and vegetable oil spreads, dressings for salads, beverages, snack bars, dairy analogs (including soy milk, ice cream and cream substitutes), cheese and cream, baked foods, ready-to-eat breakfast cereals, mayonnaise, pasta and noodles, sauces, salty snacks, processed soups, puddings, yogurt, confections, vegetarian meat analogs at a level up to 0.4 gram (g) sterol equivalents per serving; in fruit/vegetable juices at a level up to 1 g sterol equivalents per serving; and in edible vegetable oils, including dia-cylglycerol oil as a replacement, at a level up to 4 g/100g sterol equivalents per serving. The notice informs the FDA of the view of Archer Daniels Midland Co. (ADM) that phytosterols are GRAS, through scientific procedures, for use as an ingredient in the preceding. Based on information provided by ADM, as well as other information available to the FDA, the agency has no questions at this time regarding ADM's conclusion that phytosterols are GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of phytosterols. As always, it is the continuing responsibility of ADM to ensure that the food ingredients it markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

PLANTAIN EXTRACT • The extract of various species of plantain. The starchy fruit is a staple throughout the tropics and is used for bladder infections by herbalists. It is a natural astringent and antiseptic with soothing and cooling effects on blemishes and burns.

PLANTAROME • See Yucca Extract.

PLASTICIZERS • Substances when migrating from food packaging material include acetyl tributyl citrate, butyl stearate, and expoxidized soybean oil.

PLUM EXTRACT • The extract of the fruit of the plum tree Prunus domestica. The Indians boiled the wild plum and gargled with it to cure mouth sores.

POLOXAMER 331 • A thick liquid used as a dough conditioner, foam control additive, solubilizing additive in flavor concentrates, as a detergent, and in a wash for poultry. The FDA limits it to equal weight in flavor concentrations and to 0.5 percent in poultry baths; 5 grams per hog in debarring machines; and 0.5 percent by weight of flour.

POLY- • A prefix meaning “many.”

POLYACRYLAMIDE • The polymer of acrylamide monomers, it is a white solid, water soluble, that is used as a thickening additive, suspending additive, and as an additive to adhesives. In modified form it is used to clarify (see Clarifying Additive) cane sugar. Used as a film former in the imprinting of soft-shell gelatin capsules. Used in washing fruits and vegetables. Highly toxic and irritating to the skin. Causes central nervous system paralysis. Can be absorbed through unbroken skin. See acrylamides. ASP

POLYACRYLIC ACID, SODIUM SALT • See Acrylic Resins. NIL

POLYALKYL ACRYLATE • Used in the production of petroleum wax. See Petroleum. EAF

POLYAMINE-EPICHLORHYDRIN RESIN • A petition was filed to use this as a fixing additive in an enzyme derived from the bacillus Steptomyces olivaceus. The FDA put the petition in abeyance (see) in 2003.

POLYAMINO SUGAR CONDENSATE • The condensation product of the sugars fructose, galactose, glucose, lactose, maltose, mannose, rhamnose, ribose, or xylose, with a minute amount of amino acids such as alanine, arginine, aspartic acid, glutamic acid, glycine, histidine, hydroxyproline, isoleucine, leucine, lysine, methionine, phenylalanine, proline, pyroglutamic acid, serine, threonine, tyrosine, or valine. See Amino Acids.

POLYBUTENE • Indopol. Polybutylene. A plasticizer. A polymer (see) of one or more butylenes obtained from petroleum oils. Used in lubricating oil, adhesives, sealing tape, films, and coatings. May asphyxiate.

POLYCARBONATE • Used in plastic bottles, food can liners. See Bisphenol A.

POLYCHLORINATED BIPHENYLS • PCBs. Clear, amber-colored, or dark oily liquids. They may have a faint smell like motor oil, and some contain chlorobenzenes, which make them smell like mothballs. Widely used since the 1930s because of their excellent electrical and insulating abilities, PCBs were banned in 1978 by the EPA. The toxic effects were first noted when more than twelve hundred people in Japan were poisoned by eating food cooked in oil heavily contaminated with PCBs. Soon afterward, studies showed that PCBs caused cancer in test animals. In 1979 their manufacture and importation were banned in the United States based on mounting evidence that they were toxic to humans and wildlife. Today they are classified as probable human carcinogens and are listed in the top 10 percent of the EPA's most toxic chemicals. PCBs, unfortunately, remain in the environment for a long time because they do not break down. Research at the University of Maryland reported in 1998 said children exposed to dioxins (see) and PCBs prenatally or during infancy can suffer behavioral, memory, and learning problems. The Maryland investigators suggest that the underlying mechanism may be thyroid hormone disruption. Even moderate impairment of thyroid hormone function has been associated with various problems in behavior and intellectual development, and certain thyroid diseases are associated with attention deficit hyperactivity disorder and language disorders. Studies of adults exposed to dioxin and PCBs show no marked neurological effects. The Maryland research was funded by the university and by the American Thyroid Association. Fish consumption appears to be the major pathway exposure. Since PCBs do not easily break down, they can bioaccumulate in the fatty tissues of fish and mammals. A significant trend of increasing body

burden is associated with increased fish consumption. People who eat sport-caught fish consume two to three times more fish than the overall U.S. population. Concentrations of PCBs in subsurface soil at a Superfund site have been as high as 750 ppm. People who live near hazardous waste sites may be exposed to PCBs by consuming PCB-contaminated game animals, by breathing PCBs in the air, or by drinking PCB-contaminated well water. Old fluorescent lighting fixtures and old electrical devices and appliances, such as television sets and refrigerators, may contain PCBs if they were made before PCB use was stopped. When these electric devices get hot during operation, small amounts of PCBs may get into the air and raise the level of PCBs in indoor air. Because devices that contain PCBs can leak with age, they could also be a source of skin exposure to PCBs. It is number five on the CERCLA Priority List of Hazardous Substances (see).

POLYCYCLIC AROMATIC COMPOUNDS • Polycyclic aromatic hydrocarbons (PAHs) are a group of over a hundred different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot. Some PAHs are manufactured. PAHs are found in coal tar, crude oil, creosote, and roofing tar. PAH is one of seven high-quantity priority chemicals the EPA has cited for toxic chemicals needing reduction. Many products contain PAHs, including creosote wood preservatives, roofing tar, certain medicines, dyes, and pesticides. PAHs enter the atmosphere from vehicle exhaust, emissions from residential and industrial furnaces, volcanoes, and forest fires. They also may attach to particles produced during emission and in the air. PAHs may contaminate surface and groundwater and throughout the environment. You may be exposed to PAHs by breathing the air near coal-tar or asphalt production or application; breathing cigarette smoke, wood smoke, vehicle exhausts, or fumes from asphalt roads; and by eating grilled or charred meats or any food with PAHs deposited on them during growing or processing. PAHs are in the environment, in your home, and in the workplace. Because PAHs exist naturally in the environment and are man-made, you can be exposed in a number of ways. According to the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), and the U.S. Environmental Protection Agency (EPA), certain PAHs have been classified as definite, probable, or possible cancer-causing agents. Some people who have breathed or touched mixtures of PAHs for long periods have developed cancer. In laboratory animals, some PAHs have caused lung, stomach, or skin cancer. Scientists tested urine samples for levels of metabolites or breakdown products of PAHs in humans aged six years and older who took part in the CDC's national study known as the National Health and Nutrition Examination Survey. The study found a measurable amount of one or more PAH metabolites in almost all the participants. PAHs are a concern because they are persistent. Because they do not burn very easily, they can stay in the environment for a long time. There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that mice exposed to 308 parts per million (ppm) of PAHs (specifically benzo [a] pyrene) in food for 10 days (short-term exposure) caused birth defects. Mice exposed to 923 ppm of benzo (a) pyrene in food for months caused problems in the liver and blood. The PAHs listed on the EPA's priority chemical list are acenaphthene, ace-naphtylene, anthracene, benzo(g,h,i)perylene, fluorene, phenanthrene, and pyrene (see all). Once in your body, PAHs can spread and target fat tissues. Target organs include the kidneys and liver. However, PAHs will leave your body through urine and feces in a matter of days. Polycyclic aromatic hydrocarbons are number one on the CERCLA Priority List of Hazardous Substances (see).

POLYDEXTROSE • A reduced-calorie bulking additive developed by Pfizer, Inc., and approved for use in foods by the FDA in June 1981. It includes glucose, citric acid, and sorbitol. The FDA says it is not a substitute for saccharin (see) or a general sweetener but that it can replace sucrose (see) as a bulking additive in frozen desserts, cakes, and candies and reduce calories in some products as much as 50 percent. According to Pfizer, it is a one-calorie-per-gram bulking additive capable of replacing higher-calorie—4 to 9 calories per gram—ingredients such as sucrose, carbohydrates, and fats in many food products. ASP. E

POLY(DIVINYLBENZENE-COETHYLSTYRENE) • Packaging. See Styrene and Benzene. EAF

POLY(DIVINYLBENZENE-COTRIMETHYL[VINYLBENZYL]AMMONIUM CHLORIDE) • Packaging. See Benzene and Ammonium Chloride. EAF

POLYESTER-POLYURETHANE RESIN-ACID DIANHYDRIDE ADHESIVE • A petition for its use in pouches containing fatty foods was put in abeyance (see) by the FDA in 2003.

POLYETHOXYLATED ALKYLPHENOL • Dodecyl, Nonyl, and Octyl. Components of a commercial detergent for raw foods, followed by water rinsing. The only symptoms shown in animals poisoned with this substance is gastrointestinal irritation.

POLYETHYLENE • A polymer (see) of ethylene; a product of petroleum gas or dehydration of alcohol. One of a group of lightweight thermoplastics that have a good resistance to chemicals, low moisture absorption, and good insulating properties. Used as a chewing-gum base ingredient and as a film former and sheets for packaging. Also used as roughage replacement in feedlot rations for cattle. No known skin toxicity, but implants of large amounts in rats caused cancer. Ingestion of large oral doses has produced kidney and liver damage. ASP

POLYETHYLENE GLYCOL • 400-2,000 molecular weight. PEG. Defoaming additive in processed beet sugar and yeast. Improves resistance to moisture and oxidation. ASP

POLYETHYLENE GLYCOL (600) DIOLEATE • Polyethylene glycol esters of mixed fatty acids from tall oil; polyethylene glycol (400 through 6,000). An additive in nonnutritive artificial sweeteners; a component of coatings and binders in tablet food; improves resistance to oxidation and moisture. See Polyols. ASP

POLYGLYCERATE 60 • See Glycerides.

POLYGLYCEROL • Prepared from edible fats, oils, and esters of fatty acids. Derived from corn, cottonseed, palm, peanut, safflower, sesame, and soybean oils, lard, and tallow.

POLYGLYCEROL ESTER OF FATTY ACIDS • Several partial or complete esters of saturated and unsaturated fatty acids with a variety of derivatives of polyglyc-erols. ASP. E

POLYGLYCEROL POLYRICINOLEIC ACID • PGPR. See Riconoleate. The notice informs the FDA of the view of Stepan Company that PGPR is GRAS “through scientific procedures” for use as an emulsifier in margarines, low-fat margarines, spreads, creamers, and dairy analogs, at levels no greater than 1.0 percent by weight. Based on the information provided by Stepan Company, as well as other information available to the FDA, the agency has no questions at this time regarding Stepan Company's conclusion that PGPR is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of PGPR. As always, it is the continuing responsibility of Stepan Company to ensure that the food ingredients it markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

POLYGLYCERYL-4 COCOATE • See Coconut Oil and Polyglycerol.

POLYGLYCERYL-3-PEG-2 COCOAMIDE • See Coconut Oil and Glycerin.

POLYGLYCERYL-2-PEG-4 STEARATE • An ether of PEG-4 stearate and glycerin. See Stearic Acid and Glycerin.

POLYGLYCERYL PHTHALATE ESTERS OF COCONUT OIL FATTY ACIDS • See Coconut Oil and Fatty Acids. ASP

POLYISOBUTENE • See Polybutene.

POLYISOBUTYLENE • Soft to hard, elastic, light, white solid, odorless and tasteless. Used as a chewing substance in gum. Prepared from edible fats, oils, and fatty acids, hydrogenated or nonhydrogenated (see Hydrogenation). Derived from corn, cottonseed, palm, peanut, safflower, sesame, and soybean oils, lard, and tallow. Used as lubricants, plasticizers, gelling additives, humectants, surfactants, disper-sants, and emulsifiers in foods. See Resin. ASP

POLYLIMONENE • A general fixative derived from citrus oils. It is used in candy (4,500 ppm), chewing gum, and baked goods (1,000 ppm). It can be a skin irritant and sensitizer. See Limonene. ASP

POLYMALEIC ACID and ANHYDRIDE, SODIUM SALT • Used in the processing of sugar. See Maleic Acid. EAF

POLYMER • A substance or product formed by combining many small molecules (monomers). The result is essentially recurring long-chain structural units that have tensile strength, elasticity, and hardness. Examples of polymers (literally, "having many parts") are plastics, fibers, rubber, and human tissue.

POLYMERIZATION • A molecular process joining polymers (see) together.

POLYMIXIN B • A generic term for antibiotics obtained from fermentation of various media by strains of Bacillus polymyxa. Used as a bactericide in yeast culture for beer. May cause renal irritation and damage.

POLYOLS • Alcohol compounds that absorb moisture. They have a low molecular weight: polyols with a weight above 1,000 are solid and less toxic than those with weight 600 or below. The latter are liquid, and although higher in toxicity, large doses are required to kill animals. Such deaths in animals have been found to be due to kidney damage. See Propylene Glycol and Polyethylene Glycol as examples.

POLYOXYALKALENE GLYCOL • Defoaming additive in beet sugar production.

POLYOXYETHANYL-ALPHA-TOCOPHERYL SEBACATE • PTS. As a solubilizer for the dietary ingredient coenzyme Q10 in dietary supplements. Notified the FDA the producer wanted to list it as GRAS.

POLYOXYETHYLENE (600) DIOLEATE • A defoamer. ASP

POLYOXYETHYLENE GLYCOL • Ester of edible cottonseed oil and fatty acids. Solubilizing additive in pickles.

POLYOXYETHYLENE GLYCOL (600)MONORICINOLEATE • Defoaming component used in processing beet sugar and yeast.

POLYOXYETHYLENE LAURYL ETHER • Used for bloat in cattle.

POLYOXYETHYLENE (600)MONORICINOLEATE • Plasticizer. See Polyoxyethylene and Ricinoleic Acid. ASP. E

POLYOXYETHYLENE (40) MONOSTEARATE • Defoaming additive in processed foods; emulsifier for frozen desserts. Application to the skin of mice has been shown to cause skin tumors. The compound has been fed to animals and does not appear to produce tumors on its own, but there is a suggestion that it allows cancer-causing additives to penetrate more quickly. On the FDA list for further study for long- and short-term effects since 1980.

POLYOXYETHYLENE (20) SORBITAN MONOOLEATE • Emulsifier and defoamer in the production of beet sugar; a dietary vitamin and mineral supplement. Used in dill oil in spiced green beans, icing, frozen custard, iced milk, fruit, and sherbet. The FDA asked for short-term, mutagenic, teratogenic, subacute, and reproductive effects in 1980 and has not reported any findings since. E

POLYOXYETHYLENE (20) SORBITAN MONOPALMITATE • An emulsifier, flavor-dispersing additive, and defoaming additive. Used in whipped cream, beverages, confectionery, and soup. The FDA asked for further study of the safety of this additive in 1980 and has reported nothing about it since. E

POLYOXYETHYLENE (20) SORBITAN MONOSTEARATE • Polysorbate 60. An emulsifier and flavor-dispersing additive in shortening and edible oils. Used in whipped vegetable-oil topping, cake, and cake mixes; cake icing or filling; sugar-type confection coatings; coconut spread; beverage mixes; confectionery; chicken bases; gelatin desserts; dressings made without egg yolks; solid-state, edible vegetable fat-water emulsions used in substitutes for milk or cream; dietary vitamin supplements; foaming additives in nonalcoholic beverage mixes to be added to alcoholic beverages; and a wetting and dispersing additive for powdered processed foods. The FDA asked for further study of this additive in 1980.

POLYOXYETHYLENE (20) SORBITAN TRISTEARATE • Emulsifier, defoaming additive, and flavor-dispersing additive. Used in cakes and cake mixes, including doughnuts, whipped mixes, and vegetable oil toppings; cake icings and fillings; ice cream; frozen custard, ice milk, fruit sherbet, and nonstandardized frozen desserts; solid-state, edible vegetable fat-water emulsions used as milk and cream substitutes in coffee; and wetting and dispersing additives in processed powdered food. E

POLYOXYETHYLENE STEARATE • A mixture of stearate (see Stearic Acid) and ethylene oxide, it is a waxy solid once added to bread to make it "feel fresh." It was fed to rats as one-fourth of their diets and resulted in the formation of bladder stones, and subsequently a number of tumors. Banned in 1952. The European Parliament said in 2003 that this synthetic stabilizing agent can contain harmful by-products (ethylene oxide, mono- and diethyleneglycols). Its use should therefore be banned. E

POLYPHOSPHATES • Polyphosphates are legally permitted additives that are widely used to aid processing or to improve eating quality of many foods, particularly meat and fish products. Phosphates are also used in making baking powder and cola drinks, and great quantities are used in fertilizers and detergents. Phosphates are present normally in all living things and are an essential component of our diet. A phosphate is a salt of phosphoric acid; when a number of simple phosphate units are linked to form a more complex structure, this is known as a polyphosphate. The phosphates used in foods may be simple phosphates, pyrophosphates containing two phosphate units, tripolyphosphates containing three units, or polyphosphates containing more than three phosphate units. The main value of polyphosphates lies in improving the retention of water by the protein in fish. The manner in which they do this is not clearly understood, but their effect is mainly on the surface of the fish. Other substances such as common salt give similar results but with undesirable flavor effects. E

POLYPROPYLENE GLYCOL • Defoaming additive for yeast and beet sugar. ASP

POLYSACCHARIDES • Carbohydrates that are organic compounds consisting of carbon, hydrogen, and oxygen. The polysaccharides include starch, dextrin, glycogen, and cellulose.

POLYSORBATE 60 and POLYSORBATE 80 • Both are emulsifiers that have been associated with the contaminant 1,4 dioxane, known to cause cancer in animals. The 60 is a condensate of sorbitol with stearic acid, and the 80 is a condensate of sorbitol and oleic acid (see all). The 60 is waxy, soluble in solvents, and is used as an emulsifier, stabilizer, wetting, and dispersing additive for powdered processed foods, and a foaming additive for beverage mixes. It is added to chocolate coatings to prevent cocoa-butter substitutes from tasting greasy. It is found in frozen and gelatin desserts, cakes, cake mixes, doughnuts, and artificial chocolate coatings, nondairy whipped cream and creamers, powdered convenience foods, salad dressings made without egg yolks, and vitamin supplements. The 80 is a viscous liquid with a faint caramel odor and is used as an emulsifier, stabilizer, and humectant. It prevents oil from separating from nondairy whipped cream and helps nondairy coffee whiteners to dissolve. It is also found in baked goods, ice cream, frozen custard, shortenings, and vitamin and mineral supplements. FDA residue tolerances in various products are from less than 0.1 percent to 4.5 percent. Polysorbate 40 is also widely used as an emulsifier of essential oils in water. ASP

POLYSORBATE 80 WITH CARRAGEENAN • See Polysorbates and Carrageenan.

POLYSORBATES • 1 through 85. These are widely used emulsifiers and stabilizers. For example, polysorbate 20 is a viscous, oily liquid derived from lauric acid. Used in vitamins, pickle products, and mineral preparations; in special diet foods; alone or in combination with sorbitan. They are also used as dispersing additives in gelatin desserts and mixes; and up to 10 ppm in finished table salt. They are used in creaming mixtures for cottage cheese and low-fat cottage cheese and as a surfactant and wetting additive for natural and artificially colored barbecue sauces. It is a stabilizer of essential oils in water. It is used as a nonionic surfactant (see). ASP. The European Parliament said in 2003 that polysorbates are used as preservatives in cakes, cheeses, and wines, for example. Extended use may be assumed to cause damage to health; it is therefore important that their use be subject to review. Polysorbates contain harmful residues (ethylene oxide, ethylene glycols), can increase the absorption of fat-dissolving substances, and modify the digestion of various substances.

POLYSTYRENE • Used in the manufacture of resins. Reported to be an unintentional additive when tea and coffee are drunk from polystyrene cups. Colorless to yellowish, oily liquid with a penetrating odor. Obtained from ethylbenzene by removing the hydrogen or by chlorination. Sparingly soluble in water; soluble in alcohol. May be irritating to the eyes and mucous membranes and, in high concentrations, may be narcotic.

POLYSTYRENE CROSS-LINKED CHLOROMETHYLATED, THEN LAMINATED • Packaging. See Polystyrene. ASP

POLYUNSAT FAT • Listing on food labels for polyunsaturated fats (see).

POLYUNSATURATED FATS • The saturation of fat refers to the chemical structure of its constituent fatty acids. Polyunsaturates are liquid at room temperature and consist mainly of fatty acids that can hold four or more additional hydrogen atoms. See Monounsaturated Fats.

POLYVINYL ACETATE • Used in chewing-gum base. Diluent for color additive mixtures for drug use exempt from certification (see). ASP

POLYVINYL ALCOHOL 9 • Synthetic resins used to dilute the color of eggshells and used in lipstick, setting lotions, and various creams. A polymer is prepared from polyvinyl acetates by replacement of the acetate groups with the hydroxyl groups. Dry, unplasticized polyvinyl alcohol powders are white to cream-colored and have different viscosities. Solvent in hot and cold water but certain ones require alcohol-water mixtures. The FDA requires no penetration of polyvinyl alcohol through eggshell. An experimental cancer-causing and tumor-inducing additive. International Agency for Research on Cancer (IARC) (see) review. ASP

POLYVINYL BUTYRAL • Condensation of polyvinyl alcohol and butyraldehyde (see both). It is a synthetic flavoring found in coffee and strawberry. May be an irritant and narcotic.

POLYVINYL CHLORIDE • PVC. Chloroethylene Polymer. Derived from vinyl chloride (see), it consists of a white powder or colorless granules that are resistant to weather, moisture, acids, fats, petroleum products, and fungus. It is widely used for everything from plumbing to raincoats. The use of PVC as a plastic wrap for food, including meats, and for human blood, has alarmed some scientists. Children are at particular risk since many toys (such as chewable items) are made from PVC. Human and animal blood can extract potentially harmful chemicals from the plastic. The chemicals are added to PVC to make it flexible, and they migrate from the plastic into the blood and into the meats in amounts directly proportional to the length of time of storage. The result can be contamination of the blood, causing lung shock, a condition in which the patient's blood circulation to the lungs is impeded. PVC is also used in cosmetics and toiletries in containers, nail enamels, and creams. PVC has caused tumors when injected under the skin of rats in doses of 100 milligrams per kilogram of body weight.

POLYVINYL ETHYL ETHER • See Polyvinyl Alcohol.

POLYVINYL IMIDAZOLINIUM ACETATE • The polymer of vinyl imidazolinium acetate. See Polyvinylpyrrolidone.

POLYVINYL METHYL ETHER • See Polyvinyl Alcohol.

POLYVINYL POLYPYRROLIDONE • Purified vinylpyrrolidone. Used in clarifying sparkling wine. See Polyvinylpyrrolidone. ASP. E

POLY(2-VINYLPYRIDICINE-CO-STYRENE) • A coating for nutrients for cattle. See Polyvinylpyrrolidone and Styrene.

POLYVINYLPYRROLIDONE • PVP. A faintly yellow, solid plastic resin resembling albumin. Used in dietary products. Also a clarifying additive in vinegar, beer, and wine. Limitation of 6 pounds per 1,000 gallons in wine. The FDA requires that it be removed by filtration. The FDA residue tolerance is less than 10 ppm in beer; less than 40 ppm in vinegar and 60 ppm in wine from use as a clarifying additive; and less than 60 ppm as a tableting adjuvant in nonnutritive sweeteners and in flavor, vitamin, and mineral concentrates in tablet form. Ingestion may produce gas and fecal impaction or damage to lungs and kidneys. It may last in the system several months to a year. Strong circumstantial evidence indicates thesaurosis —foreign bodies in the lungs—may be produced in susceptible individuals from concentrated exposure to PVP in hairsprays. Modest intravenous doses in rats caused them to develop tumors. The European Parliament said in 2003 that these substances can contain residues of vinylpyrrolidone, a substance that is considered cancer causing in animals. E1201 has been assessed as not classifiable by the WHO's International Agency for Research on Cancer (IARC). ASP. E

POMEGRANATE • Known as the royal fruit because of the “crown” on top, it is a rich source of antioxidants. The juice of pomegranate is reputedly more effective than apple in boosting the body's antioxidant defenses, which decline naturally with age according to a study reported in 2008 by the Institute of Hygiene and Environmental Medicine in Tianjin, China. The antioxidant capacity of the blood of 26 elderly subjects increased by almost 10 percent after drinking pomegranate juice, whereas changes were negligible after apple juice, report the researchers. The study was published in Nutrition Research. Pomegranate products also have been noted to have benefits including protection against prostate cancer, slowing cartilage loss in arthritis, and potentially preventing Alzheimer's. A dietary supplement ingredient introduced by Extracts & Ingredients in 2008 combines different extracts from the pomegranate fruit, which is said to provide a tailor-made antioxidant and anti-inflammatory blend for supplement makers. The new blend contains pomegranate seed oil, pomegranate seed extract, and pomegranate juice powder. GRAS.

POMEGRANATE BARK EXTRACT • A flavoring from the dried bark, stem, or root of the tree Punica granatum, grown in the Mediterranean region and elsewhere. Contains about 20 percent tannic acid (see); rind of fruit contains 30 percent. Formerly used to expel tapeworms. Overdose can cause nausea, vomiting, and diarrhea. GRAS. ASP

PONCEAU 4R • Red 7, C.I. 16255, Cochineal Red A, New Coccine, Acid Red 18, SX purple is a synthetic colorant that may be added to foods to induce a color change. The British and the European Parliament at this writing want the coloring banned because it exacerbates hyperactivity in young children. See Cochineal. E

POPLAR EXTRACT • Balm of Gilead. Extract of the leaves and twigs of Populus nigra. In ancient times, the buds were mashed to make a soothing salve. They were also simmered in lard for use as an ointment and for antiseptic purposes. The leaves and bark were steeped by American colonists to make a soothing tea. It supposedly helped allergies and soothed reddened eyes. Used as a flavoring in alcoholic beverages only. NUL

POPPY SEED • The seed of the poppy Papaver somniferum. Used as a natural spice for flavoring for baked goods (8,600 ppm). GRAS. ASP

POT MARIGOLD • See Marigold, Pot. GRAS

POT MARJORAM • See Marjoram, Pot. GRAS

POTASSIUM • The healthy human body contains about 9 grams of potassium. Most of it is found inside body cells. Potassium plays an important

POTASSIUM • The healthy human body contains about 9 grams of potassium. Most of it is found inside body cells. Potassium plays an important role in maintaining water balance and acid-base balance. It participates in the transmission of nerve impulses and in the transfer of messages from nerves to muscles. It also acts as a catalyst in carbohydrate and protein metabolism. Potassium is important for the maintenance of normal kidney function. It has a major effect on the heart and all the muscles of the body.

POTASSIUM ACETATE • Colorless, water-absorbing crystals or powder, odorless or with a faint acetic aroma and a salty taste. Used as a buffer and antimicrobial preservative. Very soluble in water. Also used medicinally to treat irregular heartbeat and as a diuretic. The GRAS designation was removed by the FDA in the 1990s. NIL. E

POTASSIUM ACID PYROPHOSPHATE • See Sodium Acid Pyrophosphate. NUL

POTASSIUM ACID TARTRATE • Salt of tartaric acid. Colorless with a pleasant odor. An acid and buffer, it is the acid constituent of some baking powders. Used in effervescent beverages. It is also used in some confectionery products. Formerly a cathartic. GRAS. ASP

POTASSIUM ADIPATE • Antioxidant primarily used in low salt foods. No adverse effects reported. See Adipic Acid. E

POTASSIUM ALGINATE • A stabilizer (see) and thickener. See Alginates. GRAS. E

POTASSIUM ALUM • Used as a bleaching agent for dairy products in cheese preparations. See Alum.

POTASSIUM ALUMINUM SILICATE • See Aluminum and Silicate. E

POTASSIUM ASPARTAME • See Aspartame.

POTASSIUM ASPARTATE • The potassium salt of aspartic acid (see).

POTASSIUM BENZOATE • A preservative used in margarine and wine. The FDA limits the amount to 0.1 percent or if used in combination with sorbic acid (see) to 0.2 percent in margarine and 0.1 percent in wine. See Benzoic Acid. ASP. E

POTASSIUM BICARBONATE • Carbonic Acid, Monopotassium Salt. Colorless, odorless, transparent crystals or powder, slightly alkaline, salty taste. Considered a miscellaneous and/or general-purpose food additive, it is present in fluids and tissues of the body as a product of normal metabolic processes. Soluble in water. It is used in baking, soft drinks, and in low-pH liquid detergents. GRAS ASP

POTASSIUM BISULFATE • Derived by heating potassium sulfite with sulfuric acid. Used in wine processing and to make potassium bitartrate. GRAS

POTASSIUM BISULFITE • Preservative used for sodium sulfite (see) in ale, beer, and fruit-pie mix. Not to be used in foods containing vitamin B1, raw fruit and vegetables, including fresh potatoes (not frozen, canned, or dehydrated). The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amounts that can be added to food. See Sulfites. ASP

POTASSIUM BORATE • Boric Acid, Potassium Salt. A crystalline salt used as an oxidizing ingredient and as a preservative in flour. See Borates for toxicity. NUL

POTASSIUM BRÓMATE • This dough conditioner and bleaching agent, which was once widely used in bread baking, is considered a category 2B (possibly carcinogenic to humans) carcinogen by the International Agency for Research on Cancer. In 1993, the World Health Organization recommended its removal from all foods, and though it has been banned in many countries, it's still permitted in the United States and Japan, where it continues to be used in buns at Burger King, Arby's, and Wendy's, according to the Center for Science in the Public Interest. Very toxic when taken internally. Burns and skin irritation have been reported from its industrial uses. In toothpaste it has been reported to have caused inflammation and bleeding of gums. In 1980, the Ames Test (see) found it to be a mutagen. The JECFA (see) said in 1993 that new data about potassium bromate showed long-term toxicity and carcinogenicity including kidney tumors, tumors of the lining of the stomach, and thyroid tumors in rats and slightly increased kidney tumors in hamsters. On the basis of the new safety data and the new data on residual bromate in bread, the committee concluded the use of potassium bromate as a flour treatment additive was not appropriate. The previous acceptable level of treatment of flours for bread-making was therefore withdrawn. The FDA has taken no action at this writing to restrict the use of this additive. ASP

POTASSIUM BROMIDE • A preservative used in washing fruits and vegetables. Used medicinally as a sedative and antiepileptic. In large doses it can cause central nervous system depression. Prolonged intake may cause bromism. Bromism's main symptoms are headache, mental inertia, slow heartbeat, gastric distress, skin rash, acne, muscular weakness, and occasionally violent delirium. Bromides can cross the placental barrier and have caused skin rashes in the fetus. ASP

POTASSIUM CAPRATE • A cleansing ingredient. See Capric Acid. NUL

POTASSIUM CAPRYLATE • Source of potassium added to food. NUL

POTASSIUM CARBONATE • Salt of Tartar. Pearl Ash. Inorganic salt of potassium. Used as an alkali in combination with potassium hydroxide (see) for extracting color from annatto (see) seed. Also used in confections and cocoa products. Irritating and caustic to human skin and may cause dermatitis of the scalp, forehead, and hands. GRAS. ASP. E

POTASSIUM CASEINATE • The potassium salt of milk proteins used in ice cream, frozen custard, ice milk, and fruit sherbets. See Casein. ASP

POTASSIUM CHLORIDE • A colorless, crystalline, odorless powder with a salty taste. A yeast food used in the brewing industry to improve brewing and fermentation and in the jelling industry. Small intestinal ulcers may occur with oral administration. Large doses ingested can cause gastrointestinal irritation, purging, weakness, and circulatory collapse. Used as a substitute for sodium chloride (see) in low-sodium dietary foods. GRAS. ASP. E

POTASSIUM CITRATE • A transparent or white powder, odorless, with a cool, salty taste. Used as a buffer in confections and in artificially sweetened jellies and preserves. It is a urinary alkalizer and gastric antacid. GRAS. E. ASP

POTASSIUM COCOATE • See Coconut Oil. ASP

POTASSIUM COCO-HYDROLYZED PROTEIN • See Proteins.

POTASSIUM CORNATE• The potassium salt of fatty acids derived from corn oil. See Corn Oil.

POTASSIUM CYCLAMATE • Nonnutritive sweetener removed from the GRAS list in 1969 and is now illegal in foods. BAN

POTASSIUM 2-(1-ETHOXY)ETHOXYPROPANOATE • Synthetic flavoring. NIL

POTASSIUM FERROCYANIDE • Coloring. Human studies, according to the JECFA, have demonstrated that high levels were toxic to the kidney in the single short-term study available but no kidney function tests were performed. May be harmful by inhalation/ingestion/skin absorption. May cause irritation. E

POTASSIUM FUMARATE • Acidifier. See Fumaric Acid. NUL

POTASSIUM GIBBERELLATE • The salt of gibberellic acid, a plant growth-promoting hormone. White crystalline powder that absorbs water. Used as an enzyme activator in fermented malt beverages. The FDA limits it to 2 ppm in treated barley malt and 0.5 ppm in the finished beverage. EAF

POTASSIUM GLUCONATE • The potassium salt of gluconic acid (see) used as a buffering additive that helps keep soda water bubbling. Mildly toxic by ingestion. GRAS. NUL. E

POTASSIUM GLYCEROPHOSPHATE • Nutrient additive. See Glycerides. GRAS. ASP

POTASSIUM HYDROGEN SULFITE • See Sulfites. E

POTASSIUM HYDROXIDE • Caustic Potash. An alkali used to extract color from annatto seed, a peeling additive for tubers and fruits, also in cacao products. Occasionally used to prevent the growth of horns in calves. Prepared industrially by electrolysis of potassium chloride (see). Extremely corrosive, and ingestion may cause violent pain, bleeding, collapse, and death. When applied to the skin of mice, moderate dosages cause tumors. May cause skin rash and burning. The FDA banned household products containing more than 10 percent potassium hydroxide. GRAS. ASP. E

POTASSIUM HYPOPHOSPHATE • The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. See Phosphate. NUL

POTASSIUM HYPOPHOSPHITE • Used in processing additives. Can be explosive. See Phosphorous. ASP

POTASSIUM IODATE • Oxidizer. Dough Conditioner. See Potassium Iodide and Iodine Sources. GRAS. ASP

POTASSIUM IODIDE • Potassium Salt. A dye remover and an antiseptic. Used in table salt as a source of dietary iodine. It is also in some drinking water. May cause allergic reactions. GRAS. ASP

POTASSIUM LACTATE • Flavoring. See Lactic Acid. GRAS. ASP. E

POTASSIUM LAURATE • The potassium salt of lauric acid (see). NUL

POTASSIUM LAURYL SULFATE • A water softener. See Sodium Lauryl Sulfate.

POTASSIUM MALATE • See Malic Acid. E.

POTASSIUM METABISULFITE • Potassium Pyrosulfite. White or colorless, with an odor of sulfur dioxide (see), it is an antioxidant, preservative, and antifermentative in breweries and wineries. Should not be used in meats or foods recognized as sources of vitamin B1. Also used for bleaching straw and as an antiseptic, preservative, antioxidant, and a developing additive in dyes. Low toxicity. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no available evidence that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amounts that can be added to foods. See Sulfites. ASP. E

POTASSIUM-n-METHYLDITHIO-CARBAMATE • A bacteria-killing component in controlling microorganisms in sugarcane mills. Carbamates are used to prevent sprouting in potatoes and other products by stopping cell division, something we call mutations. Carbamate mutations may lead to birth defects and to cancer. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no available evidence that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amounts that can be added to food. FDA residue tolerances are less than 3.5 ppm in sugarcane being processed, less than 4.1 ppm. in terms of weight of raw cane or beets, and less than 200 ppm in cured cod roe. ASP

POTASSIUM MYRISTATE • The potassium salt of myristic acid (see). EAF

POTASSIUM NITRATE • See Nitrate. ASP. E

POTASSIUM NITRITE • See Nitrite. NUL. E

POTASSIUM OCTOXYNOL-12 PHOSPHATE • The potassium salt of a mixture of esters of phosphoric acid and octoxynol (see both).

POTASSIUM OLÉATE • Miscellaneous additive. See Potassium and Oleic Acid. NUL

POTASSIUM PALMITATE • The potassium salt of palmitic acid (see). NUL

POTASSIUM PECTINATE • See Pectin and Potassium. EAF

POTASSIUM PERMANGANATE • Dark purple or bronzelike, odorless crystals with a sweet, antiseptic taste, used as a starch modifier. Dilute solutions are mildly irritating; highly concentrated solutions are caustic. ASP

POTASSIUM PERSULFATE • White crystals, soluble in water or alcohol. Derived from potassium sulfate. Used as a flour-maturing additive, for modification of starch, and as an antiseptic. Sprayed on fresh citrus as a coating. Strong irritant. ASP

POTASSIUM PHOSPHATE • Monobasic. Dibasic. Tribasic. Used as a yeast food in the brewing industry and in the production of champagne and other sparkling wines. Used in frozen eggs as a color preservative. Used in cheese processing. Has been used medicinally as a urinary acidifier. GRAS. ASP. E

POTASSIUM POLYMETAPHOSPHATE • The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. See Potassium Phosphate for uses. NUL

POTASSIUM PROPIONATE • Preservative, antimold, and antirope agent. Propionates occur naturally in some foods, notably cheese, and are naturally present in the body. Propionate is formed every day in our intestines when dietary fiber is fermented. It is subsequently absorbed into the bloodstream. It has been estimated that 5 to 10 percent of the population may have various food sensitivities or intolerance. Of this group, 30 to 40 percent may be affected by propionate, but not in isolation. Sensitivity to propionate always occurs in conjunction with sensitivity to other chemicals, either naturally occurring or added to food. E

POTASSIUM PYROPHOSPHATE • Colorless, deliquescent crystals or granules, used as a sequestering, peptizing, and dispersing additive and in soaps and detergents. Low toxicity. GRAS. ASP

POTASSIUM SALTS OF FATTY ACIDS • In foods as binders, emulsifiers, and anticaking additives. See Fatty Acids. ASP

POTASSIUM SILICATE • Soluble Potash Glass. Colorless or yellowish, translucent to transparent glasslike particles. It is used for inorganic protective coatings, in detergents, as a catalyst, and in adhesives. GRAS

POTASSIUM SORBATE • Sorbic Acid Potassium Salt. White crystalline powder used as a preservative; a mold and yeast inhibitor; and a fungistat in beverages, baked goods, chocolate, and soda fountain syrups, fresh fruit cocktail, tangerine puree (sherbet base), salads (potato, macaroni, coleslaw, gelatin), cheesecake, pie fillings, cakes, cheeses in consumer-size packages, and artificially sweetened jellies and preserves. Low oral toxicity but may cause irritation of the skin. GRAS. ASP. E

POTASSIUM STEARATE • Stearic Acid Potassium Salt. White powder with a fatty odor. Used as a chewing-gum base. Strongly alkaline. A defoaming additive in brewing. ASP

POTASSIUM SULFATE • Does not occur free in nature but is combined with sodium sulfate. Colorless or white crystalline powder, with a bitter taste. Used as a flavoring in foods. A water corrective used in the brewing industry. Used as a salt substitute; also used as a fertilizer and a cathartic. Large doses can cause severe gastrointestinal bleeding. GRAS. ASP. E

POTASSIUM SULFITE • Preservative. See Sulfites. GRAS. EAF

POTASSIUM TARTRATES • Acidifier. No adverse reaction reported. E

POTASSIUM TRICHLOROISOCYANURATE • A sanitizer. See Arsenic.

POTASSIUM TRIPOLYPHOSPHATE • A white crystalline solid that is used in water-treating compounds, cleaners, and fertilizers; widely used as a sequestering additive (see) in processed foods. GRAS. ASP

POTATO PROTEIN • Coagulated, Hydrolyzed, or Clarified. Potato protein is a coproduct from the potato starch industry. The product has a high protein content (85 percent) and a balanced amino acid level. Used as a water binder in meat, sausage, and poultry, as a foaming aid in confectionery, bakery, and dairy products, and as an emulsifier in spreads, sauces, desserts, and dressings, at levels between 0.1 and 3.0 percent in the finished product. Potato protein is manufactured from conventional potatoes that are washed in water and ground into a mass. Sulfite is added at this stage to prevent oxidation. A recent study indicates that patatin, the main storage protein in raw potatoes, may be an allergenic component. Cooked potatoes, however, are usually well tolerated, and evidence indicates that denaturation of potato protein leads to a decrease in allergenic potential. Based on the information provided by manufacturers available to the FDA, the agency says it has no questions at this time (2008) regarding the conclusion that potato protein preparations (CPP, HPP, and HCP) are GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of potato protein preparations. As always, it is the continuing responsibility of manufacturers to ensure that the food ingredients they market are safe and are otherwise in compliance with all applicable legal and regulatory requirements. Potato protein preparations treated with sulfites should declare the presence of sulfites on the label. Historically, a starch was produced from potatoes, while the proteins, part of the waste stream, were sold off for low-value animal feed. But a new technological process that makes these waste proteins fit for human consumption has, in turn, unlocked a new, far higher value market. GRAS

POTATO STARCH • A flour prepared from potatoes ground to a pulp and washed of fibers. Swells in hot water to form a gel on cooling. May cause allergic skin reactions and stuffy nose in the hypersensitive. GRAS. ASP

POTENCY • A measure of the relative strength of a chemical.

POTENTIATION • The ability of a substance to increase the toxic effect(s) of another compound.

POTENTIATOR • A flavor ingredient with little flavor of its own that augments or alters the flavor response, such as sodium glutamate and sodium inosinate.

POULTRY PROTEIN • Use as a protein source in finished poultry products of the same species as the extracted protein. The poultry protein consists of proteins from poultry muscle tissue. According to the company Proteus, the protein and amino acid profile of the extract is similar to that of the original muscle tissue. The extract is derived from poultry muscle through an acid solubilization process. The poultry protein is intended for use as a water-binding agent and as a coating to increase moisture retention and to reduce fat absorption in the final cooked product. Based on the information provided by Proteus, as well as other information available to the FDA, the agency has no questions at this time regarding Proteus's conclusion that poultry protein is GRAS when produced as described and used under the intended conditions of use.

PPB • The abbreviation for parts per billion; a measure of concentration. May represent the concentration of a residue in soil, water, or whole animals. For example, 1 ppb is equivalent to one second in 32 years.

PPG • The abbreviation for propylene glycol (see).

PPM • The abbreviation for parts per million.

PREBIOTIC • Nondigestible food ingredients that beneficially affect the body by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon, and thus improve health. Most potential prebiotics are carbohydrates, but the definition does not exclude noncarbohydrates to be used as a prebiotic. In theory, any antibiotic that would reduce the number of potentially harmful bacteria and favor health-promoting bacteria or activities can be considered a prebiotic. It is assumed that a prebiotic should increase the number and/or activity of bifidobacteria and lactic acid bacteria (see Bifidogenic Factor and Lactic Acid), as these groups of bacteria are claimed to have several beneficial effects on the body. Prebiotics refer mainly to certain foods, and occasionally to certain food products, that support probiotic microorganism viability, enhancing their survivability. Included among prebiotics are foods such as Jerusalem and regular artichokes, oats, leeks, onions, and whole grain breads or cereals. Examples of prebiotic food products are the fructooligosaccharides (fructooligosaccharides, or fruit-derived, digestion-resistant sugars) (FOS), also in honey, and the galactooligosaccharides (galacto-oligo-saccharides) (see) sugars in galactose-containing foods like goat's milk. Probiotics are bacteria found in the gut that are understood to have health benefits. Prebiotics are ingredients that stimulate growth of probiotics in the gut, and synbiotics are a combination of the two.

PRECIPITATE • To separate out from solution or suspension. A deposit of a solid separated out from a solution or suspension as a result of a chemical or physical change.

PRECURSOR • A biologic process in which a substance turns into another active or more mature substance. Beta-carotene is a precursor of vitamin A, because the body can use it to make vitamin A.

PREDACIDE • Pesticide to get rid of vertebrates.

PREDNISOLONE • Metacortandrolone. Cortalone. Delta-Cortef. Introduced in 1955, prednisolone is related chemically to cortisol. It is used to treat inflammation in cattle. FDA residue tolerance for milk is zero. Most adverse reactions are the result of dose or length of time of administration. Potential adverse reactions include euphoria, insomnia, psychotic behavior, high blood pressure, swelling, cataracts, glaucoma, peptic ulcer, GI irritation, increased appetite, high blood sugar, growth suppression in children, delayed wound healing, acne, skin eruptions, muscle weakness, pancreatitis, hairiness, decreased immunity, and acute adrenal gland insufficiency. When withdrawn, there may be rebound inflammation, fatigue, weakness, joint pain, fever, dizziness, lethargy, depression, fainting, a drop in blood pressure upon arising from a seated or prone position, shortness of breath, loss of appetite, and high blood sugar.

PREDNISONE • Deltacortisone. Introduced in 1955 and related chemically to cortisone, a hormone secreted by the adrenal gland, prednisone is widely used to treat severe inflammation, as an immunosuppressant, and to treat acute attacks of multiple sclerosis, arthritis, and irritable-bowel syndrome in humans. It is used to treat cattle and horses for inflammation. The FDA has a zero tolerance in milk. Under International Agency for Research on Cancer (IARC) (see) review. Most adverse reactions are the result of dose or length of time of administration. In humans, potential adverse reactions from medication include euphoria, insomnia, psychotic behavior, high blood pressure, swelling, cataracts, glaucoma, peptic ulcer, GI irritation, increased appetite, high blood sugar, growth suppression in children, delayed wound healing, acne, skin eruptions, muscle weakness, pancreatitis, hairiness, decreased immunity, irregular menstruation, male infertility, and acute adrenal gland insufficiency. When withdrawn, there may be rebound inflammation, fatigue, weakness, joint pain, fever, dizziness, lethargy, depression, fainting, a drop in blood pressure upon arising from a seated or prone position, shortness of breath, loss of appetite, and high blood sugar. Sudden withdrawal may be fatal. Contraindicated in systemic fungal infections. Prednisone has been implicated in aplastic anemia and is an experimental tumor inducer.

PREDONIN • See Prednisone.

PREEMPT • See CF-3.

PREGELATINIZED STARCH • When starch and water are heated, the starch molecules burst and form a gelatin. GRAS

PREMIUMIZATION OF FLAVOR • Consumers who are willing both to experiment with new taste sensations and to pay a higher price for more sophisticated and less traditional products are the targets of this phenomenon.

PRENYL ACETATE • Synthetic flavoring with a fruity, pear, green taste and an aroma that is fruity, floral, pear. Not as pungent as amyl acetate (see) but relatively longer lasting. Used in cosmetics, detergents, fabric softeners, soaps, and food additives. May be irritating to the skin and eyes. EAF

PRENYL BENZOATE • This colorless liquid is derived from benzoic acid and benzyl alcohol. A sweet, balsamic odor with tealike quality and natural connotations. Used as an antiparasitic insecticide that kills lice and the mites responsible for the skin condition scabies, as a fixative in fragrances to improve the stability and other characteristics of the main ingredients, as a food additive in artificial flavors, as a plasticizer in cellulose and other polymers, as a solvent for various chemical reactions, and as a treatment for sweet itch in horses. EAF

PRENYL CAPROATE • Flavoring used in foodstuff, chewing gum, toothpaste and medicinal product flavor and aroma augmenting, modifying, enhancing, and imparting compositions. EAF

PRENYL ETHYL ETHER • Flavoring found in nature tasting like citrus, fruit, grass, green, and lemon. There is very little information on this additive.

PRENYL FORMATE • A synthetic fruity rum flavoring used in baked goods, beverages (both nonalcoholic and alcoholic), breakfast cereal, and chewing gum. Also used in frozen dairy, fruit ices, gelatins/granulated sugar, gravies, hard candy, imitation dairy, instant coffee/tea, jams/jellies, meat products, milk products, butter and fruit products. No information on toxic potential. EAF

PRENYL HEXANOATE • Synthetic cheese, fruit, green flavoring. Used in baked goods, beverages (nonalcoholic), beverages (alcoholic), breakfast cereal, chewing gum, condiments/relishes, confectionery frostings, egg products, fats/oils, fish products, frozen dairy fruit ices, gelatins/puddings, granulated sugar, gravies, hard candy, imitation dairy, instant coffee/tea, jams/jellies, meat products, milk products. See Hexanoic Acid.

PRENYL ISOBUTYRATE • Propanoic acid, 2-methyl-, 3-methyl-2-butenyl ester. Synthetic flavoring used in butter and fruit products. The FEMA Expert Panel (see) based its judgments on this flavoring's use levels to determine it to be GRAS.

PRENYL THIOACETATE • Synthetic pine flavoring. EAF

PRENYLTHIOL • Synthetic coffee flavoring additive. Latest evaluation by the JECFA was in 1999. The committee found no safety concern at current levels of intake when used as a flavoring agent. EAF

PRES • FDA abbreviation for chemical preservative.

PRESERVATION OF ANTIBIOTICS FOR MEDICAL TREATMENT ACT OF 2007 • PAMTA. Amends the Federal Food, Drug, and Cosmetic Act to withdraw approvals for feed-additive use of seven specific classes of antibiotics: penicillins, tetracyclines, macrolides, lincosamides, streptogramins, aminoglycosides, and sul-fonamides. Each of these classes contains antibiotics also used in human medicine.

PRESERVATIVES • About one hundred “antispoilants,” which retard or prevent food from going “bad,” are in common use. Preservatives for fatty products are called antioxidants. Preservatives used in bread are labeled mold or rope inhibitors. They include sodium propionate and calcium propionate (see both). Preservatives to prevent mold and fungus growth on citrus fruits are called fungicides. Among the most commonly used preservatives are sodium benzoate (see) to prevent the growth of microbes on cheese and syrups, sulfur dioxide (see) to inhibit discoloration in fruit juice concentrates, and nitrates and nitrites that are used to “cure” processed meats. In many instances a product might show no visible evidence of microbial contamination and yet contain actively growing, potentially harmful germs.

PRICKLY ASH BARK and OIL• Xanthoxylum spp. A natural cola, maple, and root beer flavor extract from a prickly aromatic shrub or small tree, Zanthoxylum spp., bearing yellow flowers. Used in beverages, candy, and baked goods. GRAS. NIL

P-4000 • BAN

PRIMATOL • Prometon. Aatrex. Zeazine. Weedex A. Widely used herbicide on cropland. Moderately toxic by ingestion. Induces tumors and causes adverse reproductive effects in experimental animals. A skin and severe eye irritant.

PRIMULA EXTRACT • The extract of various species of Primula taken from the rhizome and roots of the primrose or cowslip. It has been used as an expectorant, diuretic, and worm medicine. In some sensitive persons, it may cause a rash.

PROBIOTICS • We have all heard about the evil bacteria that contaminate our meat and spinach and other edibles we may ingest but there can be good bacteria deliberately added to our food. The beneficial ones are called probiotics, a word compounded from Latin and Greek meaning “favorable to life.” The World Health Organization (WHO) defines probiotics as “live microorganisms that when administered in adequate amounts confer a health benefit on the host.” The idea that friendly bacteria in yogurt, for example, can crowd out pathogenic organisms was originally propounded by Russian-French bacteriologist Ilya Metchnikoff in The Prolongation of Life published in 1907. Today, most products that contain bacteria isolated from milk products typically contain species of Lactobacillus or Bifidobacterium. Now, more and more live microorganisms are being added to food or used in animal feed. They are considered “friendly germs,” due to their benefits to the colon and the immune system by restoring microbial balance in the intestine. In addition to lactobacilli, bifidobacteria, streptococci, some yeasts and molds, alone or as mixtures are now food additives. (See pages 22–23.)

PROCAINE PENICILLIN • An antibiotic used as an injection in animals. FDA tolerance in uncooked edible tissue of cattle is 0.05 ppm, and in uncooked edible tissue of turkey, 0.01 ppm. Zero tolerance in milk and uncooked edible tissue of chicken, pheasants, quail, swine, sheep, and eggs.

PROCESS FLAVOR • Reaction Flavor. Scientific and technical knowledge is used to develop additives reminiscent of the process of preparing cooked foods at home or in a restaurant. With technology, the flavor chemists have been able to isolate meat flavors. They found, for example, that certain vitamins such as thiamine, vitamin B1, when heated give very strong meat character. In fact, most of the roast beef meat character comes from some of the thiamine reactions found in meat itself. For example, a good chicken flavor is really rancid chicken that has been controlled to a point where the volatiles give you the nice chicken flavor, but not the rancidity note. It is actually the fatty portion that is breaking down under thermal processing to give you the grill notes or the cooked notes of chicken.

PROFENOFOS • A pesticide used in feed. FDA tolerances are 6 ppm in or on cottonseed hulls; 15 ppm in soap stocks. As a residue in meat by-products of goats, cattle, hogs, poultry, and sheep, the FDA allows a residue of 0.05 ppm.

PROFLURALIN • Yellow-orange crystals used as an herbicide. FDA residue tolerances are 0.3 as a residue in or on soybean hay; 0.1 ppm in or on cottonseed, pod vegetables, and sunflower seeds; and 0.02 ppm as residue in or on eggs or milk, meat, fat, and meat by-products of cattle, hogs, goats, poultry, and sheep.

PROGESTERONE • Corlutin. Cyclogest. Luteal Hormone. Synovex. Gesterol 50. Progestaject. A progestin drug that suppresses ovulation, possibly by inhibiting pituitary gonadotropin secretion. It forms a thick cervical mucus. Used to treat absent menstruation or abnormal uterine bleeding in humans. Used in cattle and sheep to regulate reproductive cycles. Not allowed in veal calves. Potential adverse reactions in humans include nausea, vomiting, depression, high blood pressure, dizziness, migraine, lethargy, blood clots, swelling, bloating, and abdominal cramps. May cause

breakthrough bleeding, altered menstrual flow, painful or absent menstruation, enlargement of benign tumors of the uterus, cervical erosion, abnormal secretions, and vaginal candidiasis. There may be jaundice; high blood sugar; dark spots appearing on the skin; breast tenderness, enlargement, or secretion; and decreased libido. Contraindicated in persons with blood-clot disorders, cancer of the breast, undiagnosed abnormal vaginal bleeding, and in pregnancy. The FDA limits residues from progesterone treatment in animals to 3 ppb in muscle, 12 ppb in fat, 9 ppb in kidney, 6 ppb in liver of steers and calves, 3 ppb in muscle, and 15 ppb for fat, kidney, and liver of lambs. International Agency for Research on Cancer (IARC) (see) review. A cancer and tumor inducer in experimental animals. May cause birth defects.

PROLINA • A soy protein that can be made into fat-free whipped cream. See Soybean.

PROLINE • L Form. An amino acid (see) used as a food supplement but classified as nonessential. Usually isolated from wheat or gelatin. L-proline is the naturally occurring form and DL-proline is the synthetic. GRAS. ASP

PROMOTION • An intermediate stage of cancer development during which cells exposed to cancer-causing agents in the presence of promoters, move further along the pathway to cancer. The promotion stage may take several decades in humans.

PROPAN-1,2-DIOL • See Propylene Glycol. E

PROPANE • A gas heavier than air; odorless when pure. It is used as a fuel and refrigerant. Cleared for use in combination with octafluorocyclobutane in a spray propellant and as an aerating additive for foamed and sprayed foods. Cleared for use in a spray propellant and as an aerating additive for cosmetics in aerosols. May be narcotic in high concentrations. GRAS. NUL. E

1,2-PROPANEDITHIOL • See Propylene Glycol. NIL

2-PROPANETHIOL • Gas that smells like a skunk. EAF

PROPAN-1,2-DIOL ESTERS OF FATTY ACIDS • See Esters of Fatty Acids and Propylene Glycol. E

PROPANE-1,2-DIOL ALGINATE • See Alginates.

PROPANOIC ACID • See Propionic Acid. ASP

PROPARQUITE • A pesticide applied to growing crops to kill mites. FDA residue tolerance is 80 ppm in dried apple pomace and 40 ppm in dried citrus pulp and dried grape pulp. Less than 100 ppm can kill fish if it gets in water.

PROPAZINE • Propasin. Prozinex. An herbicide used on animal feed to control weeds. Moderately toxic by ingestion. Caused tumors in experimental animals.

PROPELLANT • A compressed gas used to expel the contents of containers in the form of aerosols. Chlorofluorocarbons were widely used because of their nonflam-mability. The strong possibility that they contribute to depletion of the ozone layer of the upper atmosphere has resulted in prohibition of their use for this purpose. Other propellants used are hydrocarbon gases, such as butane and propane, carbon dioxide, and nitrous oxide. The materials dispersed include shaving cream, whipping cream, and cosmetic preparations.

4-PROPENYL-2,6-DIMETHOXYPHENOL • Synthetic flavoring.

PROPENYLGUAETHOL • Synthetic flavoring. ASP

PROPENYL PROPYL DISULFIDE • Onion oil (see). NIL

(Z)-4-PROPENYLPHENOL • A flavoring determined GRAS by FEMA (see). See Phenol.

PROPETAMPHOS • A pesticide used as a spot, crack, and crevice treatment to kill parasites.

PROPIANALDEHYDE • A colorless liquid aldehyde. Used in the manufacture of plastics and as a disinfectant and preservative. In animals causes liver damage and high blood pressure. ASP

PROPIOMAZINE • Propionylpromethazine. A sedative and hypnotic used in human medicine. A tranquilizer used to treat stress in pigs.

PROPIONALDEHYDE • Propanal. A synthetic flavoring additive that occurs naturally in apples and onions. Used in fruit flavorings for beverages, ice cream, ices, candy, and baked goods. Suffocating odor. May cause respiratory irritation. Moderately toxic by ingestion. ASP

PROPIONATE • Formed every day in our intestines when dietary fiber is fermented. It is subsequently absorbed into the bloodstream. It has been estimated that 5 to 10 percent of the population may have various food sensitivities or intolerance. Of this group, 30 to 40 percent may be affected by propionate, but not in isolation. Sensitivity to propionate always occurs in conjunction with sensitivity to other chemicals, either naturally occurring or added to food. Foods permitted to contain propionates include breads, biscuits, cakes, pastries, and other flour products. Calcium propionate is an approved preservative in bread and helps to keep the bread fresh. Potassium propionate and sodium propionate are also approved preservatives. By inhibiting the growth of mold and other microorganisms, propionates allow consumers the convenience of keeping soft, fresh bread in the home without having to purchase it every day. Although both calcium propionate and sodium propionate are equally effective antimicrobial agents, calcium propionate is the form commonly used throughout the world as a preservative in bread production. In finished bread products, it can act as a calcium enricher, contributing to total calcium in the diet, and its use in bread in preference to sodium propionate will result in slightly lower sodium levels in the bread. In contrast, sodium propionate is favored over calcium propionate in cake production since calcium can interfere with the leavening, or rising action, of the cake.

PROPIONIC ACID • Propanoic Acid. Occurs naturally in apples, strawberries, tea, and violet leaves. An oily liquid with a slightly pungent, rancid odor. Can be obtained from wood pulp, waste liquor, and by fermentation. Preservative used in butter and fruit flavorings for beverages, ice cream, ices, candy, baked goods; and cheese flavorings for beverages, ice cream, ices, candy, baked goods, and cheese (600 ppm). Also used as an inhibitor and preservative to prevent mold in baked goods and processed cheeses such as Swiss and Gruyère. Its salts have been used as antifungal additives to treat skin mold. May cause migraine in those susceptible to migraines, and contact with the chemical may cause skin irritations in bakery workers. Large oral dose in rats is lethal. GRAS. ASP. E

2-PROPIONYLPYRROLINE • A flavoring in baked goods, beverages, breakfast cereal, imitation dairy, grains, soft candy, and many other food products. Determined GRAS by FEMA (see). See Pyrrole. NIL

2-PROPIONYL-2-THIAZOLINE • A flavoring determined GRAS by FEMA (see). See Propionic Acid. ASP

PROPIOPHENONE • Fixative in perfumes and used in additive processing. ASP

PROPYL- • Synthetic preservatives and flavorings used in non-protein-based products. It is derived from propane.

PROPYL ACETATE • Colorless liquid, soluble in water, derived from propane and acetate (see both). It has the odor of pears. A synthetic currant, raspberry, strawberry, apple, cherry, peach, pineapple, and rum flavoring additive for beverages, ice cream, ices, candy, and baked goods. Also used as a solvent for resins.

PROPYL ALCOHOL • Obtained from natural gas and fusel oil. Alcoholic and slightly overpowering odor. Occurs naturally in cognac green oil, cognac white oil, and onion oil. A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. Used instead of ethyl alcohol as a

solvent for shellac, gums, resins, and oils; as a dena-turant (see) for alcohol in perfumery. Not a primary irritant, but because it dissolves fat, it has a drying effect on the skin and may lead to cracking, fissuring, and infections. No adverse effects have been reported from local application as a lotion, liniment, mouthwash, gargle, or sponge bath. Mildly irritating to the eyes and mucous membranes. Ingestion may cause symptoms similar to that of ethyl alcohol (see). ASP p-PROPYL ANISÓLE • A synthetic flavoring additive, colorless to pale yellow, with an anise odor. Used in licorice, root beer, spice, vanilla, wintergreen, and birch beer flavorings for beverages, ice cream, candy, and baked goods. Moderately toxic by ingestion. Caused mutations in experimental animals. ASP

PROPYL BENZOATE • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. NIL

PROPYL BUTYRATE • Occurs naturally in apple, honey, hoop oil, and olive. Contains propyl alcohol and butyric acid. A synthetic strawberry, banana, pineapple, plum, tutti-frutti, liquor, and rum flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Propyl Alcohol and Butyric Acid for toxicity. ASP

PROPYL CINNAMATE • Cinnamic Acid. A synthetic berry, floral, rose, apple, grape, and honey flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatins. ASP

PROPYL 2,4-DECADIENOATE • Synthetic flavoring. NIL

PROPYL 2,4 DECADIENOATE • Flavoring. Colorless to light pale yellow liquid; Bartlett pear aroma. NIL

4-PROPYL-2,6-DIMETHYOXYPHENOL • Synthetic flavoring. See Onion Oil. ASP

PROPYL DISULFIDE • Flavoring with a green, herbaceous, alliaceous (onion, garlic), earthy taste and aroma. Most of it is apparently made in China. The EU and the United States say there is not information to consider it natural. The JECFA says it has no concern about safety for current intake. See Sulfide. ASP

PROPYL FORMATE • Formic Acid. A synthetic berry, apple, and rum flavoring additive for beverages, ice cream, ices, candy, and baked goods. Suspected neuro-toxicant (see). See Formic Acid for toxicity.

PROPYL 2-FUROATE • A synthetic chocolate and mushroom flavoring additive for candy, baked goods, and condiments. ASP

PROPYL GÁLLATE • A fine, white, odorless powder with a bitter taste used as an antioxidant for foods, fats, and oils and for potato flakes, mashed potatoes, and mayonnaise. Also used in lemon, lime, fruit, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. Used in pressure-sensitive adhesives as the food contact surface of labels and/or tapes applied to food. Can cause stomach or skin irritation especially in people who suffer from asthma or are sensitive to aspirin. Reaffirmed as GRAS in the FDA's reevaluation in the following amounts: 0.02 percent maximum in fat or oil content of food; maximum of 0.015 percent in food prepared by the manufacturer. ASP. E

PROPYL GLYCOL • See Propylene Glycol. GRAS

PROPYL HEPTANOATE • A synthetic berry, coffee, fruit, cognac, and rum flavoring additive for beverages, ice cream, ices, candy, liqueurs, and baked goods. ASP

PROPYL HEXANOATE • A synthetic pineapple flavoring additive for beverages, ice cream, ices, and candy. ASP

PROPYL-p-HYDROXYRENZOATE • Propylparaben. A preservative used in beverages, candy, baked goods, and artificially sweetened jellies and preserves. Also used in fruit flavorings for beverages, ice cream, ices, candy, and baked goods. Less toxic than benzoic acid (see) or salicylic acid (see). Experimental animals showed no kidney or liver damage. On the FDA list for further study for short-term mutagenic, subacute, teratogenic, and reproductive effects. GRAS. ASP. E

PROPYL ISOBUTYRATE • Nature identical but does not qualify or there are insufficient data to qualify as a natural “flavoring substance” according to the EU and the United States. Odor description is fruity, pineapple, sweet, tropical. Suggested uses: apple, cherry, citrus fruits, dairy products, grape, hard fruits, mango, melon, orange, soft fruits. ASP

PROPYL ISOVALERATE • A synthetic strawberry, apple, banana, and peach flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

PROPYL MERCAPTAN • A synthetic berry and onion flavoring additive for baked goods and pickles. ASP

PROPYL METHOXYBENZENE • See p-Propyl Anisole.

PROPYL PHENOL,-0- P- • Synthetic flavoring. Medicinal phenolic odor. See Phenol. NIL

PROPYL PHENYLACETATE • A synthetic butter, caramel, rose, fruit, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

PROPYL PROPIONATE • Propyl alcohol and propionic acid. A synthetic banana, cherry, melon, peach, prune, apple, plum, and rum flavoring additive for beverages, ice cream, ices, candy, and baked goods. Colorless, thick liquid prepared from glyc-erol (see Glycerin) and used as an anticaking additive, antioxidant, dough conditioner, humectant, solvent, stabilizer, detergent, texturizer, thickener, and wetting additive. Used in alcoholic beverages, confections, flavorings, frostings, frozen dairy products, pork, nut products, poultry, seasonings, and wine. The FDA limits it to 5 percent in alcoholic beverages; 24 percent in confections and frostings; 2.5 percent in frozen dairy products; 97 percent in seasonings and flavorings; 5 percent in nuts and nut products; and 2 percent in all other foods when used in accordance with good manufacturing practices. Limitation of 40 ppm in wine. EPA Genetic Toxicology Program. Caused birth defects in experimental animals. ASP

PROPYLENE CHLOROHYDRIN • Colorless liquid used in manufacture of propylene oxide. Toxic by ingestion and skin absorption. NUL

PROPYLENE GLYCOL • 1,2-Propanediol. A clear, colorless, viscous liquid, slightly bitter tasting. In food, it is used in confectionery, chocolate products, ice cream emulsifiers, shredded coconut, beverages, baked goods, toppings, icings, and meat products to prevent discoloration during storage. Defoaming additive in processed beet sugar and yeast. Used in antifreeze in breweries and dairy establishments. It is the most common moisture-carrying vehicle other than water itself in cosmetics. Its use is being reduced and replaced by safer glycols such as butylene and polyethylene glycol. Large oral doses in animals have been reported to cause central nervous system depression and slight kidney changes. Propylene glycol and some other glycol compounds are used as solvents for the active ingredients in trans-dermal patches that are used to put medications through the skin. GRAS. ASP

PROPYLENE GLYCOL ALGINATE • Kelcloid. The propylene glycol ester of alginic acid (see), derived from seaweed. Used as a stabilizer, filler, and defoaming additive in food. Cleared for use in French dressing and salad dressing under food standard regulations. Used as a stabilizer in ice cream, frozen custard, ice milk, fruit sherbet, and water ices, it is permitted up to 0.5 percent of the weight of the finished product. Can cause allergic reactions. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no available evidence that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. ASP

PROPYLENE GLYCOL DIBENZOATE • Preservative. See Benzoic Acid. ASP

PROPYLENE GLYCOL MONO- and DlESTERS OF FATS and FATTY ACIDS • Emulsifiers. ASP

PROPYLENE GLYCOL MONOSTEARATE • Cream-colored wax that disperses in water and is soluble in hot alcohol. It is used as a lubricating additive and emulsifier; also a dough conditioner in baked goods. Employed as a stabilizer of essential oils. Slightly more toxic than propylene glycol (see) in animals and in large doses produces central nervous system depression and kidney injury. GRAS

PROPYLENE GLYCOL STEARATE • Cream-colored wax. Disperses in water, soluble in hot alcohol. Widely used lubricating ingredient and emulsifier and stabilizer of essential oils. ASP

PROPYLENE OXIDE • Propene Oxide. Colorless, liquid starch modifier. FDA tolerance residues are less than 25 percent for treatment of starch; 700 ppm as propylene glycol in dried prunes and glazed fruit; and 300 ppm in cocoa gums and processed nut meats (except peanuts). Most propylene oxide produced is used as an intermediate in the production of various chemicals. In order of importance, in the USA, these chemicals are polyether polyols for urethanes; propylene glycol, mainly for polyester fibers; polypropylene glycol; dipropylene glycol; glycol ethers; glycerin, and surfactants (see all). Minor quantities are used for the (antimicrobial) sterilization or (insecticidal) fumigation of foodstuffs. Small quantities are also used in the production of modified food starch and alginate and as a stabilizer in dichloromethane. An International Agency for Research on Cancer Working Group (IARC, 1985) evaluated the carcinogenicity of propylene oxide and concluded that: “There is sufficient evidence for the carcinogenicity of propylene oxide to experimental animals; there is inadequate evidence for its carcinogenicity to humans. It is noted that, in the absence of adequate data in humans, it is reasonable, for practical purposes, to regard chemicals for which there is sufficient evidence of carcinogenicity in experimental animals as if they represented a carcinogenic risk to humans.” NIL

3-PROPYLI DENEPHTHALIDE • Synthetic fruit and spice flavoring additive for beverages, ice cream, ices, candy, and baked goods.

PROPYLPARABEN • Propyl-p-Hydroxybenzoate. Developed in Europe, the esters of p-hydroxybenzoic acid are widely used in the cosmetics industry as preservatives and bacteria and fungus killers. They are active against a variety of organisms and are neutral, low in toxicity, slightly soluble, and active in all solutions—alkaline, neutral, or acid. Used medicinally to treat fungus infections. Can cause contact dermatitis. Less toxic than benzoic or salicylic acid (see both). GRAS

PROPYLPARASEPT • See Propyl-p-hydroxybenzoate.

a-PROPYLPHENETHYL ALCOHOL • A synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and puddings. Toxicity similar to ethanol (see).

2-PROPYLPYRAZINE • Synthetic nutty flavoring. EAF

PROPYLPYRIDINE • A flavoring determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association.

PROSTAGLANDINS • PGA, PGB, PGC, PGD. Taglandin F2-a. Lutalyse. A group of extremely potent hormonelike substances present in many tissues. Prostaglandins are a group of about twenty lipids that are modified fatty acids. There are more than sixteen known with effects such as dilating or constricting blood vessels, stimulation of intestinal or bronchial smooth muscle, uterine stimulation, and antagonism to hormones and influencing fat metabolism. Various prostaglandins in the body can cause fever, inflammation, and headaches. Prostaglandins or drugs that affect prostaglandins are used medically in humans to induce labor, prevent and treat peptic ulcers, control high blood pressure, in the treatment of bronchial asthma, and to induce delayed menstruation. They are used in animals to induce labor and to induce abortion attached to a five-membered ring. Aspirin inhibits prostaglandin synthesis, leading to reduced inflammation.

PROTEASES • Enzymes from Aspergillus flavus, Aspergillus niger, Aspergillus oryzae or Bacillus amyloliquefacients, Bacillus licheniformis, or Bacillus subtilis. Used as meat tenderizers and in sausage curing, dough conditioning, and beer-haze removal. All EAF.

PROTECTIVE COATINGS • Antioxidants and preservatives that are used in goat cheeses and fresh fruits and vegetables to retard spoilage. The coatings may expose consumers to hidden antibiotics or coal-tar products. Among the coating additives used are anoxomer, calcium disodium and disodium EDTA, coumarone-indene resin, ethoxyquin, morpholine, natamycin, petroleum naphtha, polyacrylamide, synthetic paraffin and succinic derivatives, and terpene resin (see all). Citrus fruits, squash, grapes, sweet potatoes, asparagus, melons, papaya, plantain, turnips, watermelons, and nuts are commonly coated.

PROTEIN • Chemically, a protein is a complex nitrogenous compound made up of amino acids in peptide linkages. Dietary proteins are involved in the synthesis of tissue protein and other special metabolic functions. In anabolic processes they furnish the amino acids required to build and maintain body tissues. As an energy source, proteins are equivalent to carbohydrates in providing 4 calories per gram. Proteins perform a major structural role in all body tissues and in the formation of enzymes, hormones, and various body fluids and secretions. Proteins participate in the transport of some lipids, vitamins, and minerals and help maintain the body's homeostasis.

PROTEIN ANIMAL HYDROLYZED • See Hydrolyzed Animal Protein. ASP

PROTEIN CONCENTRATE, WHOLE FISH • Dietary supplement.

PROTEIN FATTY ACID CONDENSATES • See Amides.

PROTEIN HYDROLYSATES • Used as flavor enhancers. ASP

PROTEIN HYDROLYZED UNSPECIFIED • See Hydrolyzed Protein. ASP

PROTEIN ISOLATE • See MSG.

PROTEIN, MILK HYDROLYZED • See Hydrolyzed Whey Protein. NUL

PROTEIN, VEGETABLE, HYDROLYZED • See Hydrolyzed Vegetable Proteins and MSG.

PROVISIONAL ACCEPTABLE DAILY INTAKE • PADI. The maximum dose of a substance that is anticipated to be without health risk to humans when taken daily over the course of a lifetime. PADIs are set by the EPA.

PROVITAMIN A • See Carotene.

PRUSSIATE OF SODA, YELLOW • Salt of hydrocyanic acid derived from ammonia. Anticaking additive in salt. Hydrocyanic acid is toxic by ingestion, inhalation, and skin absorption.

PRUSSIC ACID • Hydrocyanic Acid. Occurs in some plants but is usually derived by reacting ammonia and air with methane or natural gas or from coal and ammonia. It is used in the manufacture of cyanide, acrylates, and pesticides. Toxic by ingestion. See Cyanide.

PS • Substance for which prior sanction has been granted by the FDA for specific uses.

PSEUDOPINENE • A synthetic flavoring additive used in various foods. Mildly toxic by ingestion. See a-Pinene.

PSYLLIUM • Plantago psyllium is a cultivated weed and has been used as a laxative since the early 1930s. It absorbs water and expands to increase bulk and moisture content of the stool to encourage bowel movement. Psyllium contains a soluble fiber that studies have shown can lower cholesterol levels. General Mills introduced the first psyllium cereal, Benefit, in April 1989. Heartwise was introduced in August of that year. Procter & Gamble, which makes the psyllium laxative Metamucil, had asked the FDA to prohibit General Mills from making claims that its cereal could reduce cholesterol. Procter & Gamble contended psyllium was a drug, not a food, and thus the cereal could only be marketed after extensive

tests to prove to regulators that it is safe and effective in performing as claimed. Procter & Gamble is barred from making claims about Metamucil's ability to reduce cholesterol. Heartwise is one of the only major brands of cereal containing a significant amount of psyllium, 3 grams in a one-ounce serving. Bran Buds is made by Kellogg but has less psyllium. Allergic reactions occurred in some people who ate the cereal; reactions ranged from itchy eyes and runny noses to severe difficulty in breathing. In September 1989, the FDA sent a letter to Kellogg raising new questions about its use of psyllium, which has been used for decades in bulk laxatives like Metamucil and Fiberall. On October 30, 1990, the FDA published proposed regulations in the Federal Register that would require a warning label on over-the-counter drugs containing water-soluble fibers, including psyllium, which is not absorbed systemically. The FDA ruled in February 1998 that labels on food containing soluble fiber from psyllium seed, including some breakfast cereals, may claim that these products may reduce the risk of coronary artery disease when eaten as part of a diet low in saturated fat and cholesterol. As psyllium can be hard to swallow, the new labels are also required to recommend that people eating these types of foods drink plenty of liquid.

PSYLLIUM SEED HUSK • A stabilizer from the seed of the fleaseed plant used in frozen desserts up to 0.5 percent of the weight of the finished product. See Psyllium. NUL

PTEROSTILBENE • Found in berries; could help fight colon cancer. The darker the berry, the higher the concentration. Rutgers University in New Jersey and the U.S. Department of Agriculture found pterostilbene not only reduced the rate of cancer but also appeared to reduce the growth rate of cancerous cells and inhibited certain genes linked to inflammation—factors in triggering the disease.

PTEROYLGLUTAMIC ACID • Dietary supplement. Isolated from yeast. See Folic Acid.

PTWI • The abbreviation for provisional tolerable weekly intake.

PULEGONE • Found in oils of plants, principally pennyroyal. Pleasant odor, midway between camphor and peppermint. Used in peppermint flavorings for beverages, ice cream, ices, candy, and baked goods. Pugelone has known toxic effects on the liver and lungs. Oxidative metabolites of pugelone, such as menthofuran, are oxidized with proteins in the cell and may cause organ damage. See Pennyroyal Oil for toxicity. ASP

PULLULAN • Pullulan is an extracellular bacterial polysaccharide produced from starch by aureobasidium. A slowly digested carbohydrate in humans. GRAS

PULLULANASE ENZYME • Prepared from Baccilusl subtilis expressing the gene from B. acidopullulyticus. As an enzyme in the brewing industry to hydrolyze 1–6-alpha-D-glucosidic linkages in pullulan, amylopectin, and glycogen. Notified FDA of proposed GRAS status. See Pullulanase.

PULPS • From wood, straw, bagasse, or other natural sources. A source of cellulose in food. The wood is treated with a mixture containing mainly sodium hydroxide (see). Treatment removes the fibrous lignin—the resinous substance that binds the fiber that lines the cells of wood. An indirect human food additive from packaging. The FDA's reevaluation in 1976 labeled pulps GRAS. NUL

PURINES • Components of nucleic acid, they are widely distributed in nature. Important purines are uric acid, adenine, guanine, and xanthine. Uric acid is the form of purines excreted in human urine. Caffeine is a stimulant purine. Some of the richest food sources of purines are anchovies, asparagus, organ meats, mushrooms, and sardines. Foods with low purines include breads, cereals, fats, cheese, eggs, fruits, milk, and nuts.

PYCNOGENOL • An extract of the French maritime pine tree, it is a rich source of antioxidant flavonoids (see). It reportedly reduces free radicals (see) in the body.

PYRANTEL TARTRATE • An antiworm medicine used in feed and as a veterinary medicine. The FDA's residue tolerance is 10 ppm in swine liver and kidney and 1 ppm in swine muscle.

PYRAZINES • Synthetic flavorings. During peanut roasting, pyrazine compounds correlate highly with roasted flavor and aroma. Also have the aroma of roasted coffee. See Piperazine. EAF

PYRAZINE ETHANETHIOL • Synthetic flavoring. ASP

PYRAZINE METHYL SULFIDE • Synthetic flavoring. ASP

PYRENE • Isolated from coal tar, it is used to make dyes, plastics, and pesticides. It has also been used to make benzo(a)pyrene (see), pyranine, and other incomplete combustion organic materials. It can get into your lungs when you breathe it and into your body when it is on your skin. If you eat or drink food and water that are contaminated with PAHs (see), you could be exposed to pyrene. Animal studies showed mice fed pyrene developed kidney disease and liver damage. The U.S. Environmental Protection Agency (EPA) has indicated that not enough information exists to classify pyrene as a cancer-causing substance. It is, however, on the EPA's priority list for study of toxic chemicals. Other coal-tar derivatives are known cancer-causing agents.

PYRETHRINS • Thick liquids from the pyrethrum flowers. Used in household insecticidal sprays and powders and deodorant sprays. Also used in paper bags for shipping cereals. Residues from packaging materials and equipment and storage areas may be only 1 ppm on dried foods, cereal grains, and dried prunes. Insecticides labeled nontoxic to human beings and pets usually contain pyrethrins.

PYRETHRUM • It is number 222 on the CERCLA Priority List of Hazardous Substances (see). See Pyrethrins.

PYRIDINE • Occurs naturally in coffee and coal tar. Disagreeable odor; sharp taste. Used in chocolate flavorings for beverages, ice cream, ices, candy, and baked goods. Also used as a solvent for organic liquids and compounds. Once used to treat asthma, but may cause central nervous system depression and irritation of the skin and respiratory tract. After prolonged administration, kidney and liver damage may result. Pyridine is absorbed from the respiratory and gastrointestinal tract. Small oral doses in humans have produced loss of appetite, nausea, fatigue, and mental depression. ASP

2-PYRIDINEMETHANETHIOL • Synthetic meat flavoring. Tastes like lamb. ASP

PYRIDOXINE • See Pyridoxine Hydrochloride. NIL

PYRIDOXINE DIOCTENCIATE • Vitamin B_6 Hydrochloride. Texturizer. A colorless or white crystalline powder present in many foodstuffs. A coenzyme that helps in the metabolism of amino acids (see) and fats. Also soothing to the skin. Nontoxic.

PYRIDOXINE HYDROCHLORIDE • Vitamin B_6. A colorless or white crystalline powder added to evaporated milk base in infant foods. Present in many foodstuffs. Especially good sources are yeast, liver, and cereals. A coenzyme that helps in the metabolism of ammo acids (see) and fat. Permits normal red blood cell formation. The FDA is doing a toxicology search on this additive. GRAS. ASP

PYRIDOXINE TRIPALMITATE • Vitamin B_6 Tripalmitate. See Pyridoxine Hydrochloride.

PYRIDOXOL HYDROCHLORIDE • Vitamin B6. Dietary supplement and nutrient used in baked goods, beverages and beverage bases, cereals, dairy products, meat products, plant-protein products, and snack foods.

PYROCATECHOL • Colorless crystals that turns brown when exposed to air and light. Used as an antiseptic, in dyestuffs, specialty inks, antioxidants, and light stabilizers as well as in organic synthesis. Strong irritant. Animal cancer-causing agent. Toxic by skin absorption.

PYROLIGNEOUS ACID and EXTRACT • A yellow acid. Consists of 6 percent acetic acid (see) and small concentrations of creosote, methyl alcohol, and acetone (see). It is obtained by the destructive distillation of wood. Used as a synthetic flavoring in butter, butterscotch, caramel, rum, tobacco, smoke, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, puddings, and meats (300 ppm). The extract is used largely for smoking meats (300 ppm) and in smoke flavorings for baked goods (200 ppm) and alcoholic beverages. It is corrosive and may cause epigastric pain, vomiting, circulatory collapse, and death. ASP

PYROMUCIC ALDEHYDE • See Furfural.

PYROPHOSPHATE • Salt of pyrophosphoric acid. It increases the effectiveness of antioxidants in creams and ointments. In concentrated solutions it can be irritating to the skin and mucous membranes.

PYROPHYLLITE • Aluminum Silicate Monohydrate. Obtained naturally from clay or synthesized, it is used as an anticaking and coloring additive in powders. Used as a carrier or pelleting aid in animal feed. Nontoxic.

PYRORACEMIC ACID • See Pyruvic Acid.

PYRROLE • Colorless liquid with a mild, nutty odor used as a flavoring additive in various foods. GRAS when used at a level not in excess of the amount reasonably required to accomplish the intended effect. ASP

PYRROLIDINE • Colorless to pale yellow liquid used as an intermediate in insecticides and fungicides. Used to inhibit citrus decay. Also used as a curing agent for epoxy resins. Toxic by ingestion and inhalation. ASP

1-PYRROLINE • See Pyrrole. EAF

PYRUVALDEHYDE • A synthetic flavoring, yellowish, with a pungent odor. Formed as an intermediate in the metabolism or fermentation of carbohydrates and lactic acid (see). Used in coffee, honey, and maple flavorings for beverages, ice cream, ices, candy, and baked goods. ASP

PYRUVIC ACID • An important intermediate in fermentation and metabolism, it occurs naturally in coffee and when sugar is metabolized in muscle. It is reduced to lactic acid (see) during exertion. Pyruvic acid is isolated from cane sugar. It is a synthetic flavoring used in coffee and rum flavorings for beverages, ice cream, ices, candy, chewing gum, and baked goods. Has been used as a paste in the treatment of deep burns. ASP

QMP • The abbreviation for Quality Monitoring Program, which was established in 2008 by the U.S. Department of Agriculture in response to the processed and fresh fruit and vegetable industries' need to supplement internal quality control programs. It permits companies to submit specific processed produce samples for review to graders from the USDA's Agricultural Marketing Service.

QUACK GRASS • Couch Grass. A pernicious weed in cultivated fields. See Dog Grass Extract.

QUASSIA EXTRACT • Bitter Ash. Bitterwood. Yellowish white to bright yellow chips. Bitter alkaloid obtained from the wood of Quassia amara, a tree bearing bright scarlet flowers grown in Jamaica, the Caribbean Islands, and South America. Named for a black slave who discovered its medicinal value in the mid-eighteenth century. Slight odor, bitter taste. Used in bitters, citrus, cherry, grape, liquor, root beer, sarsaparilla, and vanilla flavorings for beverages, baked goods, and liquors. Used to poison flies, to imitate hops, and as a bitter tonic and remedy for roundworms in children. ASP

QUATERNARY AMMONIUM CHLORIDE COMBINATION • The additive contains the following compounds: n-dodecyl dimethyl benzyl ammonium chloride; n-dodecyl dimethyl ethylbenzyl ammonium chloride; n-hexadecyl dimethyl benzyl ammonium chloride; n-octadecyl dimethyl benzyl ammonium chloride; n-tetradecyl dimethyl benzyl ammonium chloride; n-tetradecyl dimethyl ethylbenzyl ammonium chloride (see all). The additive is used as an antimicrobial agent in raw sugarcane juice. NUL

QUATERNARY AMMONIUM COMPOUNDS • A wide variety of preservatives, surfactants, germicides, sanitizers, antiseptics, and deodorants. They are used in processing sugarcane and in beet sugar mills. Benzalkonium chloride (see) is one of the most popular. Quaternary ammonium compounds are synthetic derivatives of ammonia, a natural product that occurs in animal metabolism.

QUEBRACHO BARK EXTRACT • Extract of a native Argentine tree, used in fruit, rum, and vanilla flavorings for beverages, ice cream, candy, ices, and baked goods. Closely related to the tranquilizer reserpine. Once promoted as an aphrodisiac, it can cause low blood pressure, nausea, abdominal distress, weakness, and fatigue. ASP

QUERCETIN • Widely distributed in the plant kingdom, especially in rinds and barks and in clover blossoms and ragweed pollen. Used therapeutically to protect blood vessels. Used in food additives to form epoxy resins.

QUERCITRON • Inner bark of a species of oak tree common in North America. Its active ingredient, isoquercitrin, is used in forming resins. Allergic reactions have been reported. See Rutin.

QUERCUS ALBA • See Oak Bark Extract.

QUICK GRASS • Triticum. See Dog Grass Extract.

QUILLA BARK • China Bark Extract. Soapbark. See Quillaja Extract. ASP

QUILLAJA EXTRACT • Soapbark. Quillay Bark. Panama Bark. China Bark. Quillaia Extracts. Bois de Panama. The extract of the inner dried bark of a tree grown in South America, Quillaja saponaria. The extracts are obtained by fluid extraction of the milled inner bark or of the wood of pruned stems and branches of a large evergreen with shiny, leathery leaves and a thick bark, native to China and several South American countries. Used as foaming agents in soft drinks and in cocktail mixes and as emulsifiers in foods such as baked goods, candies, frozen dairy products, gelatin and puddings. Their major food use is in soft drinks such as ginger beer, root beer, and cream soda and in fruit, root beer, and spice flavorings for beverages, ice cream, and candy at levels not to exceed 500 milligrams dry weight per killogram beverage. The FDA has allowed companies to label quillaja GRAS based on the information provided by ABA, the producer, as well as other information available to the FDA. The agency says it has no questions at this time. The agency has not, however, made its own determination regarding the GRAS status of the subject use and says, “As always, it is the continuing responsibility of ABA to ensure that food ingredients that the firm markets are safe.” The extracts are mixtures of biologically active compounds, including saponins, tannins, polyphenols, and calcium oxalate (see all). The saponins present in quillaja extract have a variety of biological activities: in blood, in toxicity to the cells; as an immune enhancer; a mucosal irritant; an antiinflammatory; an anti-high-cholesterol substance; and as foaming agents in soft drinks. Quillaja evidently did not report results in intakes exceeding the ADI (see). The committee recommended that the Codex Committee on Food Additives and Contaminants review the use of quillaja extracts at 500 mg/kg proposed in the category. The committee will then reconsider the subject when the specifications for quillaja extracts have been clarified; further studies of toxicity with specified quillaja products that reflect the nature of the product consumed by humans may be required. ASP. E

QUINCE SEED • The seed of a plant, Cydonia spp., grown in southern Asia and Europe for its fatty oil. Thick jelly produced by soaking seeds in water. Used in fruit flavorings for beverages, ice cream, ices, and baked goods. Used medicinally as a demulcent. Has been largely replaced by cheaper substitutes. It may cause allergic reactions. GRAS. NIL

QUININE BISULFATE • Most important alkaloid of cinchona extract (see) from trees that grow wild in South America and are cultivated in Java. Very bitter. Used in bitters flavoring for beverages and not to exceed 83 ppm in soda. Used to treat fever and as a local anesthetic and analgesic. See Quinine Extract. NIL

QUININE EXTRACT • An extract of cinchona bark (see Cinchona Extract), which grows wild in South America. Used in bitters in limited amounts as flavoring for beverages. When taken internally, it reduces fever. It is also used as a flavoring additive in numerous over-the-counter cold and headache remedies as well as “bitter lemon” and tonic water, which may contain as much as 5 milligrams per 100 milliliters. Cinchonism may consist of nausea, vomiting, disturbances of vision, ringing in ears, and nerve deafness caused by an overdose and/or a sensitivity to quinine that results from drinking tonic water. Quinine more commonly causes a rash. The JECFA (see) said the amount of quinine in drinks was not of concern to most, but that some consumers are hypersensitive to quinine, and therefore, its presence in foods and beverages should be noted.

QUININE HYDROCHLORIDE • A synthetic flavoring additive derived from cinchona bark (see) and used in bitters, citrus, and fruit flavorings for beverages. Same medical use as quinine sulfate (see). See Quinine Extract for toxicity. ASP

QUININE SULFATE • A synthetic flavoring additive derived from cinchona bark (see) and used in bitters flavoring for beverages. Also used medicinally to treat malaria, as an analgesic, and as a local anesthetic. ASP

QUINOLINE • A coal-tar derivative used in the manufacture of dyes. Also a solvent for resins. Made either by the distillation of coal tar, bones, and alkaloids or by the interaction of aniline (see) with acetaldehyde and formaldehyde (see both). Absorbs water. Also used as a tissue preservative. See Coal Tar for toxicity. See also FD and C Colors. NIL

QUINOLINE YELLOW • The British and the European Union Parliament, at this writing, are seeking to ban this color because it has been reported to worsen hyperactive behavior in young children. See Quinoline. E

QUIZALOFOPETHYL • White crystals used as an herbicide in animal feed. FDA residue tolerances are: 0.2 ppm in soybean hulls; 0.5 ppm in soybean meal; 1.0 ppm in soybean soap stock; 0.5 on soybeans; 0.2 ppm in eggs; 0.1 in eggs; 0.05 ppm in milk fat; 0.05 in fat of cattle, goats, hogs,

soybean meal; 1.0 ppm in soybean soap stock; 0.5 on soybeans; 0.2 ppm in eggs; 0.1 in eggs; 0.05 ppm in milk fat; 0.05 in fat of cattle, goats, hogs, and sheep; 0.02 ppm in meat of cattle, goats, hogs, and sheep; 0.05 ppm; 0.05 ppm as residues in fat, meat, and meat byproducts of cattle, goats, hogs, and sheep; and 1.0 as residues on cottonseed.

RACEMIC ACID • See Tartaric Acid.

RADIATION OF FOOD • See Irradiation of Food.

RADISH EXTRACT • Extract of Raphanus sativus. The small seeds of the radish remain viable for years. Has been used as a food since ancient times.

RAISIN SEED OIL • Dried grapes or berries used in lubricating creams. See Grape Seed Oil.

RALGRO • Zeranol. Used to increase growth in cattle and sheep. The FDA limits residue to zero in cattle and sheep. Has adverse reproductive effects in experimental animals.

RAPESEED OIL, HYDROGENATED • Brownish yellow oil from a turniplike annual herb of European origin. Widely grown as a forage crop for sheep in the United States. Canada sought clearance to sell rapeseed in the United States, but it was barred because it contains erucic acid (see), which was cited in the early 1970s as a possible source of heart problems based on the results of tests on rats. New varieties of the seeds—canola—have been developed that have low erucic acid levels. Now rapeseed oil is widely used in American salad oils, peanut butter, and some cake mixes. A distinctly unpleasant odor. Can cause acnelike skin eruptions. When rats were fed a diet high in rapeseed oil over a lifetime, they showed significantly greater degenerative changes in the liver and a higher incidence of kidney damage than animals fed other vegetable oils. See Erucic Acid. GRAS. ASP

RAPESEED OIL, FULLY HYDROGENATED • A stabilizer used in peanut butter. GRAS. ASP

RAPESEED OIL, FULLY HYDROGENATED and SUPERGLYCERINATED • An emulsifier used in shortenings for cake mixes. See Rapeseed Oil, Hydrogenation, and Glycerin. GRAS. ASP

RAPESEED OIL, LOW ERUCIC ACID • Miscellaneous additive that may be used in many products except in infant formula. May be declared on the label as canola oil. See Erucic Acid. NUL

RAPESEED OIL, LOW ERUCIC ACID PARTIALLY HYDROGENATED UNSAPONIFIABLES • Fraction of rapeseed oil (see) that is not changed into a fatty alcohol when it is saponified (heated with an alkali and acid). GRAS except in infant formula. See Euricic Acid. NUL

RASPBERRY EXTRACT • See Raspberry Juice.

RASPBERRY JUICE • Juice from the fresh ripe fruit grown in Europe, Asia, the United States, and Canada. Used as a flavoring for lipsticks, food, and medicines. It has astringent properties.

rBGH • The abbreviation for recombinant (genetically modified) bovine (cow) growth hormone. Found in dairy products, including milk and cheese. Dairy farmers inject cows with it to stimulate milk production, and it sometimes ends up in the milk sold in grocery stores. Research has tied it to prostate, colon, and breast cancers. Look for milk that says “no rBGH or “no hormones” on the label.

rBST • The abbreviation for recombinant bovine somatotropin. Also referred to as bST and BST, BGH. Bovine Growth Hormone. It is a protein hormone produced in the pituitary glands of cattle. It can be produced synthetically using recombinant DNA technology. It is administered to the cow by injection and used to increase milk production. Currently Monsanto is the only company that markets recombinant bovine somatotropin, under the trade name Posilac. See Bovine Somatotropin and IGF-I.

RDA • Recommended Dietary Allowances of the Food and Nutrition Board, National Academy of Sciences, National Research Council. The Recommended Daily Dietary Allowance was started in the 1940s to safeguard the public's health. The RDAs were estimates of the nutritional needs of adults and children developed by the FDA to be used as the legal standards for labeling foods in regard to nutritional content.

RECOMBINANT DNA TECHNOLOGY • A broad range of techniques involving the manipulation of genetic material of organisms, including technologies by which scientists isolate genes from one organism and insert them into another. The term is often used synonymously with genetic engineering and to describe DNA sequences isolated from and transferred between organisms by genetic engineering techniques.

RECOMMENDED DIETARY ALLOWANCES • RDA. The former listing of amounts of certain nutrients needed to maintain health. These have been replaced by daily values (see pages 15–16 in introduction) on labels. See RDA.

RED • See FD and C Red (Nos. 3, 4, 40, and Citrus Red) and Lyco Red.

RED ALGAE • Seaweed. GRAS

RED PEPPER • Cayenne Pepper. A condiment made from the pungent fruit of the plant. Used in sausage and pepper flavorings. May be an irritant and also cause allergic reactions. Used medically as a topical pain killer.

RED RASPBERRY LEAF EXTRACT • An extract of the leaves of the red raspberry. Used as a flavoring.

RED 2G • Color used in Europe. E

RED SAUNDERS • Red Sandalwood. Flavoring in alcoholic beverages only.

REDUCED • Product has been nutritionally altered and contains at least 25 percent less of a nutrient such as fat or salt or 25 percent fewer calories than the regular product.

REDUCED-LACTOSE WHEY • See Whey and Reducing Additive. GRAS

REDUCED-MINERALS WHEY • Obtained by removing a portion of the minerals from whey. Used as a texturizer, nutritional extender, nutritive sweetener, formulation, and processing aid. See Whey and Reducing Additive. GRAS

REDUCING ADDITIVE • A substance that decreases, deoxidizes, or concentrates the volume of another substance. For instance, a reducing additive is used to convert a metal oxide to the metal itself. It also means a substance that adds hydrogen additives to another; for example, when acetaldehyde is converted to alcohol in the final step of alcoholic fermentation. It is used in foods to keep metals from oxidizing and affecting the taste or color of fats, oils, salad dressings, and other foods containing minerals.

REDUCTION • The process of reducing by chemical or electrochemical means. The gain of one or more electrons by an ion or compound. It is the reverse of oxidation.

REG • FDA abbreviation for a food additive for which a petition has been filed and regulation issued.

REGENERATED CELLULOSE • Miscellaneous use with resins. See Cellulose.

RELEASE AGENTS • Substances migrating from food-packaging include linoleamide, oleamide, and palmitamide (see all).

RELEASING ADDITIVE • A compound such as butter or an oil that prevents a product from sticking to the sides of a container. Also refers to a chemical that permits easy removal of the meat of a clam or other crustacean.

RENNET • Rennin (animal derived) and chymosin preparation (fermentation derived). Enzyme from the lining membranes of the stomach of suckling calves. Used for curdling milk in cheese making and in junket. Sometimes as a digestant. Reaffirmed GRAS in 1982. ASP

REPELLENTS • Pesticide to get rid of pesty insects, birds, other vertebrates.

RESIN, ACRYLAMIDE—ACRYLIC ACID • A clarifying additive in beet sugar and sugarcane juice. The acid is used in the synthesis of this acrylic resin.

RESIN, COUMARONE—INDENE • A chewing-gum base and protective coating for citrus fruit. Coumarone is derived from coal tar and is used with a mixture of indene chiefly in the synthesis of coumarone resins.

RESIN FROM FORMALDEHYDE, ACETONE and TETRAETHYLENEPENTAMINE • Used to coat film in touch with food. NUL

RESIN, ISOBUTYLENE • Polyisobutylene. A chewing-gum base made from the chemical used chiefly in manufacturing synthetic rubber.

RESIN, METHACRYLIC and DIVINYL BENZENE • A compound of fine particle size, weakly acidic. Used as an absorbent for vitamin B12 in nutritional supplement products.

RESIN, PETROLEUM HYDROCARBON • A chewing-gum base synthesized from fuel oil.

RESINS • Brittle substances, usually translucent or transparent, formed from the hardened secretions of plants. Among the natural resins are damar, elemi, and sandarac (see all). Synthetic resins include polyvinyl acetate, various polyester resins, and sulfonamide resins (see all). Toxicity depends upon ingredients used. See Gums.

RESIN, TERPENE • Alpha and Beta Pinene. A chewing-gum base and coating for fresh fruits and vegetables. Pinene (see) has the same toxicity as turpentine.

RESORCINOL • A preservative, antiseptic, and antifungal additive. Obtained from various resins. A sweetish taste. Irritating to the skin and mucous membranes. May cause allergic reactions, particularly of the skin. The FDA issued a notice in 1992 that resorcinol has not been shown to be safe and effective for stated claims in over-the-counter products. ASP

RESVERATROL, TRANS • Ingredient in beverages, including bottled teas, sport drinks, carbonated soft drinks and juice, at levels according to current good manufacturing practices. At notifier's request, the FDA ceased to evaluate it as GRAS.

RETINOIDS • Derived from retinoic acid—vitamin A—it is used to treat acne and other skin disorders. See vitamin A.

RETINOL • Vitamin A (see).

RETINYL PALMITATE • The ester of vitamin A and palmitic acid sometimes mixed with vitamin D (see all).

RfC • The abbreviation for request for comment.

RfD • The abbreviation for reference dose.

RHAMNOSE, L • Occurs in poison sumac, Rhus toxicodendron. Combined with sugar in many other plants. It is used in the manufacture of food additives. ASP

RHATANY EXTRACT • Krameria spp. A flavoring. The dried root of Krameria triandra from Peru and Brazil. A flavoring additive. Used as a cosmetic astringent. See Krameria Extract. ASP

RHIZOPUS ORYZAE • An enzyme used in production of dextrose (sugar) from starch.

RHODENAL • See Citronellal.

RHODINOL • A synthetic flavoring additive isolated from geranium rose oil (see). It has the strong odor of rose and consists essentially of geraniol and citronellol (see both). Used in strawberry, chocolate, rose, grape, honey, spice, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and jelly. ASP

RHODINYL ACETATE • Acetic Acid. An acidulant and synthetic flavoring, with a light, fresh, roselike odor. Used in berry, coconut, apricot, floral, rose, and honey flavorings for beverages, ice cream, ices, candy, and baked goods. A skin irritant. ASP

RHODINYL BUTYRATE • Butyric Acid. A synthetic raspberry, strawberry, and fruit flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

RHODINYL FORMATE • Formic Acid. Synthetic flavoring with a roselike odor. Used in raspberry, rose, apple, cherry, plum, pear, and pineapple flavorings for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. See Formic Acid for toxicity. ASP

RHODINYL ISOBUTRYATE • Isobutyric Acid. A synthetic raspberry, floral, rose, apple, pear, pineapple, and honey flavoring additive for beverages, ice cream, ices, candy, baked goods, and gelatin desserts. ASP

RHODINYL ISOVALERATE • Isovaleric Acid. A synthetic berry, floral, rose, and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

RHODINYL PHENYLACETATE • Phenylacetic Acid. A synthetic flavoring used in beverages, ice cream, ices, candy, and baked goods. ASP

RHODINYL PROPIONATE • Propionic Acid. A synthetic berry, rose, plum, and honey flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

RHODYMENIA PALMATA • See Dulse.

RHUBARB • Rheum Spp. The root of Rheum rhaponticum used as a flavoring in alcoholic beverages only. Has been used as a laxative. ASP

RHYNCHOSIA PYRAMIDALIS • A large, tropical twining plant with yellow flowers. Used as a flavoring.

RIBOFLAVIN • Vitamin B2. Lactoflavin. Formerly called vitamin G. Riboflavin is a factor in the vitamin B complex and is used in emollients. Every plant and animal cell contains a minute amount. Good sources are milk, eggs, and organ meats. It is necessary for healthy skin and respiration, protects the eyes from sensitivity to light, and is used for building and maintaining human body tissues. A deficiency leads to lesions at the corner of the mouth and to changes in the cornea. The RDA for infants is 4,000 micrograms per day and for adults 1,300 micrograms. Its yellow to orange-yellow color is used to dye eggshells. It is permanently listed as a food color. It does not require certification. Riboflavin and its more soluble form, riboflavin-5-phosphate, are added as enrichment to dry baby cereals, poultry stuffing, peanut butter, prepared breakfast cereals, enriched flour, enriched cornmeal, enriched corn grits, enriched macaroni, and enriched breads and rolls. GRAS. ASP. E

RIBOFLAVIN-5-PHOSPHATE AND SODIUM • A more soluble form of riboflavin (see). GRAS. EAF

Rl BONUCLEIC ACID • RNA. Found in both the nucleus and cytoplasm of the cell, it is the material that contains directions for the genetic code of the cell, DNA.

RIBOSE, D- • Ribose occurs naturally in all living cells. It is a simple sugar that begins the metabolic process for ATP production (see). Prepared by hydrolysis of yeast (see). ASP

RIBOTIDE • A flavor enhancer developed by the Japanese.

RICE BRAN • A by-product of rice processing that is usually discarded or used as animal feed. Although it is rich in fiber and a host of other beneficial nutrients, one of the main attractions for manufacturers is the cost savings it can confer. The USDA (see) approved stabilized rice bran as an enhancer for pulverized meat and poultry products.

RICE BRAN OIL • Oil expressed from the broken coat of rice grain. Used as a coating for candy. Nontoxic.

RICE BRAN WAX • The wax obtained from the broken coat of rice grain. Used as a coating additive, as a chewing-gum base, and a releasing additive (see). NIL

RICE, MILLED • Rice with the bran removed. ASP

RICE STARCH • The finely pulverized grains of the rice plant used as an anticaking additive, thickener, and gelling additive. May cause an allergic reaction. The final report to the FDA (see) of the Select Committee on GRAS Substances stated in 1980 that it should continue GRAS status with no limitations other than good manufacturing practices. ASP

RICINOLEATE • Salt of ricinoleic acid found in castor oil.

RICINOLEIC ACID • A mixture of fatty oils found in the seeds of castor beans. Castor oil contains 80 to 85 percent ricinoleic acid. The oily liquid is used in soaps, flavorings, antifungal additives, and in contraceptive jellies. It is believed to be the active laxative in castor oil.

RIGHT-TO-KNOW • See Community Right-to-Know List established by the Environmental Protection Agency and other government and civic organizations.

RISK • The potential for realization of unwanted negative consequences or events.

RISK ASSESSMENT • Qualitative or quantitative evaluation of the environmental and/or health risks resulting from exposure to a chemical or physical pollutant; combines exposure assessment results with toxicity assessment results to estimate risk.

RNA • Ribonucleic Acid. A nucleic acid that is found in the cytoplasm and also in the nucleus of some cells. One function of RNA is to direct the manufacture of proteins.

RNI • Canadian abbreviation for recommended nutrient intake.

ROBENIDINE • Crystals from ethanol (see). Used to treat parasites in chickens. The FDA limits 0.2 ppm in skin and fat of chickens and 0.1 ppm in other chicken tissues. Moderately toxic by ingestion.

ROCHELLE SALT • Potassium Sodium Tartrate. Translucent crystals or white crystalline powder with cooling saline taste. Used in the manufacture of baking powder and in the silvering of mirrors.

RODENTICIDE • Pesticide to get rid of rodents.

RONNEL • Used in cattle feed. A systemic pesticide. See Organophosphates.

ROSA ALBA • See Rose, Absolute.

ROSA CANINA • See Rose Hips Extract.

ROSA CEMTIFOLIA • See Rose, Absolute.

ROSE, ABSOLUTE • Same origin as for rose Bulgarian (see). Used as a berry, rose, fruit, and nut flavoring additive for beverages, ice cream, ices, candy, and baked goods, except for allergic reactions. GRAS. EAF

ROSE BENGAL • A bluish red, fragrant liquid taken from the rose of the Bengal region of the Asian subcontinent.

ROSE BUDS, FLOWERS • Flavoring. See Rose Extract. GRAS. NUL

ROSE BULGARIAN • True Otto Oil. Attar of Roses. Rose Otto Bulgaria. One of the most widely used perfume ingredients, it is the essential oil, steam distilled from the flowers of Rosa damascena. The rose flowers are picked early in the morning when they contain the maximum amount of perfume and are distilled quickly after harvesting. Bulgaria is the main source of supply, but Russia, Turkey, Syria, and Indochina also grow them. The liquid is pale yellow and has warm, deep floral, slightly spicy, and extremely fragrant red-rose smell. Used as a flavoring additive in loganberry, raspberry, strawberry, orange, rose, violet, cherry, grape, peach, honey, muscatel, maple, almond, pecan, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and jellies. Also used in coloring matter, and as a flavoring in pills. May cause allergic reactions. GRAS

ROSE EXTRACT • An extract of the various species of rose, it is used in raspberry and cola beverages and in fragrances, except for allergic reactions. GRAS

ROSE FLOWERS • See Rose Extract. NUL

ROSE GERANIUM • Distilled from any of several South African herbs grown for their fragrant leaves. May cause allergic reactions. GRAS

ROSE HIPS EXTRACT • Hip berries. Extract of the fruit of various species of wild roses, it is rich in vitamin C and is used as a natural flavoring. Widely used by organic food enthusiasts. GRAS. ASP

ROSE LEAVES EXTRACT • Derived from the leaves of the genus Rosa. Used in raspberry and cola beverages. NUL

ROSE OIL • Attar of Roses. The fragrant, volatile, essential oil distilled from fresh flowers. Colorless or yellow with a strong fragrant odor and taste of roses. Nontoxic but may cause allergic reactions. See Rose Bulgarian. EAF

ROSE OTTO BULGARIA • See Rose Bulgarian.

ROSE WATER, STRONGER • Rosa centifolia. The watery solution of the odoriferous constituents of roses, made by distilling the fresh flowers with water or steam. Nontoxic but may cause allergic reactions. NIL

ROSELLE • Hibiscus sabdariffa. An herb cultivated in the East Indies, it is used for making tarts and jellies, and it gives a tart taste to acid drinks. It is also used as a natural red food coloring for soft drinks, tea-type products, punches, apple jelly, and pectin jelly, but it is not stable in carbonated beverages. GRAS. EAF

ROSEMARY EXTRACT • Garden Rosemary. A flavoring from the fresh aromatic flowering tops of the evergreen shrub Rosemarinus officinalis grown in the Mediterranean region. Used for beverages, condiments, and meat. It is also used in citrus, peach, and ginger flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. Also being studied as a natural antioxidant. Extracts have been found to help extend shelf life by up to 30 percent. A member of the mint family, it is reputed as a cancer prevention agent. And if used on hamburgers, for example, it can potentially break up cancer-causing compounds that can form when the meat is cooked. J. Scott Smith, a Kansas State University food science professor, has been looking into the carcinogenic compounds known as HCAs (see) and reported HCAs were reduced in levels ranging from 30 to 100 percent. Antioxidants can have other benefits besides curtailing HCAs, Smith said. “There is some indication that they protect the pancreas. If you can get that from burgers, then that's great.” The European Food Safety Authority (EFSA) said rosemary extract is safe for use as an antioxidant

in food, expanding application opportunities and increasing its natural appeal in 2008. European member states said the additive could no longer be described as a flavoring extract because it provided progressively less flavor to the end product. GRAS. ASP

ROSEMARY OIL • The oil obtained from the flowering tops of Rosemarinus officinalis. A teaspoonful of the oil, however, may cause illness in an adult, and an ounce may cause death. See Rosemary Extract. ASP

ROSEMARY OLEORESIN • Dark brownish yellow semisolid with the fresh leaf fragrance of rosemary used as a scent of new-mown hay. ASP

ROSIDINHA • Sideroxylon. A large green genus of tropical trees, family Sapotaceae having hard wood and somewhat bell-shaped flowers with a few seeded berries. Used as a flavoring. ASP

ROSIN ADDUCT WITH FUMARIC ACID, PENTAERYTHRITOL ESTER • See

Rosin and Fumaric Acid. NIL

ROSIN AND ROSIN DERIVATIVES • Colophony. Softener for chewing gum from Pinus spp. Also used as a coating for citrus fruit. It is a pale yellow residue left after distilling off the volatile oil from the oleoresin obtained from various species of pine trees chiefly produced in the United States. Also used in the manufacture of varnishes and fireworks. It is a common cause of contact dermatitis. ASP

ROSIN, GUM, GLYCEROL ESTER • A softener for chewing gum. See Rosin and Glycerol. ASP

ROSIN, LIMED • Made by heat fusing of rosin and calcium hydroxide (see) with good oil and solvent solubility, and mainly used for manufacturing. Used as a coating in contact with food. NIL

ROSIN, METHYL ESTER, PARTIALLY HYDROGENATED • Used in the manufacture of food additives and as a softener for chewing gum. ASP

ROSIN, PARTIALLY DIMERIZED, CALCIUM SALT, or PARTIALLY (CAT-ALYTICALLY) HYDROGENATED • A coating for fresh citrus fruit. See Rosin and Hydrogenated. ASP

ROSIN, POLYMERIZED GLYCEROL ESTER, PARTIALLY HYDROGENATED GLYCEROL ESTER, or PARTIALLY DIMERIZED GLYCEROL ESTER • A softener for chewing gum. See Rosin and Glycerol. ASP

ROSIN, TALL OIL, GLYCEROL ESTER • There are three general methods of producing rosins commercially—solvent extraction of pure stump wood (wood rosin); tapping of gum from the living tree (gum rosin); separation from tall oil (tall oil rosin). The three rosins, freed of extraneous impurities and refined, differ somewhat but all three may have glycerin added to produce the glycerol ester. Glycerol esters used as food additives in beverages and chewing gum are those prepared from wood rosin that is harvested from the stumps of the longleaf pine (Pinus palustris) and purified to a beverage-grade ester gum. The resin acid composition of wood rosin can vary considerably. The toxicology of glycerol esters of wood rosins harvested from the stumps of the pine tree is different from that of glycerol esters from tall oil and gums. Glycerol ester of wood rosin was previously considered by the JECFA (see) at its eighteenth, twentieth, thirty-third, and forty-fourth meetings. At its twentieth meeting, the committee noted that in view of the stable ester bond and the anticipated stability of this material, studies of long-term and reproductive toxicity should be performed on the specific substance, as opposed to unmodified rosin, before further evaluation. At the forty-fourth meeting of the committee, a full monograph was prepared on glycerol ester of wood rosin. The committee was still unable to establish an ADI (see) until studies become available demonstrating the metabolic stability and nonbioavailability of glycerol ester of wood rosin under conditions resembling those present in the human gastrointestinal tract. See Tall Oil and Glycerol. ASP

ROSIN WOOD • See Rosin Tall Oil. NIL

ROSIN, WOOD, GUM or WOOD PARTIALLY HYDROGENATED, PENTAERYTHRITOL • A coating for fresh citrus fruit. See Rosin and Maleic Acid. ASP ROSMARINUS OFFICINALIS • See Rosemary Extract.

ROXARSONE • A common arsenic used by chicken companies that is mixed with feed to control intestinal parasites and promote growth, according to research chemists. Used in chicken and swine feeds, in drinking water of chickens, turkey, and swine. Organic arsenic is added to the feed of some 70 percent of the 7 billion roasters grown annually in the United States. The inorganic arsenic is found in poultry waste, which is used as fertilizer. That increases the risk that the inorganic arsenic will contaminate surface water and groundwater drinking supplies in farming areas where the chicken litter fertilizer is spread repeatedly, said John Stolz, professor of biology at Duquesne and coauthor of the study reported in the peer-reviewed Environmental Science & Technology Online News. Dr. Ellen Silbergeld, a researcher from the Johns Hopkins School of Public Health, said the poultry industry's practice of using arsenic compounds in its feed is something that has not been studied. “It's an issue everybody is trying to pretend doesn't exist,” she said. For years, medical experts have warned that chronic human exposure to arsenic could lead to certain forms of cancer. The National Academies, which advises the federal government on a range of health and science issues, reported to Congress in 2001 “that the data indicate arsenic causes cancer in humans at doses that are close to the drinking water concentrations that occur in the United States.” In 2004, a lawsuit was filed linking roxarsone with cancer in Prairie Grove, Arkansas, and chicken litter spread around the town of 2,540 people. More than 95 percent of the homes tested in the town had traces of roxarsone, which degrades into arsenic—a known carcinogen. A subsequent study conducted for the U.S. Geological Survey in Denver supported that theory. The European Union declared the use of roxarsone undesirable in 1999, and its member nations no longer use it.

RTECS • The Registry of Toxic Effects of Chemical Substances is a compendium of data extracted from the open scientific literature. The data are recorded in the format developed by the RTECS staff and arranged in alphabetical order by prime chemical name. Six types of toxicity data are included in the file: (1) primary irritation; (2) mutagenic effects; (3) reproductive effects; (4) tumorigenic effects; (5) acute toxicity; and (6) other multiple dose toxicity. Specific numeric toxicity values such as LD50, LC50, TDLo, and TCLo are noted as well as species studied and route of administration used. For each citation, the bibliographic source is listed, thereby enabling the user to access the actual studies cited. No attempt has been made to evaluate the studies cited in RTECS. The user has the responsibility of making such assessments. The Registry of Toxic Effects of Chemical Substances (RTECS) can be accessed at http://eee.cdc.gov/niosh/rtecs. Access the Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles and toxFAQs at www.atsdr.cdc.gov/toxprofiles or http://www/atsdr/cdc/gpv/tpcfaw/html.

RUBBER, BUTADIENE STYRENE • Latex. A chewing-gum base.

RUBBER, NATURAL, SMOKED SHEET, and LATEX SOLIDS • Hevea brasilien-sis. Rubber as well as rubber-based adhesives are common causes of contact dermatitis. The natural gum obtained from the rubber tree is not allergenic; the offenders are the chemicals added to natural rubber gum to make it a useful product. Such chemicals are accelerators, antioxidants, stabilizers, and vulcanizers, many of which can cause allergies. A petition to employ single-use rubber threads in processing and packaging of foods, including meat and poultry, was put in abeyance (see) by the FDA in 2003. Rubber smoked sheet is a chewing-gum base. ASP

RUE OIL • Ruta graveolens. A spice additive obtained from the fresh aromatic blossoming plants grown in southern Europe and Asia, Ruta graveolens. The oil has a fatty odor and is used in baked goods. It is obtained by steam distillation and is used in fragrances and in blueberry, raspberry, coconut, grape, peach, rum, cheese, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and condiments. It may cause photosensitivity. In 1976, the FDA confirmed rue oil as GRAS in all categories of food at a maximum use level of 2 ppm. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the

FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. ASP

RUM • An alcoholic beverage from fermented molasses. Flavoring for candied fruits. NUL

RUM ETHER • A synthetic flavoring, consisting of water, ethanol, ethyl acetate, methanol, ethyl formate, acetone, acetaldehyde, and formaldehyde (see all). Used in butter, liquor, and rum flavorings for beverages, ice cream, ices, candy, baked goods, gelatin, chewing gum, and alcoholic beverages (1,600 ppm). ASP

RUTIN • Pale yellow crystals found in many plants, particularly buckwheat. Used as a dietary supplement for blood or lymph vessel fragility. There is reported use of the chemical; it was not assigned for toxicology literature in 1999 and is still ASP.

RYE FLOUR • Used in powders. Flour made from hardy annual cereal grass. Seeds are used for feed and in the manufacture of whiskey and bread. May cause allergic reactions.

SACCHARIDE HYDROLYSATE • A mixture of sugars derived from using an alkali and water on a mixture of glucose and lactose (see).

SACCHARIDE ISOMERATE • See Saccharide Hydrolysate.

SACCHARIN • 1,2-Benzisothiazol-3(2H)-one Saccharin (acid form), sodium saccharin and calcium saccharin. Sweet'n Low. SugarTwin. Used for more than a hundred years in the United States, it is produced from a substance that occurs in grapes and is between three hundred and five hundred times sweeter than table sugar. It has a bitter aftertaste, and therefore is often blended with other sweeteners. It is widely used as a noncaloric tabletop sweetener, in beverages, and in foods. The average daily dietary intake is generally less than 1 mg/kg bw. Saccharin is excreted in urine and does not accumulate in the body, therefore, does not provide energy (calories). It was used with cyclamates in the experiments that led to the ban on cyclamates. The FDA proposed restricting saccharin to 15 milligrams per day for each kilogram of body weight or one gram a day for a 150-pound person. Then, on March 9, 1977, the FDA announced the use of saccharin in foods and beverages would be banned because the artificial sweetener had been found to cause malignant bladder tumors in laboratory animals. The ban was based on a study sponsored by the Canadian government that found that seven out of thirty-eight animals developed tumors, three of them malignant. In addition, one hundred offspring were fed saccharin, and fourteen of them developed bladder tumors. In contrast, one hundred control rats were not fed saccharin and only two developed tumors. At the time of the FDA's announcement, 5 million pounds of saccharin were being consumed per year, 74 percent of it in diet soda, 14 percent in dietetic food, and 12 percent as a tabletop replacement for sugar. There was an immediate outcry, led vociferously by the Calorie Control Council, an organization made up of commercial producers and users of saccharin. The FDA, urged by Congress, then delayed the ban. The moratorium on prohibiting the use of saccharin has been extended indefinitely. Since 1977, however, saccharin containers carry labels warning that saccharin may be hazardous to your health. Saccharin has exhibited mutagenic activity (genetic changes) in the early-warning Ames Test (see) for carcinogens. When administered orally to mice, mutagenic activity was demonstrated in the urine of these animals as well as in tissue tests. Highly purified saccharin was not mutagenic in tissue tests, but the urine of mice fed saccharin was. Congress's Office of Technology Assessment, in view of the evidence to date, strongly endorsed the scientific basis of the FDA's proposed ban. “This review of animal studies leads to the conclusion that saccharin is a carcinogen for animals,” the FDA panel said. Clouding the degree of risk, however, is that up to 20 ppm of unknown chemical impurities contaminated those doses fed the rats in the Canadian study that led to the FDA's original move. The impurities themselves proved mutagenic in the Ames Test. On November 6, 1978, the Committee of the Institute of Medicine and National Research Council concluded that saccharin is a potential carcinogen in humans. The extremely low potency of saccharin as a carcinogen was emphasized by the committee. However, they expressed special concern that children under ten years of age were consuming diet sodas and other saccharin-containing products in increasing amounts. Exposure in children, the committee noted, may have special significance because of the long time required for some cancers to develop. There were some “worrisome data” regarding consumption by women of childbearing age, children, and teenagers. The concern about fetal exposure grew out of earlier findings of increased bladder cancers in male rats fed high-saccharin diets or born to mothers that were on high-saccharin diets during pregnancy. The committee concluded that it is most likely that saccharin itself is the carcinogenic additive, rather than any impurities that may be associated with its manufacture. The fight to keep saccharin on the market spotlighted the Delaney Amendment, which prohibits known carcinogens from being added to food, and a move to weaken that amendment persists. In 1969, Britain banned saccharin except as an artificial sweetener. In 1950, France banned it except as a nonprescription drug. Germany restricts its use to certain foods and beverages, which must state on the label that it is in the product. In 1997, the Caloric Control Council, a U.S. trade group, successfully requested the National Toxicology Program to review new data to lead to a delisting of saccharin as a carcinogen. In 2003, the FDA continued its approval of saccharin use. The International Agency for Research on Cancer (IARC) notes that case-control studies of the car-cinogenicity of artificial sweeteners have been reported only for the urinary bladder or lower urinary tract. Most of the studies were published between 1975 and 1985, so that any association would be to sweeteners that were on the market over twenty-five years ago. The studies varied widely in the detail with which information on the source and nature of artificial sweeteners was identified, collected, and presented. The terms used in the various studies include “table-top,” “dietetic beverages,” “saccharin,” and “artificial sweeteners” with no further characterization; only the salts of saccharin are used in these ways. Eight of the studies considered were hospital based, which raises uncertainty about the representativeness of the controls' consumption of artificial sweeteners in relation to the general population. The results of the population-based studies must also be viewed with caution, owing to the sizable proportion of nonrespondents, which might reflect the occurrence of health-related conditions associated with the use of replacements for sugar. A statistically significant relative risk for the association between use of artificial sweeteners (and saccharin salts as such) and bladder cancer were found for men but not for women in an early study in Canada. In subsequent population-based studies, including a study of several thousand people in the United States, estimates for the entire population of each study did not confirm the existence of an association. In some studies, estimates of the strength of the association between consumption of sweeteners and bladder cancer differed between smokers and nonsmokers, but the direction of the difference and its distribution between the sexes was inconsistent over the studies. In spite of the fact that three studies showed high, statistically significant relative risks for small subsets of consumers of very large amounts of artificial sweeteners, the finding was limited to men in one study and to women in the other two. In addition, no consistent pattern of dose-response relationship between use of artificial sweeteners and cancers of the urinary bladder or lower urinary tract is apparent in the available literature. In 2008, at a Codex meeting, it was decided to delete the function “flavor enhancer” associated with saccharin (and sodium, potassium, and calcium salts). EAF. E

SACCHARIN, AMMONIUM SALT • 1,2-Benzisothiazol-3(2H)-one. See Saccharin. NUL

SACCHARIN, CALCIUM SALT • 1,2-Benzisothiazol-3(2H)-one. Most of the saccharin sweeteners are made with calcium because it is more soluble. See Saccharin.

SACCHARIN, SODIUM SALT • 1,2-Benzisothiazol-3(2H)-one. This product contains a chemical(s) known to the state of California to cause cancer. The FDA and the JECFA do not label it as a carcinogen. See Saccharin. ASP. E

SAFFLOWER OIL • The edible oil expressed from the seed of an Old World herb that resembles a thistle, with large, bright red or orange flowers. Widely cultivated for its oil, which thickens and becomes rancid on exposure to air. It is used in salad oils and shortenings, and as a vehicle for medicines. As a dietary supplement it is alleged to be a preventative in the development of atherosclerosis—fat-clogged arteries. American safflower (American saffron) is no longer authorized for use.

SAFFRON • Crocus. Vegetable Gold. Spanish or French Saffron. The dried stigma of the crocus, Crocus sativus, cultivated in Spain, Greece, Italy, France, and Iran. Orange-brown; strong, peculiar aromatic odor; bitterish, aromatic taste. Almost entirely employed for coloring and flavoring. It has been permanently listed for use in foods since 1966. It does not require certification. Used in bitters, liquors, and spice flavorings for beverages, baked goods, meats, and liquors. Cleared by the USDA Meat Inspection Department for coloring sausage casing, oleomargarine, shortening, and for marking ink. The extract is used in honey and rum flavorings for beverages, ice cream, ices, candy, baked goods, and condiments, and it goes into yellow coloring. GRAS. ASP

SAFROLE and ANY OIL CONTAINING SAFROLE • Illegal. Found in certain natural oils such as star anise, nutmeg, and ylang-ylang, it is a stable,

SAFROLE and ANY OIL CONTAINING SAFROLE • Illegal. Found in certain natural oils such as star anise, nutmeg, and ylang ylang. It is a stable, colorless to brown liquid with an odor of sassafras and root beer. Used in the manufacture of heliotropin (see). Used as a beverage flavoring until it was banned in 1960. The toxicity of this fragrance ingredient is being questioned by the FDA. It is an animal liver carcinogen. BAN

SAFROLE-FREE EXTRACT OF SASSAFRAS • A flavoring in food. See Sassafras Bark Extract. ASP

SAGE • Spanish. Greek. The flowering tops and leaves of the shrubby mints. Spices include Greek sage and Spanish sage. The genus is Salvia, so named for the plant's supposed healing powers. Greek sage is used in fruit and spice flavorings for beverages, baked goods, and meats (1,500 ppm). Greek sage oil, obtained by steam distillation, is used in berry, grape, liquor, meat, crème de menthe, nutmeg, and sage flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, condiments, meats, and pickles. Greek sage oleoresin (see) is used in sausage and spice flavorings for condiments and meats. Spanish sage oil is used in fruit and spice flavorings for beverages, ice cream, ices, candy, baked goods, condiments, and meats. It is also used as a meat preservative. Greek sage is used in medicine. Used by herbalists to treat sore gums, mouth ulcers, and to remove warts. Arabs believed it prevents dying. GRAS. ASP

SAIGON CINNAMON and SAIGON CINNAMON LEAF OIL • See Cinnamon.

SAINT JOHN'S BREAD • See Locust Bean Gum. GRAS

SAINT JOHN'S WORT FLOWERS, LEAVES, and CAULIS • Hypericum perforatum. Amber. Blessed. Devil's Scourge. God's Wonder Herb. Grace of God. Goatweed. Hypericum. Klamath Weed. The plant contains volatile oil, tannin, resin, pectin, and glycosides (see all). It was believed to have infinite healing powers derived from the saint, the red juice representing his blood. It was used as an antivenereal. It is used to treat pains and diseases of the nervous system, arthritic pains, and injuries. An infusion made from its leaves is used for stomach disorders, diarrhea, depression, and bladder problems, and to remove threadworms in children. It is now being studied by researchers from the National Cancer Institute and various universities as a potential treatment for cancer and AIDS. The FDA listed Saint John's wort as an “unsafe herb” in 1977. The FDA issued a notice in 1992 that Saint John's wort has not been shown to be safe and effective as claimed in OTC (see) digestive-aid products. That does not mean, however, that it cannot be used for other purposes. NIL

SALAD OIL • Any edible vegetable oil. Dermatologists advise rubbing salad oils or fats on the skin, particularly on babies and older persons.

SALATRIM • Short- and Long-Chain Acid Triglyceride Molecules. This is a family of reduced-calorie fats that are only partially absorbed in the body. It contains 5 calories per gram. It is used in such products as Hershey's reduced-fat, semisweet chocolate-flavor baking chips. GRAS

SALICARIA EXTRACT • Spiked Loosestrife. Extract of the flowering herb Lythrum salicaria, which has purple or pink flowers. Used since ancient Greek times as an herb that calms nerves and soothes skin.

SALICIN • A chemical derived from the bark of several species of willows and poplar trees. Aspirin and other salicylates are derived from salicin or made synthetically.

SALICYLALDEHYDE • Salicylic Aldehyde. A synthetic flavoring made by heating phenol (very toxic) and chloroform. Occurs naturally in cassia bark. Clear, bitter, almondlike odor, burning taste. Crystalline, bitter powder. Gives a sensation of warmth on the tongue. Soluble in hot water. Used in butter flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, condiments, and liqueurs. Lethal dose in rats is 1 gram per kilogram of body weight. ASP

SALICYLATES • Amyl. Phenyl. Benzyl. Menthyl. Glyceryl. Dipropylene Glycol Esters. Salts of Salicylic Acid. Those who are sensitive to aspirin may also be hypersensitive to FD and C Yellow No. 5, a salicylate, and to a number of foods that naturally contain salicylate, such as almonds, apples, apple cider, apricots, blackberries, boysenberries, cherries, cloves, cucumbers, currants, gooseberries, grapes, nectarines, oil of wintergreen, oranges, peaches, pickles, plums, prunes, raisins, raspberries, strawberries, and tomatoes. Foods with added salicylates for flavoring may be ice cream, bakery goods (except bread), candy, chewing gum, soft drinks, Jell-O, jams, cake mixes, and wintergreen flavors.

SALICYLIC ACID • Occurs naturally in wintergreen leaves, sweet birch, and other plants and has a sweetish taste. Synthetically prepared by heating phenol with carbon dioxide, it is used as a preservative in food products. It is also used as a fungicide in the treatment of animals. Residues are prohibited in milk. EPA Genetic Toxicology Program (see). It is used in making aspirin. It can be absorbed through the skin. Absorption of large amounts may cause vomiting, abdominal pain, increased respiration, acidosis, mental disturbances, and skin rashes in sensitive individuals. It is poisonous by ingestion. Causes birth defects in experimental animals. EAF

SALICYLIC ETHER • See Ethyl Salicylate.

SALICYLIDES • Any of several crystalline derivatives of salicylic acid (see) from which the water has been removed.

SALINOMYCIN • Coxistac. An antiparasite drug used in chicken feed. Very toxic, and may be fatal, if swallowed, inhaled, or absorbed through the skin. For example, a previously healthy, thirty-five-year-old male was working in a factory making animal feed mixes. One of his tasks was to add salinomycin granules into a “worm” screw as chicken grain feed flowed past. An accidental blowback of the salinomycin granules occurred, resulting in inhalation and swallowing of a small amount despite washing out of the mouth. A few minutes later, the man became acutely unwell with nausea, shortness of breath, and dizziness. He arrived in the emergency department thirty minutes after exposure, where he was found to be agitated and complaining of leg weakness, nausea, and photophobia. After six weeks in the hospital he was discharged with very little exercise tolerance and other aftereffects. Dr. Phillipa Story, Emergency Department, Waikato Hospital, who reported the incident in Journal of the New Zealand Medical Association, March 12, 2004, wrote: “This patient ingested an estimated 1 mg/kg of salinomycin resulting in a 6-week hospital admission with prolonged muscle destruction, pain, and disability. It is clear from this case that humans may be vulnerable to the toxic effects of ionophore antibiotics.” See pages 2–3 in the foreword.

SALMONELLA • Named for the American veterinarian Dr. D. E. Salmon, it is a bacteria that occurs in the intestinal tract and tissues of infected humans and animals. Many of the more than twelve hundred different types can cause food poisoning, entering the food supply through meats or animal products from infected animals or from contamination by an infected animal or person. One of the most common food-borne illnesses in the United States, the symptoms are diarrhea, abdominal cramps, fever, and sometimes vomiting, which occur six to forty-eight hours after eating. Infections range from moderate, with recovery in three to four days, to fatal. Salmonella bacteria grow rapidly in cooked foods such as meat, eggs, custards, and salads that have been left unrefrigerated for several hours. It may also be transmitted by infected poultry and by sewage-polluted water. The National Academy of Science's Institute of Medicine estimated that doses of antibiotics in livestock promote growth or prevent infection for less than 2 percent of the human deaths due to food-borne, antibiotic-resistant salmonella. In 1989, according to a “new risks” assessment made for the FDA by the National Academy of Science's Institute of Medicine (IOM), the group “was unable to find data directly implicating subtherapeutic doses of antibiotics in livestock with illnesses in people” or to come up with a “numerical answer” about the risk that animal medication posed to humans. The IOM estimated that the doses of antibiotics given to livestock to promote growth or prevent infection would account for less than 2 percent of the human deaths due to food-borne, antibiotic-resistant salmonella. The committee felt that stopping the use of antibiotics to promote growth in livestock might reduce the total number of human deaths due to salmonella poisoning, but that such results could not be supported scientifically. Since 1989 the incidence of salmonella resistant to antibiotics has been increasing, according to another government agency, the Centers for Disease Control. Salmonella has contaminated almost every chicken sent to market and has led the U.S. government to

require warning labels on poultry products.

SALT • A compound formed by the interaction of an acid and a base. Sodium chloride, or common table salt, is an example. Sodium is the alkali or base and chloride provides the acidic factor.

SALTS OF FATTY ACIDS • Aluminum, calcium, magnesium, potassium, and sodium salts of capric, caprylic, myristic, oleic, palmitic, and stearic acids (see all) manufactured from fats and oils derived from edible sources. Used as anticaking additives, binders, and emulsifiers in various foods. ASP

SALT OF STEARIC ACID • See Stearic Acid.

SALTPETER • Potassium Nitrate. Niter. See Nitrate and Potassium. Acute intoxication is unlikely because a large dose causes vomiting and because it is rapidly excreted. Potassium poisoning disturbs the rhythm of the heart, and orally poisoned animals die from respiratory failure. Prolonged exposure to even small amounts may produce anemia, methemoglobinemia (lack of oxygen in the blood), and kidney damage.

SALVIA • See Sage.

SAMBUCUS EXTRACT • See Elder Flowers.

SANDALWOOD OIL, EAST INDIAN • It has extensive uses in the perfume industry as a fixative, and use in body care products for the fragrance it provides. The pale yellow, somewhat viscous volatile oil obtained by steam distillation from the dried ground roots and wood of the plant. Used in floral, fruit, honey, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. Used by aromatherapists to combat bronchitis, chapped and dry skin, depression, laryngitis, leucorrhea, oily skin, scars, sensitive skin, stress, and stretch marks. It also has historical applications as an aid in meditation for religious ceremonies. East Indian sandalwood is believed to create an exotic, sensual mood with a reputation as an aphrodisiac. May produce skin rash in the hypersensitive, especially if present in high concentrations. EAF

SANDALWOOD OIL, WEST INDIAN • Less soluble than the East Indian variety. See Amyris Oil. EAF

SANDALWOOD OIL, YELLOW • Arheol. Same origin as East Indian sandalwood oil (see). A floral, fruit, honey, and ginger ale flavoring additive for beverages, ice cream, ices, candy, baked goods, and chewing gum. EAF

SANDARAC • Used in alcoholic beverages only. Resin from a plant grown in Morocco, Tetraclinis articulata. NUL

SANI • The abbreviation for sanitizing agent for food-processing equipment.

SANITIZING SOLUTIONS • For use on food-processing equipment followed by adequate draining. The FDA sets limits on uses and concentrations for many compounds. See, for example, Quaternary Ammonium Compounds or Butoxy Monoether of mixed (ethylene) prolyalkylene glycol.

SANTALOL, ALPHA AND BETA • Alcohols from sandalwood used in fragrances. See Sandalwood Oil. ASP

SANTALUM ALBUM • See Sandalwood Oil.

SANTALYL ACETATE • Acetic Acid. A synthetic flavoring additive obtained from sandalwood oils (see). Used in floral, pear, and pineapple flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

SANTALYL PHENYLACETATE • Phenylacetic Acid. A synthetic flavoring obtained from sandalwood oils (see). NIL

SANTOQUIN • Ethoxyquin. A yellow liquid antioxidant and herbicide. It has been found to cause liver tumors in newborn mice. See Sodium Acid Pyrophosphate (SAP). A questionable additive. See Ethoxyquin.

SAPONIFICATION • Involves a chemical reaction in which a liquid alkali such as hydroxide forms an alcohol and the sodium salt of the acid involved in the mixture. The process is usually carried out on fats and oils. When, for example, triglycerides (see) are mixed with sodium or potassium hydroxide to produce glycerol and a fatty acid salt, the result is called “soap.”

SAPONIN • Any of numerous glycosides—natural or synthetic compounds derived from sugars—that occur in many plants such as soapbark, soapwort, or sarsaparilla. Characterized by their ability to foam in water. Yellowish to white, acrid, hygroscopic. In powder form they can cause sneezing. Extracted from soapbark or soapwort and used chiefly as foaming and emulsifying additives and detergents.

SAPORESSE PLUS • Made from yeast (see) it is an additive that is aimed at reducing the need for salt up to 20 percent in sauces, soups, and ready-to-eat meals as well as snacks. The company, Synergy, claims that it has the advantage of being free of MSG (see) and hydrolyzed vegetable protein (see both).

SARCODACTYLIS OIL • From the fruit of the dried fruit of Citrus medica var. sarcodactylis (Fam. Rutaceae). Its volatile oil is an expectorant and antiasthmatic. Used in oil-based sprays to control scale insects. EAF

SARSAPARILLA EXTRACT • The dried root from tropical American plants, Smilax spp. Used in cola, mint, root beer, sarsaparilla, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, and baked goods. Still used for psoriasis; formerly used for syphilis. There is reported use of the chemical, but it has not yet been assigned for toxicology literature. ASP

SASSAFRAS BARK EXTRACT • Safrole. Safrole-free. It is the yellow to reddish yellow volatile oil obtained from the roots of the sassafras, Sassafras albidum. It is 80 percent safrole (see) and has the characteristic odor and taste of sassafras. Used in rum and root beer flavorings for beverages, ice cream, ices, candy, and baked goods. Applied to insect bites and stings to relieve symptoms; also a topical antiseptic and used medicinally to break up intestinal gas. May produce dermatitis in hypersensitive individuals. ASP

SASSAFRAS LEAVES • Safrole-free. Same origin as the bark extract. Used in soups (30,000 ppm). There is no reported use of the chemical and no toxicology information is available. See Sassafras Bark Extract for toxicity. NIL

SAT FAT • The abbreviation for saturated fat on food labels.

SAT FAT CAL • The abbreviation for saturated fat calories on food labels.

SATURATED FATS • Saturated fats contain only single-bond carbon linkages and are the least active chemically. They are usually solid at room temperature. Most animal fats are saturated. The common saturated fats are acetic, butyric, caproic, caprylic, capric, lauric, myristic, palmitic, stearic, arachidic, and behenic. Butterfat, coconut oil, and peanut oil are high in saturated fats. See Fat.

SAUNDERS WHITE OIL • See Sandalwood Oil.

SAUSAGE CASINGS, HCL AND CELLULOSE FIBERS • Tree pulp is used to make sausage casings. See Collagen. ASP

SAVORY EXTRACT •An extract of Saturejahortensis, an aromatic mint known as summer or winter savory. The dried leaves of summer savory is a spice used in baked goods, condiments, and meats. Summer savory oil is obtained from the dried whole plant. It is used as a spice in condiments, candy, and baked goods. Summer savory oil oleoresin (see) is a spice used in candy, baked goods, and condiments. Winter savory (S. montana) oil and oleoresin spices are used in candy, baked goods, and condiments. Poisonous by skin contact. Moderately toxic by ingestion. A severe skin irritant. GRAS. ASP

SAVORY SUMMER • Satureja hotensis. See Savory Extract. ASP

SAVORY, WINTER • Satureja montana. See Savory Extract. ASP

SAVORY, WINTER OLEORESIN • Satureja montana. See Savory Extract. NIL

SCHINUS MOLLE OIL • A natural flavoring extract from the tropical pepper tree, Schinus molle. Used in candy, baked goods, and condiments. GRAS. There is reported use of the chemical; it has not yet been assigned for toxicology literature. ASP

SCLAREOLIDE • There is reported use of the chemical; it was not assigned for toxicology literature in 1999 and is still ASP.

SCOGS • The abbreviation for the U.S. Select Committee on GRAS Substances.

- Types of SCOGS conclusion definitions include the following:
- There is no evidence in the available information on [substance] that demonstrates, or suggests, reasonable grounds to suspect, a hazard to the public when they are used at levels that are now current or might reasonably be expected in the future.
- There is no evidence in the available information on [substance] that demonstrates a hazard to the public when it is used at levels that are now current and in the manner now practiced. However, it is not possible to determine, without additional data, whether a significant increase in consumption would constitute a dietary hazard.
- While no evidence in the available information on [substance] demonstrates a hazard to the public when it is used at levels that are now current and in the manner now practiced, uncertainties exist requiring that additional studies be conducted.
- The evidence on [substance] is insufficient to determine that the adverse effects reported are not deleterious to the public health should it be used at former levels and in the manner formerly practiced. In view of the almost complete lack of biological studies, the Select Committee has insufficient data upon which to evaluate the safety of [substance] as a [intended use].

SCOTCH SPEARMINT OIL • Mentha cardiaca. Minty odor strength. Fresh green spearmint, cooling, candy, leafy, spicy with a wintergreen afternote. Used in candy, seasoning, jams, jellies, and sweet sauces. EAF

SCURVY GRASS EXTRACT • The extract of the leaves and flower stalks of Cochlearia officinalis. The bright green leaves of this northerly herb were collected and eaten in large quantities by European seamen to prevent scurvy. The plant has the strong odor of horseradish, to which it is related.

SDA • FDA's abbreviation for solubilizing and dispersing agent.

SEA BUCKTHORN • Hippophae rhamnoides. An important natural resource of the mountainous regions of China and Russia. The plant grows naturally in sandy soil at an altitude of 1,200-4,500 meters (4,000-14,000 feet) in cold climates, though it can be cultivated at lower altitudes and into temperate zones. A study published in 2008 in the Society of Chemical Industry's Journal of the Science of Food and Agriculture found that sea buckthorn extract may ward off liver disease, leading researchers to conclude that it could be incorporated into a nutraceutical food or supplement targeting the condition. The berries have already been linked to health benefits for conditions such as cholesterol, heart disease, and inflammation.

SEBACIC ACID • Decanedioic acid. Colorless leaflets, sparingly soluble in water and soluble in alcohol. Manufactured by heating castor oil with alkalies or by distillation of oleic acid (see). The esters of sebacic acid are used as stabilizers.

2-SEC-BUTYLCYCLOHEXANONE • Freskomenth. Synthetic flavoring that is a colorless, viscous liquid and solidifies to an opaque mass; woody camphoraceous, somewhat musty odor. Used as a flavor enhancer in chewing gum. The JECFA has no safety concern at current amount of flavoring. See Ketones. ASP

SEC-BUTYL ETHYL ETHER • Synthetic flavoring. No safety concern at current levels of intake when used as a flavoring agent. See Butane. ASP

SELENIUM • Yellow solid or brownish powder, insoluble in water. Discovered in 1807 in the earth's crust. Used as a nutrient. An antioxidant that reputedly protects against the free-radical damage that can lead to cancer. A National Cancer Institute journal study found men with the highest level of selenium had one-third the risk of developing prostate cancer compared with lowest levels. Other research suggests selenium is only effective in slowing advanced prostate cancer. The Food Standards Agency recommends 75 mcg selenium a day for men, 60 mcg for women—equivalent to three Brazil nuts a day. Occupational exposure causes pallor, nervousness, depression, garlic odor of breath, gastrointestinal disturbances, and skin rash. Liver injury in experimental animals has been reported with selenium. Sabinsa Corporation is making its selenium ingredient available for food and beverage manufacturers in the United States, following a recent GRAS certification it requested.

SELENIUM AS SODIUM SELENITE or SELENATE • Used as a feed additive. The FDA limits it to less than 0.1 ppm in complete feed for chickens, swine, turkeys, sheep, beef cattle, dairy cattle, and ducks.

SELF-RISING FLOUR • White flour to which sodium bicarbonate and one or more of the acid reacting additives are added, such as sodium acid pyrophosphate (see).

It contains salt. The mixture composes a leavening system that allows the flour to rise when wetted in baked goods.

SEM • See Semicarbazide.

SEMICARBAZIDE • SEM. The World Health Organization (see) has considered possible public health concerns with regard to SEM in food at the request of several member states and based on information provided by the EFSA (see). These concerns arise from the presence of SEM in food products packaged in glass jars with metal lids that have foamed plastic seals. SEM has been detected at low levels in a number of such food products, including baby foods. The origin of SEM in these cases has been linked to the permitted use of azodicarbonamide (see) in the plastic seals. The presence of SEM has raised concern since it has weak carcinogenic activity when fed to laboratory animals at high doses. Based on levels reported in food, the health risk, if any, to consumers, including infants, appears to be very small, according to the WHO. However, since the relatively high consumption of products in glass jars by infants can result in higher exposure as compared with other consumers, the presence of SEM in baby foods is considered particularly undesirable. Therefore, the WHO recommends that, as a priority, alternative materials be evaluated for their suitability, including their microbiological and chemical safety and introduced as rapidly as possible for baby foods, and subsequently other foods. The WHO notes that other possible sources of dietary exposure to SEM should be investigated. For example, SEM is a known metabolite of the veterinary drug nitrofurazone and is used as an indicator for the use of the drug in food of animal origin. SEM has also been detected in seaweed-derived products, which are widely used as food additives. Azodicarbonamide, in addition to its use in foamed seals, is used as a blowing agent in rubber products and foamed polyethylenes that are permitted for other food packaging applications. In a number of countries, azodicarbonamide is also approved as a food additive for use as a bleaching agent in cereal flour and as a dough conditioner. Azodicarbonamide was reviewed in 1965 by the Joint Expert Committee on Food Additives (JECFA), which recommended a maximum treatment level for flour of 45 mg/kg. Azodicarbonamide is also used in certain pesticide formulations and industrial applications. Further studies aimed at clarifying whether SEM is formed from azodicarbonamide are needed. In addition, better information on the mechanism of toxicity and on exposure to SEM from all sources would help to define the nature of what is now considered to be a low risk to human health. The International Programme on Chemical Safety (IPCS) reviewed the human health concerns for azodicarbonamide primarily from the perspective of occupational exposure in 1999. The WHO will continue to monitor the situation with regard to SEM in food. If sufficient additional information so warrants, the WHO, in collaboration

WHO will continue to monitor the situation with regard to SEM in food. If sufficient additional information is warranted, the WHO, in collaboration with the Food and Agriculture Organization of the United Nations (FAO), will carry out risk assessments of SEM and possibly azodicarbonamide to provide sound scientific advice to the Codex Alimentarius Commission and member states. Related to this issue, the potential linkage of azodicarbonamide, SEM, and ethyl carbamate, another chemical of concern, needs to be elucidated. The JECFA is conducting a risk assessment of ethyl carbamate. In order to facilitate additional risk assessments, the JECFA has requested that existing data and notices of planned studies for both SEM and azodicarbonamide be provided on toxicity and on human exposure, including occurrence, levels, formation, and fate. Information from national and regional risk assessments was especially sought. Data on levels of SEM and azodicarbonamide in food and the diet were to be electronically submitted using the GEMS/Food (see) format.

SEMOLINA • The purified ground inside of durum wheat. It takes longer to cook and is less likely to be overcooked than flour. It has a 50 percent protein efficiency compared with nonfat dry milk. It is used in pasta products.

SENNA, ALEXANDRIA • Flavoring from the dried leaves of Cassia senna grown in India and Egypt. Has been used as a cathartic. EAF

SENSITIVITY • Hypersensitivity. An increased reaction to a substance that may be quite harmless to nonallergic persons.

SENSITIZATION • The development of a hypersensitive or allergic reaction upon reexposure to a substance. The reaction may be immediate or delayed and may be of short-term or chronic duration.

SENSITIZE • To administer or expose to an antigen provoking an immune response so that, on later exposure to that antigen, a more vigorous secondary response will occur.

SEQ • FDA's abbreviation for sequestrant.

SEQUESTERING ADDITIVE • A preservative that prevents physical or chemical changes affecting color, flavor, texture, or appearance of a product. Ethylenediamine tetraacetic acid (EOTA) is an example. It is used in carbonated beverages.

SERINE • L form only. An amino acid (see), nonessential, taken as a dietary supplement. It is a constituent of many proteins. See Proteins. Was on the FDA list requiring further information from at least 1980 to 1999, now ASP.

SEROTONIN • A neurotransmitter thought to play a role in temperature regulation, mood, and sleep. It is believed that it can be raised by eating carbohydrates, and it inhibits secretions in the digestive tract and stimulates smooth muscles. It is an important regulator of both mood and appetite. It may be useful for victims of seasonal depression, people who want to stop smoking, and others.

SERPENTARIA EXTRACT • Snakeroot. Snakeweed. Virginia Snakeroot. Extracted from the roots of Aristolochia serpentaria, its yellow rods turn red upon drying. Used in the manufacture of resins and as a bitter tonic. It is permitted in alcoholic beverages only. Can affect heart and blood pressure when ingested. Related to black cohosh and echinacea (see both). NIL

SERUM ALBUMIN • The major protein component of blood plasma derived from bovines. Used as a moisturizing ingredient.

SERUM PROTEINS • See Serum Albumin.

SERV SIZE • The abbreviation on labels for serving size.

SERVINGS • Label listing for servings per container.

SESAME • Seeds and Oils. The edible seeds of an East Indian herb, Sesamum indicum, which has a rosy or white flower. The seeds, which flavor bread, crackers, cakes, confectionery, and other products, are used in the manufacture of margarine as well. The oil has been used as a laxative and skin softener and contains elements active against lice. May cause allergic reactions, primarily contact dermatitis. GRAS. ASP

SESQUITERPENE LACTONES • In recent years, more than six hundred plants have been identified as containing these substances, and more than fifty are known to cause allergic contact dermatitis. Among them are arnica, chamomile, and yarrow (see all).

SHADDOCK EXTRACT • An extract of Citrus grandis and named for a seventeenth-century sea captain who brought the seeds back from the East Indies to Barbados. Shaddock is a large, thick-rinded, pear-shaped citrus fruit related to and largely replaced by the grapefruit.

SHARK-LIVER OIL • A rich source of vitamin A, believed to be beneficial to the skin. A brown, fatty oil obtained from the livers of the large predatory fish.

SHEA BUTTER • The natural fat obtained from the fruit of the karite tree, Butyrospermum parkii. Also called karite butter, it is chiefly used as a food but also in soap and candies.

SHEA BUTTER UNSAPONIFIABLES • The fraction of shea butter that is not saponified during processing, that is, not turned into fatty alcohol.

SHEA NUT OIL • Obtained as a fractionated “by-product” of shea butter production. The kernels yield an edible oil somewhat similar to olive oil. GRAS. EAF

SHELLAC • A resinous excretion of certain insects feeding on appropriate host trees, usually in India. As processed for marketing, the lac, which is formed by the insects, may be mixed with small amounts of arsenic trisulfide for color and with rosin. White shellac is free of arsenic. Shellac is used as a candy glaze and polish up to 0.4 percent. May cause allergic contact dermatitis. There is reported use of the chemical, but it has not yet been assigned for toxicology literature. ASP. E

SHELLAC WAX • Bleached, refined shellac. See Shellac. ASP

SHORTENINGS • A fat such as butter, lard, or vegetable oil used to make cake, pastry, bread, and other pastries light and flaky. See Salad Oil and Hydrogenated.

SHRIMP-DERIVED CHITOSAN • Ingredient in food including meat and poultry products. The notice informs the FDA of the view of Primex that shrimp-derived chitosan is GRAS, through scientific procedures for use in foods in general, including meat and poultry, for multiple technical effects. In a letter dated October 31, 2005, the FDA said that Primex asked the FDA to cease to evaluate Primex's request for GRAS status for this additive and the FDA said its evaluation effort stopped.

SIBERIAN FIR OIL • See Pine Needle Oil.

SILICA • A white powder, slightly soluble in water, that occurs abundantly in nature and is 12 percent of all rocks. Sand is a silica. Used as a coloring additive.

SILICA AEROGEL • A fine, white powder, slightly soluble in water, that occurs abundantly in nature and is 12 percent of all rocks. Sand is a silica. Chemically and biologically inert, it is used as an antifoaming additive in beverages and as a surfactant. Used chiefly in the manufacture of glass. Also used as a coloring additive. See Silicones. GRAS. EAF

SILICATES • Salts or esters derived from silicic acid (see). Any of numerous insoluble complex metal salts that contain silicon and oxygen that constitute the largest group of minerals and that with quartz make up the greater part of the earth's crust (as rocks, soils, and clays). The simplest silicate is sand, a molecule formed by joining one silicon atom with two oxygen atoms.

SILICIC ACID • Silica Gel. White, gelatinous substance obtained by the action of acids on sodium silicate (see). Odorless, tasteless, inert, white, fluffy

SILICIC ACID • Silica Gel. White, gelatinous substance obtained by the action of acids on sodium silicate (see). Odorless, tasteless, inert, white, fluffy powder when dried. Insoluble in water and acids. Absorbs water readily.

SILICON DIOXIDE • Silica. Occurs in nature as agate, amethyst, chalcedony, cristobalite, flint, quartz, sand, and tridymite. Used as a defoamer in beer production. Cleared for use as a food additive and as an anticaking additive at a level not to exceed 2 percent in salt and salt substitutes, in BHT (see Butylated Hydroxytoluene), in vitamins up to 3 percent, in urea up to 1 percent, and in sodium propionate up to 1 percent (see all). In feed and feed components, it is also used as an anticaking or grinding additive and is limited to 1 percent by weight of finished food. In dried egg products with moisture, it is limited to less than 5 percent of weight. It is used as an absorbent for some vitamin E and vitamin B in tableted foods for special dietary use. It is also a component of microcapsules for flavoring oil and it migrates to food from paper and paperboard products. Prolonged inhalation of the dust can injure lungs. See Silica Aerogel. GRAS. ASP. E

SILICONES • Any of a large group of fluid oils, rubbers, resins, and compounds derived from silica (see) that are water repellent, skin adherent, and stable over a wide range of temperatures.

SILK PROTEIN FOOD POWDER • Micropowder type for food additives as a natural emulsifier and special amino acids supplement. Fibroin is the principal form of natural silk. Silk has no fat, no cholesterol, no sugar, and no added ingredients. Turned down for GRAS status in 2002 because of insufficient information.

SILVER • When small silver balls known as “silver dragées” are sold exclusively for decorating cakes and are used under conditions that preclude their consumption as confectionery, they are not considered to be in the category of a food or confectionery. Silver-colored almonds have been offered for cake decoration. In this regard, the Center for Food Safety and Applied Nutrition has stated: “Although the articles [silver-colored almonds] may be intended for cake decoration, we do not agree that they are dragées [see; dragées are a modern alternative to almonds, having a sugar shell usually containing chocolate]; further, we see no compelling information that the articles are to be used for decorative purposes only and thus would not be eaten. There is no authority under the color additive regulations in the United States which permits silver to be used as a color. Neither is there a food additive regulation (or exemption) authorizing silver as a food coating.” Silver is now sold only as a “nonnutritive” decoration, according to the FDA. Certification of this color additive is not necessary for the protection of the public health and therefore batches of it are exempt from the certification requirements, according to the FDA rule. Silver is permitted as a food additive coloring in the European Union. E

SILVER DRAGÉES • See Dragées. NUL

SILVER FIR, NEEDLES and TWIGS, OIL • Abies alba. Silver Fir Needle. Highly esteemed in Europe for its medicinal virtues and its fragrant scent, the silver fir is a relatively small coniferous tree, with a regular pyramidal shape and a silvery white bark. The essential oil is obtained by steam distillation from the needles and young twigs, fir cones, and broken-up pieces. Silver fir needle is used as an ingredient in some cough and cold remedies and rheumatic treatments and also as a fragrance. NUL

SILVICIDE • Pesticide to kill unwanted trees and woody vegetation.

SIMARUBA BARK • A flavoring for use in alcoholic beverages only. It is from a southern American tree or shrub with a bitter bark, Simarouba amara. NIL

SIMAZINE • An herbicide. The tolerance is 1 ppm in molasses for animal feed. The tolerance is 0.01 ppm in drinkable water as a result of spray aquatic plants. Identified as priority hazardous substance by the European Union. May contaminate drinking water.

SIMPLESSE • A fat substitute developed by the same company that brought you NutraSweet. It is made from egg and milk protein. It can be used, according to the company, in margarine, ice cream, salad dressings, and yogurt. It cannot be used in baked food. Its introduction was delayed by the FDA, which said in 1988 that even though Simplesse was made from natural food, it should be premarket tested for safety.

SIMULIN • Not a sweetener or a sugar alternative but aimed at being “a sugar defense mechanism that can be added to any sugar-laden manufactured food and then works to protect the body from the glycemic impact of that food without altering the taste.”

SINETROL • A French patented extract made from red orange, orange, grapefruit, and guarana extract with total fruit biophenols of 60-80 percent, flavanones 10–20 percent HPLC, and caffeine 1–4 percent. It reputedly is a natural fat burner. It is still being evaluated in Europe but efforts are under way to enter it into the U.S. market.

SITOSTANOL • A substance in some Finnish margarines, it cut LDL cholesterol (the bad kind) by 20 percent. It reportedly inhibits cholesterol absorption, whereas statins, the medications used for that purpose, prevent cholesterol manufacture. Researchers speculate that sitostanol may be especially effective in people with high cholesterol-absorption rates who may not respond to statin therapy.

SKIM MILK • Whole milk from which fat has been reduced to less than 0.5 percent. It is used in the production of low-fat cheeses, casein, and lactose. It is an additive in frozen desserts, baked goods, and candies. It is also used as a drink.

SKIM MILK, DEXTROSE CULTURED • Used as an antimicrobial agent in cheeses, sauces, salad dressings, sausages, soups, deli salads, salsas, pasta, tortillas, muffins, cereal bars, sour cream, yogurt, and hash brown potatoes at a maximum level of 2 percent in the finished products. See also Milk. GRAS

SLIMICIDE • Pesticide to kill slime molds.

SLOE BERRIES • Blackthorn Berries. The fruit of the common juniper. The extract is a natural flavoring used in berry, plum, and liquor flavorings for beverages, ice cream, ices, candy, baked goods, and cordials (up to 43,000 ppm). Sloe gin is flavored with sloe berries. GRAS. There is reported use of the chemical; it has not yet been assigned for a toxicology literature search. ASP

SMALL PLANKTIVOROUS PELAGIC FISH BODY OIL • See Fish Oil. GRAS

SMALLAGE and SMELLAGE • See Lovage.

SMOKE FLAVORING SOLUTIONS • Condensates from burning hardwood in a limited amount of air. The solutions are used to flavor various foods, primarily meats, and as antioxidants to retard bacterial growth. Also permitted in cheese and smoke-flavored fish. The Select Committee of the Federation of American Societies for Experimental Biology (FASEB), under contract to the FDA, concluded that smoke flavorings in general pose no hazard to the public when used at current levels and under present procedures, but uncertainties exist that require further study. The committee also said there are insufficient data upon which to base an evaluation of smoked-yeast flavoring, produced by exposing food-grade yeast to wood smoke. It is used to flavor soups, cheese, crackers, dip, pizza, and seasoning mixes.

SMOKED SHEET RUBBER • A chewing-gum base.

S-METHYL BENZOTHIOATE • Flavoring. The JECFA (see) says it has no safety concern. EAF

S-METHYL HEXANETHIOATE • Synthetic flavoring. EAF

S-METHYL 3-METHYLBUTANETHIOATE • Synthetic flavoring. EAF

S-METHYL 4-METHYLPENTANETHIOATE • Synthetic flavoring. EAF

S-METHYL THIOACETATE • Synthetic flavoring. EAF

SNAKEROOT OIL • Canadian Oil. Wild Ginger. Derived from the roots of the plant Asarum canadense, which had a reputation for curing snakebites. Grown from Canada to North Carolina and Kansas. Used in ginger, ginger ale, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, baked goods, and condiments. See Black Cohosh and Echinacea. EAF

SOAPBARK • See Quillaja Extract.

SODIUM • A metallic element that is soft, silvery, and oxidizes easily in air. It is waxlike at room temperature and brittle at low temperature. It has many uses in combination with other chemicals. Sodium chloride (see) is common table salt.

SODIUM ACETATE • Sodium Salt of Acetic Acid. Transparent crystals highly soluble in water. Used as a preservative, flavoring, and pH control additive in candy, cereals, fats, grain products, jams, jellies, meat products, oils, pasta, snack foods, soup mixes, soups, and sweet sauces. Also migrates from cotton and cotton fabrics used in dry food packaging. Medicinally it is used as an alkalizer and as a diuretic. Moderately toxic by ingestion. A skin and eye irritant. GRAS. ASP. E

SODIUM ACID PHOSPHATE • Sequestrant in cheeses and frozen desserts. GRAS. ASP

SODIUM ACID PYROPHOSPHATE • SAP. A white mass or free-flowing powder used as a buffer. It is a slow-acting acid constituent of a leavening mixture for self-rising and prepared cakes, doughnuts, waffles, muffins, cupcakes, and other types of flours and mixes. Also used in canned tuna fish. The U.S. Department of Agriculture has proposed that SAP be added to hot dogs and other sausages to accelerate the development of a rose-red color, thus cutting production time by some 25 to 40 percent. It is related to phosphoric acid, which is sometimes used as a gastric acidifier. GRAS. ASP

SODIUM ACID SULFITE • See Sodium Bisulfite.

SODIUM ADIPATE • See Adipates. E

SODIUM ALGINATE • A gum obtained as a sodium salt of alginic acid (see) from seaweed. Dissolves in water to form a viscous, colloidal solution and is used in cosmetics as a stabilizer, thickener, and emulsifier. Used in frozen desserts, fruit jelly preservatives, and jams. It is the sodium salt of alginic acid extracted from brown seaweed. GRAS. E

SODIUM N-ALKYLBENZENESULFONATE • Processing for fruits and vegetables. See Surfactants. ASP

SODIUM ALUM • See Alum.

SODIUM ALUMÍNATE • A strong alkaline employed in the manufacture of lake colors used in foods (see FD and C Lakes). Also used in water softening and printing. Migrates to food from paper and paperboard products. GRAS. NIL

SODIUM ALUMINOSILICATE • Sodium Silicoaluminate. Anticaking additive used in dried whole eggs and egg yolks and grated cheese. A chemical substance used in dental compounds, colored lakes (see FD and C Lakes) for foods, and in washing compounds. GRAS. ASP. E

SODIUM ALUMINUM PHOSPHATE • A white, odorless powder, insoluble in water, used as a buffer in self-rising flour. Used with sodium bicarbonate (see). Used also in various cheeses. GRAS. ASP

SODIUM ALUMINUM PHOSPHATE ACIDIC • See Sodium Aluminum Phosphate and Acid. E

SODIUM ALUMINUM SILICATE • Anticaking additive. ASP. E

SODIUM ALUMINUM SULFATE • A flour-bleaching additive used alone or in combination with potassium aluminum, calcium sulfate, and other compounds. Used in cereal flours. See Aluminum. GRAS

SODIUM ARSANILATE • Used in animal feed. See Arsenic.

SODIUM ASCORBATE • Vitamin C. Sodium. Aside from its use in vitamin C preparations, it can serve as an antioxidant in chopped meat and other foods to retard spoiling; also used in curing meat. See Ascorbic Acid. GRAS. ASP. E

SODIUM BENZOATE • Sodium benzoate naturally occurs in several fruits like apples, plums, and cranberries. A few sweet spices contain small amounts of sodium benzoate, including cloves and cinnamon. A preservative that is the sodium salt of benzoic acid (see), it is active against yeast and bacteria. A major market for sodium benzoate is as a preservative in the soft drink industry, as a result of the demand for high fructose corn syrup (HFCS) in carbonated beverages. Sodium benzoate is also widely used as a preservative in pickles, sauces, and fruit juices. It is used in acidic foods such as fruit juices, relishes, and beverages, and it works best in slightly acid media. Used also as a preservative in margarine, codfish, bottled soft drinks, maraschino cherries, mincemeat, fruit juices, pickles, confections, fruit jelly preserves, and jams. Nontoxic for external use. Moderately toxic by ingestion. Caused birth defects in experimental animals. Larger doses of 8 to 10 grams by mouth may cause nausea and vomiting. Small doses have little or no effect. Benzoic acid and sodium benzoate are used as antimicrobial agents in edible coatings. Additional information is required in order to evaluate whether sodium benzoate may be toxic to genes. GRAS. ASP. E

SODIUM BICARBONATE • Bicarbonate of Soda. Baking Soda. An alkali prepared by the reaction of soda ash with carbon dioxide and used in prepared pancake, biscuit, and muffin mixes; as a leavening additive in baking powders; in various crackers and cookies; to adjust acidity in tomato soup, ices, and sherbets; in pastes and beverages; in syrups for frozen products; and in confections and self-rising flours. Also used in cornmeals and canned peas. Its white crystals or powder are used as a gastric antacid, as an alkaline wash, and to treat burns. Used also as a neutralizer for butter, cream, milk, and ice cream. It may alter the urinary excretion of other drugs, thus making those drugs either more toxic or less effective. GRAS. ASP

SODIUM BISULFATE • Sodium Acid Sulfite. Sodium Hydrogen Sulfite. Colorless or white crystals fused in water, with a disagreeable taste. A strong acid, it is used as a disinfectant in the manufacture of foods and pickling compounds. See Sodium Bisulfite. GRAS

SODIUM BISULFITE • Sodium Acid Sulfite. An inorganic salt. It is a white powder with a disagreeable taste, used as a bleaching additive in ale, wine, beer, and other food products. Used as a preservative in canned shrimp but not recognized as a source of vitamin E. It prevents discoloration and inhibits bacterial growth. It is used in dried fruit to inhibit browning and to maintain the bright color. It is also used in reconstituted lemon juice. Commercial bisulfite consists chiefly of sodium metabisulfite (see). In its aqueous solution, it is an acid. Concentrated solutions are highly irritating to the skin and mucous membranes. Sodium bisulfite can cause changes in the genetic material of bacteria and is a suspect mutagen. Not permitted in meats and other sources of vitamin B1; strong irritant to the skin and tissue. The Select Committee on GRAS Substances found it did not present a hazard at present use levels but that additional data would be needed if higher use occurred. The committee said in 1980 that it should continue as GRAS with limitations on the amounts that can be added to food. See Sulfites. ASP

SODIUM BORATE • Used as a preservative and emulsifier. Hard, odorless powder insoluble in water, it is a weak antiseptic and astringent for mucous membranes. NIL

SODIUM BOROHYDRIDE • Prepared from methyl borate and sodium hydride, it is used as a reducing additive (see) for various food-additive chemicals. It scavenges for traces of aldehyde, ketones, and peroxides in organic chemicals. It is used as a modifier for hops extract. ASP

SODIUM BRÓMATE • Inorganic salt. Colorless, odorless crystals that liberate oxygen. Used as a solvent. See Potassium Bromate for toxicity.

SODIUM BROMIDE • A sanitizing additive that requires adequate drainage, according to the FDA.

SODIUM CALCIUM ALUMINOSILICATE HYDRATED • Used to prevent salt and dry mixes from caking. GRAS. NIL

SODIUM CAPRATE • The sodium salt of caprylic acid. It functions as a binder, emulsifier, and anticaking agent. See Surfactants. NUL

SODIUM CAPRYLATE • See Palm Oil. NUL

SODIUM CARBONATE • Soda Ash. Small, odorless crystals or powder that occur in nature in ores and in lake brines or seawater. Absorbs water from the air. Used as a neutralizer for butter, cream, fluid milk, and ice cream; in the processing of olives before canning; and in cocoa products. Used in cocoa products and canned peas as an optional ingredient in standardized foods (see Standards of Identity and Standards of Quality). A strong alkali. Ingestion of large quantities may produce corrosion of the gastrointestinal tract, vomiting, diarrhea, circulatory collapse, and death. GRAS. ASP. E

SODIUM CARBOXYMETHYLCELLULOSE • Made from a cotton by-product. Prepared by treating alkali cellulose with sodium chloroacetate. Used as a stabilizer, thickener, gelling additive, and nonnutritive bulking aid. Used to prevent water loss, make food opaque, and to texturize food. Found in ice cream, beverages, confections, baked goods, icings, toppings, chocolate milk, chocolate-flavored beverages, gassed cream (pressure-dispensed whipped cream), syrup for frozen products, variegated mixtures, cheese spreads, and in certain cheeses. Also used in French dressing, artificially sweetened jellies, preserves, gelling ingredients, and mix-it-yourself powdered drinks. Medicinally used as a laxative (1.5 grams orally), antacid (15–30 milligrams of 5 percent solution), and in pharmacies for preparing suspensions. Can cause digestive disturbances. See Cellulose Gums. GRAS

SODIUM CARRAGEENAN • Sodium salt of carrageenan (see).

SODIUM CASEINATE • Casein. The soluble form of milk protein in which casein is partially neutralized with sodium hydroxide and used as a texturizer in ice cream, frozen custard, ice milk, and sherbet. Cleared by the USDA Meat Inspection Department for use in imitation sausage, soups, and stews. GRAS. ASP

SODIUM CASTORATE • The sodium salt of the fatty acids derived from castor oil (see).

SODIUM CHLORIDE • Common table salt. In addition to seasoning, it is used as a pickling additive, a preservative for meats, vegetables, and butter. Prevents browning in cut fruit. Also reported to irritate the roots of the teeth when used for a long time in dentifrices. Not considered toxic but can adversely affect persons with high blood pressure and kidney disease. GRAS. ASP

SODIUM CHLORITE • A powerful oxidizer prepared commercially and used to modify food starch (see Modified Starch) up to 0.5 percent. The main application of sodium chlorite is the generation of chlorine dioxide for bleaching and stripping of textiles, pulp, and paper. It is also used for disinfection in a few municipal water treatment plants after conversion to chlorine dioxide. An advantage in this application, as compared to the more commonly used chlorine, is that trihalomethanes are not produced from organic contaminants. Sodium chlorite, like many oxidizers, should be protected from inadvertent contamination by organic materials to avoid the formation of an explosive mixture. Toxicity depends on concentration. ASP

SODIUM CHOLATE • See Cholic Acid.

SODIUM CITRATE • White, odorless crystals, granules, or powder with a cool salty taste. Stable in air. Prevents “cream plug” in cream and “feathering” when cream is used in coffee; an emulsifier in ice cream, processed cheese, and evaporated milk; a buffer to control acidity and retain carbonation in beverages, in frozen fruit drinks, confections, fruit jellies, preserves, and jams. It attaches itself to trace metals present in water and inhibits their entering the living cell. Proposed as a replacement for phosphates in detergents, but also causes algae growth and removes the necessary trace metals from water as well as the toxic ones. Used as a sequestering additive (see) to remove trace metals in solutions and as an alkalizer in cosmetic products. Can alter urinary excretion of other drugs, thus making those drugs either less effective or more toxic. GRAS. E

SODIUM CLOXACILLIN • A penicillin antibiotic. FDA tolerance for residues in milk is 0.01 ppm. See Cloxacillin.

SODIUM COCOATE • See Coconut Oil.

SODIUM COCO-HYDROLYZED ANIMAL PROTEIN • The sodium salt of the condensation product of coconut acid chloride and hydrolyzed animal protein. See Hydrolyzed Protein.

SODIUM COCOYL GLUTAMATE • A softener. See Glutamate.

SODIUM DECYLBENZENESULFONATE • An additive with miscellaneous uses but generally used in coatings for fresh citrus fruits. See Benzoic Acid. NIL

SODIUM DEHYDROACETATE • Dehydroacetic Acid. A preservative; white, odorless powder, with an acrid taste. Used in cut or peeled squash and as a plasticizer, fungicide, and bactericide in antienzyme toothpaste. Can cause impaired kidney function. Large doses can cause vomiting, ataxia, and convulsions. There are no apparent allergic skin reactions. ASP

SODIUM DIACETATE • A compound of sodium acetate and acetic acid (see); a white, crystalline solid. Smells like vinegar. Used as a preservative. Inhibits molds and rope-forming bacteria in baked goods. GRAS. ASP

SODIUM DIALKYLPHENOXYBENZENEDISULFONATE • Used in lye mixtures for peeling fruits and vegetables. NIL

SODIUM 2,2-DICHLOROPROPIONATE • Dalapon. A pesticide. The FDA tolerance is 20 ppm in dehydrated citrus pulp for cattle feed from application to citrus during growing season. It is a strong irritant to the eyes and skin. See Propionic Acid.

SODIUM DIHYDROGEN PHOSPHATE • White, odorless powder or granules used as a buffer, dietary supplement, emulsifier, nutrient, and in poultry wash. Used in beverages, cheese, meat products, poultry, and soft drinks. In meat food products, where allowed, limited to 5 percent. Mildly toxic by ingestion. A human eye irritant.

SODIUM N, n-DIMETHYLDITHIOCARBAMATE • Vinstop. Sta-Fresh. An antimicrobial additive used on beets and sugarcane. The FDA limits the additive to 3 ppm based on weight of raw products. Moderately toxic by ingestion. Has caused mutations in experimental animals. ASP

SODIUM DODECYLBENZENESULFONATE • An anionic detergent, it is used to treat raw food products. It may irritate the skin. Will cause vomiting if swallowed. NIL

SODIUM ERYTHORBATE • Sodium Isoascorbate. A white, odorless powder used as an antioxidant in pickling brine up to 7.5 ounces per 100 gallons and in meat products up to three-quarters of an ounce per 100 pounds. Also used in beverages and baked goods and in cured cuts and cured, pulverized products to accelerate color fixing in curing. GRAS. ASP. E

SODIUM 2-ETHYL 1-HEXYLSULFATE • A component of a commercial detergent for washing raw foods. ASP

SODIUM ETHYL p-HYDROXYBENZOATE • See Hydroxybenzoate. E

SODIUM FERRIC EDTA • Prepared from disodium ethylenediaminetetraacetic acid and ferric nitrate. Used as an iron source. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there were insufficient biological and other studies upon which to base an evaluation of it when it is used as a food ingredient. Nothing new apparently has been reported by the FDA since. See Iron Salts.

SODIUM FERRICITROPYROPHOSPHATE • A white powder used in food enrichment. It is less prone to induce rancidity than other orthophosphates. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there were insufficient biological and other studies upon which to base an evaluation of it when it is used as a food ingredient. See Iron Salts. NUL

SODIUM FERROCYANIDE • Used as an anticaking additive for table salt and as a processing aid in wine. The FDA limits residue to 1 ppm in finished wine. E

SODIUM FLUORIDE • Used in toothpastes to prevent tooth decay and as an insecticide, disinfectant, and preservative. It is used to fluoridate municipal water. Nearly 70 percent of U.S. residents who get water from community water systems now receive fluoridated water, according to a study by the Centers for Disease Control and Prevention. The proportion of the U.S. population receiving fluoridated water, about 184 million people, increased from 65.8 percent in 1992 to 69.2 percent in 2006, said the study in the Morbidity and Mortality Weekly Report. It is also used as a wood preservative and a rodenticide, for chemical cleaning, electroplating, and glass manufacture, and as a preservative for adhesives. Can cause nausea and vomiting when ingested, and even death, depending upon the dose. Strong irritant to the tissues. Fluorides added to water to reduce the incidence of dental caries is 1 ppm. The concentration used has been established to be far below the permissible level of toxicity. The program has been in existence for more than thirty years, yet there are still some scientists and citizens who worry about its adverse effects. Chronic endemic fluorosis due to a high concentration of natural fluoride in local water supplies involves mottling of the teeth, bone changes, and, rarely, brain and nerve involvement. Acute fluoride poisoning can cause heart, brain, nerve, and gastrointestinal damage. This is a substance for which a petition has been filed but the FDA has not allowed it as a nutrient additive because “it has not been proven safe.” NUL

SODIUM FORMATE • White, deliquescent crystals used in paper packaging. Moderately toxic by ingestion. NUL

SODIUM FUMARATE • See Fumaric Acid. NUL

SODIUM GLUCOHEPTONATE • Chelating agent (see). ASP

SODIUM GLUCONATE • Gluconic Acid. Sodium Salt. A pleasant-smelling compound, it is used as a sequestering additive (see). GRAS. ASP. E

SODIUM GLUTAMATE • The monosodium salt of the L-form of glutamic acid (see).

SODIUM GLYCERYL OLÉATE PHOSPHATE • See Glyceryl Monostearate.

SODIUM HEXAMETAPHOSPHATE • Sodium Polymetaphosphate. Graham's Salt. An emulsifier, sequestering additive (see), and texturizer. Used in breakfast cereals, angel food cake, flaked fish, ice cream, ice milk, beer, bottled beverages, reconstituted lemon juice, puddings, processed cheeses, and artificially sweetened jellies. Used in foods and potable water to prevent scale formation and corrosion. Because it keeps calcium, magnesium, and iron salts in solution, it is an excellent water softener and detergent. Phosphorus is an essential nutrient, but it has to be in balance with other minerals such as calcium in the diet. Too much phosphorus in foods could lead to an imbalance and adversely affect bones, kidney, and heart. Lethal dose in dogs is 140 milligrams per kilogram of body weight. Used in Calgon, Giltex, and other such products. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging with no limitations other than good manufacturing practices. ASP

SODIUM HÚMATE • Sodium humate is the salt of humic acids, derived from natural oxidized lignite through extraction. Sodium humate has a wide use in industry, such as the removal of toxic metals from wastewater. Used as an emulsifier. ASP

SODIUM HYALURONATE • The sodium salt of hyaluronic acid. From the fluid in the eye; it is used as a gelling additive.

SODIUM HYDROSULFATE • Sodium Dithionate. A bacterial inhibitor and antifermentative.

SODIUM HYDROSULFITE • A bacterial inhibitor and antifermentative in the sugar and syrup industries. Slight odor. There is reported use of the chemical, it has not yet been assigned for toxicology literature. See Sulfites. GRAS. ASP. E

SODIUM HYDROXIDE • Caustic Soda. Soda Lye. An alkali and emulsifier. Readily absorbs water. Used as a modifier for food starch, a glazing additive for pretzels, and a peeling additive for tubers and fruits. The FDA banned use of more than 10 percent in household liquid drain cleaners. Its ingestion causes vomiting, prostration, and collapse. Inhalation causes lung damage. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging with no limitations other than good manufacturing practices. ASP. E

SODIUM HYDROXIDE GELATINIZED STARCH • Starch (see) that has been gelatinized with sodium hydroxide. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there were insufficient biological and other studies upon which to base an evaluation of it when it is used as a food ingredient. Nothing new has been reported since.

SODIUM HYPHOSPHITE • An emulsifier or stabilizer used in food with no limitations other than current good manufacturing practices. The affirmation of this ingredient as GRAS as a direct human food ingredient is based upon following current good manufacturing practices. NUL

SODIUM HYPOCHLORITE • A preservative used in the washing of cottage cheese curd. Also used medically as an antiseptic for wounds. Ingestion may cause corrosion of mucous membranes and esophageal or gastric perforation. The aqueous solutions are Eau de Javelle, Clorox, Dazzle. ASP

SODIUM HYPOPHOSPHATE • White crystals, soluble in water, used as a sequestering additive.

SODIUM IODATE and SODIUM IODIDE • Sources of iodine in animal feed. See Iodine. GRAS

SODIUM INOSINATE • See Inosinate.

SODIUM IRON EDTA • NaFeEDTA. A dietary supplement for use in supervised food fortification programs in populations in which iron-deficiency anemia is widespread. The JECFA (see) was asked to comment on this additive that is supposed to be restricted to specific supervised applications. The committee was concerned about overfortification or misuse and did not recommend its availability for general use by individuals. It recommended it be used only as a supervised dietary supplement. In 2007, the JECFA said it is suitable for use as a source of iron for food fortification provided that the total intake of iron from all food sources including contaminants does not exceed the PMTDI (see) of 0.8 mg/kg bw. Total intake, the committee said, of EDTA should not exceed acceptable levels, also taking into account the intake of EDTA from the food additive use of other EDTA compounds. And ADI (see) of 0-2.5 mg/kg bw was previously set for calcium disodium and disodium salts of EDTA (see both) equivalent to up to 1.9 mg/kg bw. Akzo Nobel notes that NaFeEDTA has been used in studies in developing countries for the iron fortification of foods. No adverse effects were reported in humans participating in long-term NaFeEDTA fortification studies in which fish and soy sauces, sugar, and curry powder were fortified with NaFeEDTA providing levels of 4 to 15 mg/p/d of iron (0.067 to 0.25 milligrams per kilogram of bodyweight per day [mg/kg bw/d]). Kraft acknowledges that, in large doses, EDTA may interfere with the absorption or retention of minerals but states that moderate doses of EDTA are generally considered to be innocuous. Akzo Nobel also notes that numerous human absorption trials have been conducted with iron from other sources. In general, these trials provided iron levels ranging from 0.2 to 80 mg/p/d in various foods, with no

adverse effects reported. Kraft notes that iron poisoning symptoms may occur from iron overload caused by acute ingestion of as little as 25 mg/kg bw/d of iron, with clinically significant iron poisoning occurring at iron doses of 60 mg/kg bw/d. Kraft estimates that a dose of 60 mg/kg bw/d of iron would be equivalent to consumption of approximately 100 liters (L) of reconstituted beverage containing 2.5 mg iron per 200 mL reconstituted soft drink. Kraft states that this estimate also supports the conclusion that the intended uses of NaFeEDTA will not cause toxicity in normal individuals. Based on the information provided by Akzo Nobel and Kraft and other information available to the FDA, the agency has no questions at this time regarding Akzo Nobel's conclusion that NaFeEDTA is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status.

SODIUM IRON PYROPHOSPHATE • See Sodium Pyrophosphate.

SODIUM ISCISTEROYL LACTYLATE • The sodium salt of isostearic acid and lactyl lactate. See Stearic Acid and Lactic Acid.

SODIUM ISOASCORBATE • See Erythrobic Acid.

SODIUM LACTATE • Plasticizer substitute for glycerin. Colorless, thick, odorless liquid miscible with water, alcohol, and glycerin. It is used as an antioxidant, bodying additive, and humectant. Solution is neutral. Used medicinally as a systemic and urinary alkalizer. GRAS. ASP. E

SODIUM LAURATE • See Sodium Lauryl Sulfate. NUL

SODIUM LAURETH SULFATE • SLES. The sodium salt of sulfated ethoxylated lauryl alcohol, widely used as a water softener. Preexisting dermatitis would likely be made worse by exposure to this product. See Surfactants.

SODIUM LAUROYL GLUTAMATE • A softener. See Glutamate.

SODIUM LAURYL SULFATE (SLS) • A detergent, wetting additive, and emulsi-fier. It is used to treat raw foods, followed by a water rinsing. It is employed as a whipping aid in cake mixes and dried-egg products. In frozen and liquid egg whites the FDA allows up to 125 ppm; in egg white solids, 0.1 percent; 5,000 ppm by weight of gelatin as a whipping additive used in preparing marshmallows; 25 ppm in finished product. It is also used as a surfactant in some dry beverage bases and fruit juice drinks unless precluded by food standards (see). The FDA allows 10 ppm in crude vegetable oils and animal fats. Prepared by sulfation of lauryl alcohol (see) followed by neutralization with sodium carbonate. Also emulsifies fats. It can produce allergic sensitivity reactions. ASP

SODIUM LIGNOSULFONATE • The sodium salt of polysulfonated lignin derived from wood. It is used as a dispersing additive. It is also used as an emulsi-fier, stabilizer, and cleaning additive.

SODIUM MAGNESIUM SILICATES • See Silicates.

SODIUM MALATES • Food Acids. E

SODIUM 3-MERCAPTOOXOPROPIONATE • Synthetic flavoring. EAF

SODIUM METABISULFITE • An inorganic salt. A bacterial inhibitor in wine, ale, and beer; an antifermentative in sugar and syrups; a preservative for fruit and vegetable juices; antibrowning additive in cut fruits, frozen apples, dried fruits, prepared fruit pie mix, peeled potatoes, and maraschino cherries. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that the additive did not present a hazard when used at present levels but that increased use would require additional safety data. See Sulfites. ASP. E

SODIUM METAPHOSPHATE • Graham's Salts. A dough conditioner. Used in dental polishing additives, detergents, water softeners, sequestrants, emulsifiers, food additives, and textile laundering. See Sodium Hexametaphosphate. GRAS. ASP

SODIUM METASILICATE • Alkali usually prepared from sand and soda ash. Used as a peeling solution for peaches and as a denuder for tripe “in amounts sufficient for the purpose.” Used in detergents. Caustic substance, corrosive to the skin, harmful if swallowed, and cause of severe eye irritations. GRAS. ASP

SODIUM (4-METHOXYBENZOYLOXY)ACETATE • Synthetic flavoring that FEMA (see) labels GRAS. It is used in cereals and confectionery frostings. EAF

SODIUM 3-METHOXY-4-HYDROXYCINNAMATE • Synthetic flavoring. See Cinnamic Acid. EAF

SODIUM 2-(4-METHOXYPHENOXY)PROPANOATE • Synthetic flavoring. NUL

SODIUM METHYL COCOYL and OLEYL TAURATE • See Ox Bile.

SODIUM METHYL P-HYDROXYBENZOATE • See Hydroxybenzoate. E

SODIUM METHYL SULFATE • Used in processing pectin (see). ASP

SODIUM MONOALKYLPHENOXYBENZENEDISULFONATE • Used in lye for peeling fruits and vegetables.

SODIUM MONO- and DIMETHYL NAPHTHALENE SULFONATE •

Anticaking and lye peeling additives used in cured fish and meats, and potable water. Also used in sodium nitrite in cured fish and meat. ASP

SODIUM MONOHYDROGEN PHOSPHATE • Dibasic Sodium Phosphate. Used as a buffer, to retain juices, as a dietary supplement, emulsifier, hog wash, poultry wash, and in evaporated milk, poultry, instant pudding, and whipped products. Limited by the FDA to 0.5 percent of total poultry product. Mildly toxic by ingestion. A skin and eye irritant.

SODIUM MYRISTATE • See Myristic Acid and Fatty Acids. NUL

SODIUM MYRISTOYL ISETHIONATE • See Myristic Acid.

SODIUM NICOTINATE • This was used for what the FDA termed “deceptive use in ground meat for color retention.” The FDA has banned it despite the request by producers for extension of its use.

SODIUM NITRATE • See Nitrate. ASP. E

SODIUM NITRITE • Addition to the surface of raw beef via migration from packaging film to maintain the characteristic color of raw beef at a maximum level of 113 mg per square meter. See Nitrite. GRAS pending. ASP. E

SODIUM OLÉATE • Sodium salt of oleic acid. White powder, fatty odor, alkaline. Used in soaps. NUL

SODIUM ORTHOPHENYL PHENOL • A preservative in and on citrus fruits. See Phenol. E

SODIUM PALMITATE • Sodium salt of palmitic acid (see). See also Fatty Acids. NUL

SODIUM PANTOTHENATE • A member of the B vitamin family. It is important as a constituent of coenzyme A. Its name is derived from the Greek word pantothen, meaning “everywhere.” Used as a dietary supplement. GRAS. NUL

SODIUM PECTINATE • A stabilizer and thickener for syrups for frozen products, ice cream, ice milk, confections, fruit sherbets, French dressing and other salad dressings, fruit jelly, preserves, and jams. Used in quantities that reasonably compensate for the deficiency, if any, of natural pectin content of the fruit ingredients. GRAS. NUL

SODIUM PHOSPHATE (DIBASIC) • Disodium Phosphate. Used in frozen desserts, enriched farina, and macaroni and noodle products. See Sodium Phosphate. GRAS. ASP. E

SODIUM PHOSPHATE (MONO-, Dl-, and TRIBASIC) • Buffer and effervescent used in the manufacture of detergents. Without water, it can be irritating to the skin but has no known skin toxicity. See Phosphorous Sources. GRAS. ASP. E

SODIUM PHOSPHOALUMINATE • The acid salt of phosphoric acid. An ingredient of baking powders and other leavening mixtures. GRAS for packaging. See Phosphoric Acid for toxicity.

SODIUM POLYACRYLATE-ACRYLAMIDE RESIN • A miscellaneous additive used in beet sugar or cane sugar juice to control organic mineral scale. The FDA says it can be up to 2.5 percent by weight of juice or liquor. See Acrylates and Acrylamide.

SODIUM POLYMETHACRYLATE • Used in boiler water to inhibit mineral scale in beet and cane sugar production. The FDA allows up to 3.6 ppm of raw juice weight. See Acrylates. ASP

SODIUM POTASSIUM TARTRATE • Rochelle Salt. A buffer for confections, fruit jelly preserves, and jams. For each 100 pounds of saccharin in these products, 3 ounces of sodium potassium tartrate is used. Also used in cheese. Used medicinally as a cathartic. GRAS. NUL. E

SODIUM PROPIONATE • Colorless or transparent, odorless crystals that gather water in moist air. Used as a preservative in foodstuffs to prevent mold and fungus. Used in baked goods, frostings, confections, and gelatin. It has been used to treat fungal infections of the skin, but can cause allergic reactions. GRAS. ASP. E

SODIUM PROPYL p-HYDROXYBENZOATE • Almost odorless, small, colorless crystals or a white crystalline powder. Preservative. See p-Hydroxybenzoate. E

SODIUM PYROPHOSPHATE • Used to decrease the amount of cooked-out juices in canned hams, pork shoulders, and bacon at 5 percent phosphate in pickle; 0.5 percent phosphate in product (only clear solution may be injected into hams). It is also used in cold-water puddings and processed cheese. It is an emulsifier salt and a texturizer as well as a sequestrant. The FDA labeled it GRAS for use as a sequestrant. ASP

SODIUM RIBOFLAVIN PHOSPHATE • B vitamin containing sodium phosphate (see).

SODIUM SACCHARIN • An artificial sweetener in use since 1879. Pound for pound it is three hundred times as sweet as natural sugar but leaves a bitter aftertaste. It was used along with cyclamates in the experiments that led to their ban in 1969. The FDA has proposed restricting saccharin to 15 milligrams per day for each kilogram of body weight or 1 gram a day for a 150-pound person. On the FDA's priority list for further safety testing.

SODIUM SALT • See Sodium Benzoate.

SODIUM SALTS OF FATTY ACIDS • See Sodium and Fatty Acids. ASP

SODIUM SESQUICARBONATE • Lye. White crystals, flakes, or powder produced from sodium carbonate. Soluble in water. Used as a neutralizer for butter, cream, fluid milk, and ice cream, in the processing of olives before canning, cacao products, and canned peas. May cause an allergic reaction in the hypersensitive. There is reported use of the chemical; it has not yet been assigned for toxicology literature. GRAS. ASP

SODIUM SILICATE • Water Glass. Soluble Glass. An anticaking additive for preserving eggs and detergents in soaps. Strongly alkaline. As a topical antiseptic can be irritating and caustic to the skin and mucous membranes. If swallowed, it causes vomiting and diarrhea. GRAS. ASP

SODIUM SILICOALUMINATE • Anticaking additive used in table salt up to 2 percent; dried egg yolks up to 2 percent; in sugar up to 1 percent; and in baking powder up to 5 percent. Slightly alkaline. See Silicates. GRAS

SODIUM SOAP • See Sodium Stearate.

SODIUM SORBATE • A food preservative used in cheeses alone or in combination with potassium sorbate or sorbic acid (see both). It is also used in fruit butter, artificially sweetened fruit jelly, preserves, jams, and margarines. Also migrates from packaging into food. In 1984, in the journal Food Chemistry, researchers reported sodium sorbate is a genotoxicity (see) additive although its potency seems to be weak, and that sorbic acid and potassium sorbate are less genotoxic than the sodium salt. GRAS. ASP

SODIUM STEARATE • Alkaline; 92.82 percent stearic acid (see). Used as an emulsifier in foods. A fatty acid used as a chewing-gum base. It was approved in 1998 as an anticaking additive in animal feed. One of the least allergy-causing of the sodium salts of fatty acids. Nonirritating to the skin. ASP

SODIUM STEAROYL LACTYLATE • Used as follows unless precluded by food standards (see): 0.5 percent by weight of flour as a dough strengthener, emulsifier, or processing aid in baked products, pancakes, waffles, and prepared mixes; 0.2 percent by weight of finished food as surface active additive, emulsifier, or stabilizer in icings, fillings, puddings, and toppings; 0.3 percent by weight of finished emulsion or stabilizer in liquid and solid edible fat-water emulsion used as substitutes for milk and cream in coffee; 0.5 percent of dry weight as formulation aid, processing aid, or surfactant in dehydrated potatoes; 0.2 percent by weight as an emulsifier, stabilizer, or texturizer in snack dips and cheese and cheese product substitutes and imitations; 0.25 percent by weight of finished food as an emulsifier, stabilizer, or texturizer in sauces or gravies, products containing same, and prepared mixes of same. See Lactic Acid. ASP. E

SODIUM STEAROYL-2-LACTYLATE • The sodium salt of a lactylic ester of fatty acid. Prepared from lactic acid and fatty acids. It is used as an emulsifier, plasticizer, or surfactant in an amount not greater than that required to produce the intended physical or technical effect, and where standards of identity (see) do not preclude use, in the following: bakery mixes, baked products, cake icings, fillings and toppings, dehydrated fruits and vegetables, dehydrated fruit and vegetable juices, frozen desserts, pancake mixes, precooked instant rice, pudding mixes, solid-state edible vegetable fat-water emulsions used as substitutes for milk or cream in coffee, and with shortening and edible fats and oils when such are required in the foods listed above. See Lactic Acid for toxicity. E. ASP

SODIUM STEARYL FUMARATE • Fine white powder used as a dough conditioner in bakery products, cereals processed for cooking, starch-thickened flour, and dehydrated potatoes. As a stabilizing additive in nonyeast-leavening bakery products up to 1 percent of weight of flour used. FDA limits are 0.5 percent of flour for yeast-leavened baked goods; 1 percent for nonyeast-leavened baked goods; 1 percent of dehydrated potatoes; 1 percent of dry processed cereals for cooking; and 0.2 percent for starch-thickened flour. ASP

SODIUM SULFACHLOROPYRIDAZINE MONOHYDRATE • An antibiotic used for chickens. The FDA requires zero residue in uncooked edible tissues of chickens.

SODIUM SULFATE • Salt Cake. Occurs in nature as the minerals mirabilite and nardite. Used in chewing-gum base and to preserve tuna fish and biscuits. Used medicinally to reduce body water. It is a readditive (see) and a precipitant; mildly saline in taste. Usually harmless when applied in toilet preparations. May prove irritating in concentrated solutions if applied to the skin and permitted to dry and then remain. May also enhance the irritant action of certain detergents. Taken by mouth, it stimulates gastric mucous production and sometimes inactivates a natural digestive juice—pepsin. Fatally poisoned animals show only diarrhea and intestinal bloating with no gross lesions outside the intestinal tract. ASP. E

SODIUM SULFIDE • Composition in chewing-gum base. Crystals or granules prepared from ammonia that easily absorb water. Also used in dehairing hides and wool pulling, engraving, and cotton printing. NUL

SODIUM SULFITE • White to tan-pink, odorless or nearly odorless powder having a cooling, salty, sulfurlike taste. An antiseptic, preservative, and antioxidant used as a bacterial inhibitor in wine-brewing and distilled-beverage industries. Also an antifermentative in the sugar and syrup industries and a browning inhibitor in cut fruits; used in frozen apples, dried fruit, prepared fruit pie mix, peeled potatoes, maraschino cherries, dried fruits, and glazed fruits. Foods and drinks containing sulfites may release sulfur dioxide. If this is inhaled by people who suffer from asthma, it can trigger an asthmatic attack. Sulfites are known to cause stomach irritation, nausea, diarrhea, skin rash, or swelling in sulfite-sensitive people. People whose kidneys or livers are impaired may not be able to produce the enzymes that break down sulfites in the body. Sulfites may destroy thiamin and consequently are not added to foods that are sources of this B vitamin. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it did not present a hazard when used at present levels but that additional data would be necessary if a significant increase in consumption occurred. See Sulfites. ASP. E

SODIUM SULFO-ACETATE DERIVATIVES • Used as emulsifiers in margarine. Up to 0.5 percent. See Sodium Sulfate.

SODIUM TARTRATE • A laxative, sequestrant, chemical reactant, and stabilizer in cheese and artificially sweetened jelly. See Tartaric Acid. GRAS. NUL. E

SODIUM TAUROCHOLATE • Taurocholic Acid. The chief ingredient of the bile of carnivorous animals. Used as an emulsifier in dried egg white up to 0.1 percent. It is a lipase accelerator. Lipase is a fat-splitting enzyme in the blood, pancreatic secretion, and tissues. NUL

SODIUM TETRABORATE • See Borax. E

SODIUM TETRAPHOSPHATE • Sodium Polyphosphate. Used as a sequestering additive. See Phosphate. GRAS

SODIUM THIOSULFATE • An antioxidant used to protect sliced potatoes and uncooked french fries from browning and as a stabilizer for potassium iodide in iodized salt. Also used to neutralize chlorine and to bleach bone. It is an antidote for cyanide poisoning and has been used in the past to combat blood clots; used to treat ringworm and mange in animals. Poorly absorbed by the bowel. GRAS. ASP

SODIUM p-TOLUENE-SULFOCHLORAMINE • Chloramine-T. Water-purifying additive and a deodorant used to remove weed odor in cheese. Suspected of causing rapid allergic reaction in the hypersensitive. Poisoning by chloramine-T is characterized by pain, vomiting, sudden loss of consciousness, circulatory and respiratory collapse, and death.

SODIUM TOLUENESULFONATE • Methylbenzenesulfonic Acid, Sodium Salt. An aromatic compound that is used as a solvent. See Benzene.

SODIUM TRIMETAPHOSPHATE • A starch modifier. See Sodium Metaphosphate and Modified Starch.

SODIUM TRIPOLYPHOSPHATE • STPP. A texturizer and sequestrant cleared for use in food-starch modifiers. A water softener. Also cleared by the USDA Meat Inspection Department to preserve meat by decreasing cooked-out juices in canned hams, pork shoulders, chopped ham, and bacon. Also used as a dilutant for Citrus Red No. 2 (see). It is used in angel food cake mix, beef, desserts, gelling juices, goat, canned ham, lamb, lima beans, meat loaf, meat toppings, meringues, mutton, canned peas, pork, poultry, sausage products, and veal. It may deplete the body of calcium if taken in sufficient amounts, and such a case of low calcium was reported in a patient poisoned with water softener. It is a crystalline salt, moderately irritating to the skin and mucous membranes. Ingestion can cause violent purging. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging with no limitations other than good manufacturing practices. See Sodium Phosphate. ASP

SODIUM XYLENESULFONATE • A composition of sanitizing solutions.

SODIUM ZINC METASILICATE • Fusing silica (sand) with sodium carbonate, it is used as a water softener and as an anticorrosion agent in boiler-water feed. NUL

SOI • Abbreviation for standards of identity (see).

SOL FIBER • Listing on food labels for soluble fiber. See Solubilization and Fiber.

SOLUBILIZATION • The process of dissolving in water such substances as fats and liquids that are not readily soluble under standard conditions by the action of a detergent or similar additive. Technically, a solubilized product is clear because the particle size in an emulsion is so small that light is not bounced off the particle. Sodium sulfonates are common solubilizing additives.

SOLUBLE ANIMAL COLLAGEN • See Solubilization and Collagen.

SOLUBLE COLLAGEN • The protein derived from the connective tissue of young animals.

SOLV • FDA abbreviation for solvent (see).

SOLVENT • A liquid capable of dissolving or dispersing one or more substances. Methyl ethyl ketone is an example of a solvent.

SORBATE, CALCIUM • See Calcium Sorbate.

SORBIC ACID • Acetic Acid. Hexadienic Acid. Hexadienoic Acid. Sorbistat. A white, free-flowing powder obtained from the berries of the mountain ash. It is also made from chemicals in the factory. It is used in cosmetics as a preservative and humectant. A mold and yeast inhibitor, it is used in foods, especially cheeses and beverages. It is also used in baked goods, chocolate syrup, fresh fruit cocktail, soda-fountain-type syrups, tangerine puree (sherbet base), salads (potato, macaroni, coleslaw, gelatin), cheesecake, pie fillings, cakes, cheese in consumer-size packages, and artificially sweetened jellies and preserves. Percentages range from 0.003 percent in beverages to 0.2 percent in cheeses. Practically nontoxic but may cause skin irritation in susceptible people. When injected under the skin in 2,600-milligram doses per kilogram of body weight, it caused cancer in rodents. GRAS. ASP. E

SORBITAN • A compound from sorbitol that has the water removed.

SORBITAN DIISOSTEARATE • The diester of isostearic acid and hexitol. See Fatty Acids.

SORBITAN DIOLEATE • The diester of oleic acid and hexitol anhydrides derived from sorbitol. See Sorbitan Fatty Acid Esters.

SORBITAN FATTY ACID ESTERS • Mixture of fatty acids (see) and esters of sorbitol (see) and sorbitol with the water removed. Widely used in food and the cosmetics industry as an emulsifier and stabilizer.

SORBITAN ISOSTEARATE • See Sorbitan Fatty Acid Esters.

SORBITAN LAURATE • Span 20. Oily liquid used as an emulsifier and stabilizer of essential oils in water.

SORBITAN MONOLAUREATE • Emulsifier and stabilizer. See Sorbitan and Lauric Acid. E

SORBITAN MONOOLEATE • Polysorbate 80. An emulsifying additive for special dietary products and pharmaceuticals, a defoamer in yeast production, and a chewing gum plasticizer. An unintentionally administered daily dose of 19.2 grams per kilogram of body weight for two days to a four-month-old baby caused no harm except loose stools. ASP. E

SORBITAN MONOPALMITATE • An emulsifier and flavor-dispersing additive used as an alternate for sorbitan monostearate (see) in cake mixes. E

SORBITAN MONOSTEARATE • An emulsifier, defoamer, and flavor dispersing additive. Used in cakes and cake mixes, whipped vegetable-oil toppings, cookie coatings, cake icings and fillings, solid-state edible vegetable fat-water emulsions used as substitutes for milk or cream in coffee, coconut spread, beverages, confectionery, and baked goods. Percentages range from 1 to 0.66 percent. No single dose is known to be lethal in animals, and man has been fed a daily single dose of 20 grams without harm. ASP. E

SORBITAN OLÉATE • Sorbitan Monooleate. An emulsifying additive, defoaming additive, and plasticizer.

SORBITAN PALMITATE • Span 40. Derived from sorbitol (see). An emulsifier in cosmetic creams and lotions, a solubilizer of essential oils in water.

SORBITAN SEQUISTEARATE • See Sorbitan Stearate.

SORBITAN SESQUIOLEATE • An emulsifier. See Sorbitol and Oleic Acid.

SORBITAN STEARATE • Sorbitan Monostearate. An emulsifier and a solubilizer of essential oils in water. Manufactured by reacting edible commercial stearic acid with sorbitol (see both). E

SORBITAN TRIISOSTEARATE • See Stearic Acid.

SORBITAN TRIOLEATE • See Sorbitol.

SORBITAN TRISTEARATE • An emulsifier and alternate for sorbitan stearate (see).

SORBITOL, D- • An alcohol first found in the ripe berries of the mountain ash; it also occurs in other berries (except grapes), and in cherries, plums, pears, apples, seaweed, and algae. Consists of white, hygroscopic powder, flakes, or granules with a sweet taste. A sugar substitute for diabetics. Used as a thickener in candy, a sequestrant in vegetable oils, a stabilizer and sweetener in frozen desserts for special dietary purposes, and a humectant and texturizing additive in shredded coconut and dietetic fruits and soft drinks. Used in embalming fluid and mouthwashes. Medicinally used to reduce body water and for intravenous feedings. If ingested in excess, it can cause diarrhea and gastrointestinal disturbances. Eating as little as 10 grams of sorbitol can cause diarrhea in some children. One piece of hard, sugar-free candy contains about 2.6 grams of sorbitol, and one thin, sugar-free chocolate bar contains about 10 grams. In adults and children, sorbitol may alter the absorption of other drugs, making them less effective or more toxic. GRAS. ASP. E

SORBOSE • Derived from sorbitol (see) by fermentation. Used in the manufacture of vitamin C—accounts for nearly a thousand tons of ascorbic acid (see) produced yearly. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging with no limitations other than good manufacturing practices. NUL.

SORBUS EXTRACT • Service Tree Extract. The extract of Sorbus domestica. An extract was used by the Indians to make a wash for sore and blurred eyes from the sun, as from climbing and hiking or from dust.

SORGHUM • The second most widely grown feed grain in the United States. Only 2 to 3 percent of the crop is used for human food in the United States, but it is the reverse in Africa and Asia. However, a new sorghum plant has been developed that is twice as nutritious in protein as the common variety and is 50 percent richer in lysine, an essential amino acid. The syrup, produced by evaporation from the stems and the juice, resembles cane sugar but contains a high proportion of invert sugars (see) as well as a starch and dextrin (see both). Very sweet, it is used as a texturizer and sweetener in foods.

SORGHUM GRAIN SYRUP • Produced from dried sorghum juice. See Sorghum.

SORREL EXTRACT • Rumex Extract. An extract of the various species of Rumex. The Europeans imported this to America and the Indians adopted it. Originally the root was used as a laxative and as a mild astringent. It was also used for scabs on the skin and as a dentifrice. It was widely used by American medical circles in this century to treat skin diseases.

SOY EXTRACT • See MSG.

SOY FLOUR • See Soybean Oil.

SOY LECITHIN ENZYMATICALLY MODIFIED TO HAVE INCREASED PHOPHATIDYLSERINE • Ingredient in food in general, except meat and poultry. Lipogen, which notified the FDA that it deserved a GRAS for this ingredient, summarized multiple published and unpublished studies examining the toxicity of soy lecithin PS and its phosphatidylserine component. Lipogen states that the safety of the phosphatidylserine component of soy lecithin PS is confirmed by a series of published short- and long-term animal toxicity studies, and tolerance by humans in clinical trials. Lipogen notes the absence of treatment-related adverse effects in these studies. Furthermore, Lipogen discusses an unpublished absorption study in humans with soy lecithin PS and published studies on absorption, distribution, metabolism and elimination studies with phosphatidylserine in rodents. Based on these reports, Lipogen states that the bioavailability of the ingested phosphatidylserine is limited due to extensive hydrolysis in the intestine prior to absorption, and that the absorbed phosphatidylserine and other components of soy lecithin PS are transported and metabolized like phospholipids in the diet. The Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA) (see) amended the Federal Food, Drug, and Cosmetic Act to require that the label of a food that is or contains an ingredient that bears or contains a “major food allergen” declare the presence of the allergen. FALCPA defines a “major food allergen” as one of eight foods or food groups (i.e., milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans) or a food ingredient that contains protein derived from one of those foods. The FDA has no questions about the applicant's GRAS status.

SOY PROTEIN ISOLATES • See Soybean.

SOY SAUCE • Fermented or Hydrolyzed. A hydrolysis product of soybeans. A combination of mold fermentation and acid hydrolysis is used. The molds employed are Aspergillus flavus, A. niger, and A. oryzae. Soy sauce consists of a mixture of amino acids, peptides, polypeptides, peptones, simple proteins, purines, carbohydrates, and other organic compounds suspended in an 18 percent sodium chloride solution. In 1983, some manufacturers began producing soy sauce with a lower salt content, but it is still very high. Used directly on food as a flavoring. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no available evidence that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amounts that can be added to food.

SOY STEROL • See Soybean Oil.

SOY STEROL ACETATE • See Soybean Oil and Acetate.

SOYA BEAN OIL FATTY ACIDS HYDROXYLATED • See Soybean Oil. ASP

SOYA FATTY ACID AMINE, ETHOXYLATED • See Soybean Oil. NUL

SOYA FATTY ACIDS HYDROXYLATED • See Soybean and Hydroxylate. ASP

SOYA HYDROXYETHYL IMIDAZOLINE • See Ethylenediamine and Urea.

SOYAMIDE DEA • See Soybean Oil.

SOYAMINE • See Soybean Oil.

SOYBEAN • An erect, bushy, hairy legume, Glycine max, native to Asia and extensively cultivated in China, Japan, and elsewhere, whose seeds yield valuable products. Contains glycerides of linoleic, oleic, linolenic, and palmitic acids. See Soybean Oil.

SOYBEAN OIL and FLOUR • Extracted from the seeds of plants grown in eastern Asia, especially Manchuria, and the midwestern United States. The oil is made up of 40 percent protein, 17 percent carbohydrates, 18 percent oil, and 4.6 percent ash. It contains ascorbic acid, vitamin A, and thiamine. Also used in the manufacture of margarine. Debittered soybean flour contains practically no starch and is widely used in dietetic foods. Soybean oil is used in defoamers in the production of beet sugar and yeast, and in the manufacture of margarine, shortenings, candy, and soap. Soybean is used in many products, including MSG, dough mixes, Lea & Perrins and Heinz's Worcestershire sauces, soy sauce (very salty, even the low-salt version), salad dressings, pork link sausages, luncheon meats, hard candies, nut candies, and milk and coffee substitutes. It is made into soybean milk, soybean curd, and soybean cheese. About 300 million bushels of soybeans are grown yearly in the United States, one-third more than in China. May cause allergic reactions. However, the JECFA (see) reports that allergenicity of soy bean oil has been inadequately tested and needs to be reevaluated. GRAS. EAF

SOYBEAN OIL, EXPOXIDIZED • See Soybean Oil. EAF

SOYBEAN OIL, HYDROGENATED • See Soybean Oil. ASP

SOYBEAN OIL UNSAPONIFIABLES • The fraction of soybean oil that is not saponified (turned into fatty alcohol) in the refining of soybean oil fatty acids.

SOY CONCENTRATE, ENZYME ACTIVATED • Enzymes are used to break down soy into easier-to-use amino acids and peptides. ASP

SOY PROTEIN, ISOLATE • The principal active components are isoflavones, phytochemicals that have demonstrated antioxidant, antiangiogenetic, and estrogen activity. ASP

SP • FDA abbreviation for spices and other natural seasonings and flavorings.

SP/ADJ • FDA abbreviation for spray adjuvant.

SPANISH HOPS • See Ditanny of Crete.

SPANISH ORIGANUM • See Origanum Oil.

SPEARMINT • Garden Mint. Green Mint. It is the essential volatile oil obtained by steam distillation from the fresh aboveground parts of the flowering plant Mentha spicata, grown in the United States, Europe, and Asia. It is colorless, yellow, or yellow-green with the characteristic taste and odor of spearmint. The principal active constituent of the oil contains at least 50 percent carvone (see). The fresh ground parts of the aromatic herb are used in spearmint flavoring for beverages, meats, and condiments (1,000 ppm). Widely cultivated in the United States, it is used in butter, caramel, citrus, fruit, garlic, soy, and spice flavorings for beverages, ice cream, ices, candy, baked goods, condiments (100,000 ppm), fats, oils, and icings (50,000 ppm). Has been used to break up intestinal gas. May cause allergic reactions such as skin rash. The plant Mentha spicata originated in Europe, was introduced into the United States, and is now one of the most important essential oil-bearing plants of the United States. Spearmint oil is produced by steam distillation of the flowering tops of the plants, which are partially dried prior to distillation. The distillation is carried out in the fields in stills. GRAS. ASP

SPECTINOMYCIN • A veterinary antibacterial additive. The FDA tolerance for its residue in edible tissues of chicken and in drinking water is 0.1 ppm.

SPERMACETI • Cetyl Palmitate. Derived as a wax from the head of the sperm whale. Used to make creams glossy and increase their viscosity. Generally nontoxic but may become rancid and cause irritations.

SPERM OIL, HYDROGENATED • Obtained from the sperm whale. Yellow, thin liquid; slightly fishy odor if not of good quality. Used as a releasing additive or lubricant in baking pans and as a coating on fresh citrus fruits. Processed to make it more solid. NUL

SPICE OLEORESINS • Derived from spices and contain the total odors and related characteristics. They are produced by extraction of the spice with a solvent or by distillation. Spice oleoresins are frequently used with added food-grade dilutents, preservatives, and antioxidants, and other substances that must be listed on the label in accordance with current U.S. regulations or with the regulations of other countries. See Oleoresins.

SPICES • Label listing may still contain MSG (see) and other additives you may wish to avoid, even though they are spices.

SPIKE LAVENDER OIL • French Lavender. Used in perfumes. A pale yellow, stable oil obtained from a flower grown in the Mediterranean region. A lavenderlike odor. Used in fruit, floral, mint, and spice flavorings for beverages, ice cream, ices, candy, and baked goods. Used also for fumigating to keep moths from clothes. Moderately toxic by ingestion. GRAS

SPIKENARD EXTRACT • Nardostachys jatamansi. An East Indian aromatic plant. The dried roots and young stems are used as an ingredient in flavorings and perfumes. It was not assigned for toxicology literature in 1999 and is still EAF.

SPINACH EXTRACT • An extract of the leaves of spinach, Spinaciea olerácea.

SPIRAEA EXTRACT • Queen Meadow. Extract from the flowers of Spiraea ulmaria. Contains an oil similar to wintergreen oil (see). The roots are rich in tannic acid (see).

SPIRAL FLAG OIL • See Costus Root Oil.

SPIRIT OF NITROUS ETHER • See Ethyl Nitrite.

SPIRIT VINEGAR • Grain Vinegar. Distilled Vinegar. Produced by the fermentation of dilute distilled alcohol and acetic acid. It is an acidulant and provider of flavor. It is used in mayonnaise, sauces, and salad dressings.

SPIRO(2,4-DITHIA-1-METHYL-8-OXABICYCLO(3.3.0)OCTANE3,3'-(1'-OXA-2'-ME) • Synthetic flavoring. ASP

SPIRULINA • The dried biomass of Athrospira platensis. Used in foods such as bars, powdered nutritional drink mixes, popcorn, and as a condiment in salads and pasta, at levels ranging from 0.5 to 3 grams per serving size. GRAS

SPLENDA • See Sucralose.

SPRUCE NEEDLES AND TWIGS • Extract of Picea spp. Used in flavorings. See Spruce Needles and Twigs Oil. NUL

SPRUCE NEEDLES AND TWIGS OIL • Colorless to light yellow, pleasant-smelling oil obtained from the needles and twigs of various spruces and hemlocks. Used chiefly in scenting soaps and cosmetics but also used as a flavoring. See Hemlock Oil. ASP

SQUALENE • Obtained by hydrogenation of shark-liver oil. Occurs in smaller amounts in olive oil, wheat germ oil, and rice bran oil. A faint agreeable odor, tasteless, miscible with vegetable and mineral oils, organic solvents, and fatty substances. A lubricant and perfume fixative. A bactericide used in surfactants (see).

STAB • FDA abbreviation for stabilizer.

STABILIZER • A substance added to a product to give it body and to maintain a desired texture or consistency. Chocolate milk needs a stabilizer to

keep the particles of chocolate from settling to the bottom of the container. Calcium (see Calcium Acetate) is used as a stabilizer in canned tomatoes to keep them from falling apart. Stabilizers that migrate from food-packaging material include aluminum mono-, di-and tristearate and ammonium citrate.

STANDARDS OF COMPOSITION • SOC. Regulate the amounts of cooked meat and poultry that processed products must contain. These standards dictate how much chicken goes into a chicken pot pie along with the peas and gravy. When shopping, you can compare foods for overall content. In "beef with noodles," beef is the main ingredient. In "noodles with beef," noodles are the main ingredient.

STANDARDS OF FILL • Guarantee that a minimum amount of food is placed in its container and prohibits excessive amounts of air or water.

STANDARDS OF IDENTITY • The FDA and USDA previously established a "recipe" for about three hundred foods, such as peanut butter and mayonnaise, fixing the ingredients by law. Many of these foods were exempted from the need for ingredient listing. The 1994 labeling law requires manufacturers to give full ingredient listings for all foods.

STANDARDS OF QUALITY • Ensure that only those fruits and vegetables of high quality, free of defects, are used. Products of lesser quality might be so labeled (mandarin orange pieces instead of segments, for example).

STANILO • Spectinomycin. An antibiotic used on chickens. The FDA limits residues to 0.1 ppm in chickens. Used to treat syphilis in humans. Potential adverse reactions in humans include hives, decreased urine output, fever, and chills.

STANNIC CHLORIDE • Tin Tetrachloride. A thin, colorless, fuming, caustic liquid, soluble in water. May be highly irritating to the eyes and mucous membranes. See Stannous Chloride. NUL. E

STANNOUS CHLORIDE • Tin Dichloride. An antioxidant, soluble in water, and a powerful reducing additive, used in canned asparagus, canned soda (11 ppm), and other foods. Used to revive yeast. Low systemic toxicity but may be irritating to the skin and mucous membranes. On the FDA list for further study of mutagenic, teratogenic, subacute, and reproductive effects since 1980. GRAS. ASP. E

STAPHYBIOTIC • Bactopen. Cloxacillin. Tegopen. A penicillin antibiotic used on cattle. The FDA permits residue of 0.01 ppm in uncooked edible tissue of cattle and in milk. Mildly toxic by ingestion but can cause allergic reactions. STAPHYLOCOCCUS CARNOSUS • Bacteria used as starter culture in fermented meat products that decreases the level of volatiles arising from fat oxidation. Reduces nitrate and ammonia. Acts as an antioxidant. In 2008, Danisco launched two new cultures, Staphylococcus carnosas combined with Staphylococcus carnosas vitulinus. The producer claims the cultures can give meats the same color, flavor, and shelf life as those cured with nitrite salts—but allowing for all-natural claims to be made on the label.

STAR ANISE • Chinese Anise. Fruit of Illicium verum from China, called star because of the fruit's shape. The extract is used in fruit, licorice, anise, liquor, sausage, root beer, sarsaparilla, vanilla, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, meats (1,000 ppm), and liqueurs. The oil is used in blackberry, peach, licorice, anise, liquor, meat, root beer, spice, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, baked goods, meats, syrups, and liqueurs. The fruit is a source of anise oil (see Anise). Star anise has been used as an expectorant and carminative. Japanese star anise is Illicium anisatum and contains a toxic lactone called anisatin, unknown in the Chinese variety. The Food and Drug Administration (FDA) released an advisory on September 10, 2003, warning consumers against drinking teas containing star anise. Reportedly, these teas caused illness in approximately forty individuals, including fifteen infants, over two years. Symptoms ranged from seizures and vomiting to jitteriness and rapid eye movement. GRAS

STARCH • Acid Modified. Pregelatinized and Unmodified. Starch is stored by plants and is taken from grains of wheat, potatoes, rice, corn, beans, and many other vegetable foods. Insoluble in cold water or alcohol but soluble in boiling water. Comparatively resistant to naturally occurring enzymes, and this is why processors "modify" starch to make it more digestible. Starch is modified with propylene oxide, succinic anhydride, 1-octenyl succinic anhydride, aluminum sulfate, or sodium hydroxide (see all), pullinase, and many other chemicals. Starch is a major component of cereals and many vegetables. The average U.S. diet has about 180 grams per person daily. Modified starch contributes about a gram per person per day. The source of starch and the type of modification are not usually identified on the label, since the FDA does not require it. The modified starches used in foods are most often bleached starch, acetylated distarch adipate, distarch phosphate, acetylated distarch phosphate, and hydroxypropyl distarch phosphate. The latter three are commonly used in baby foods. Used internally to alleviate diarrhea. The final report to the FDA of the Select Committee on GRAS Substances said there was no information that starch acetate was hazardous to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. On the other hand, starch sodium succinate, starch sodium octenyl succinate, and starch sodium hypochlorite oxidized were said not to demonstrate a hazard to the public at current use levels, but uncertainties do exist, requiring additional studies. However, GRAS status continues while tests are being completed and evaluated. Acid-modified and pregelatinized starches were said in the final report to be GRAS and require no limitations other than good manufacturing practices. ASP.

STARCH, ACID MODIFIED • See Acid Modified Starch. ASP

STARCH, ALPHA-AMYLASE MODIFIED • See Starch. NUL

STARCH, BLEACHED • A thickener starch is bleached with active oxygen obtained from hydrogen peroxide and/or peracetic acid, ammonium persulfate, sulfur dioxide, chlorine (as calcium hypochlorite), and potassium permanganate. The starch is bleached to obtain a whiter product. Bleaching improves extraction, separation, and purification processes leading to higher yields. Starch bleached with calcium hypochlorite has limited use as a component of batter for commercially processed foods. If the additive is used in a product, it will have a label stating, "food starch-modified." Starch may be bleached by treatment with one or more of the following: active oxygen obtained from hydrogen peroxide and/or peracetic acid, not to exceed .45 percent of active oxygen ammonium persulfate, not to exceed .075 percent and sulfur dioxide, not to exceed .05 percent chlorine, as calcium hypochlorite, not to exceed .036 percent of dry starch chlorine, as sodium hypochlorite, not to exceed .0082 pound chlorine per pound of dry starch potassium permanganate, not to exceed .2 percent (residual not to exceed 50 ppm) sodium chlorite, not to exceed .5 percent. ASP

STARCH DIETHYLAMINCIETHYL ETHER • See Starch.

STARCH, FOOD MODIFIED ACETYLATED DISTARCH ADIPATE • See Modified Starch. ASP

STARCH, FOOD, MODIFIED ACETYLATED DISTARCH GLYCEROL • See Modified Starch. NIL

STARCH, FOOD, MODIFIED ACETYLATED DISTARCH OXYPROPANOL • See Modified Starch. EAF

STARCH, FOOD, MODIFIED BETA-AMYLASE MODIFIED STARCH • See Modified Starch and Enzymes. EAF

STARCH, FOOD, MODIFIED DISTARCH GLYCEROL • See Modified Starch and Glycerol. NIL

STARCH, FOOD, MODIFIED PULLULANASE • See Modified Starch. EAF

STARCH, PREGELATININZED • Pregelatinized starch is starch (vegetable source) that has been processed (cooking starch slurries, drying and grinding, or applying chemicals to modify its properties) to permit swelling in cold water, unlike natural starch, which requires heating. ASP

STARCH SODIUM OCTENYL SUCCINATE • Emulsifier, stabilizer, thickener. See Succinic Acid. E

STARCH, UNMODIFIED • Refers to the absence of any attempt to alter or influence the raw material's physical properties. ASP

STARTER DISTILLATE • Butter Starter Distillate. Steam distillate of Streptococcus lactis, S. cremoris, S. lactis subsp. diacetylactic, Leuconostoc citrovorum, and L. dextronicum. Used as a flavoring additive in margarine. GRAS

STEARAMIDE • Emulsifier. Colorless leaflets, insoluble in water. See Stearic Acid.

STEARAMINE • See Stearic Acid.

STEARAMINE OXIDE • See Stearyl Alcohol.

STEARATES • Salts of stearic acid (see).

STEARETH-2 • A polyoxyethylene (see) ether of fatty alcohol. The oily liquid is used as a surfactant (see) and emulsifier (see).

STEARETH-4 THROUGH-100 • The polyethylene glycol esthers of stearyl alcohol. The number indicates the degree of liquidity; the higher, the more solid. See Steareth-2.

STEARIC ACID • Octadecanoic Acid. Occurs naturally in some vegetable oils, cascarilla bark extract, and as a glyceride (see) in tallow and other animal fats and oils. A white, waxy, natural fatty acid, it is the major ingredient used in making bar soap and lubricants. Prepared synthetically by hydrogenation (see) of cottonseed and other vegetable oils. Slight tallowlike odor. Used in butter and vanilla flavorings for beverages, baked goods, and candy (4,000 ppm). Also a softener in chewing-gum base. It is a possible sensitizer for allergic people. Caused tumors in experimental animals. A human skin irritant. In 1988, University of Texas researchers reported in the New England Journal of Medicine that it did not raise blood cholesterol levels as much as other saturated fats. See Fatty Acids. GRAS. ASP

STEARYL ACETATE • The ester of stearyl alcohol and acetic acid (see both).

STEARYL ALCOHOL • Stenol. A mixture of solid alcohols prepared from sperm whale oil. White flakes, insoluble in water, soluble in alcohol and ether. Used as a coating additive, emulsifier, lubricant, solvent, and texturizing additive in baked goods, cakes, desserts, fruits, ice cream, nuts, peanut butter, puddings, shortening, and whipped toppings. A substitute for cetyl alcohol (see) to obtain a firmer product at ordinary temperatures. ASP

STEARYL ALCOHOL, PLUS BEESWAX • Emulsifier and thickener. ASP

STEARYL BETAINE • See Surfactants and Stearic Acid.

STEARYL CAPRYLATE • The ester of stearyl alcohol and citric acid (see both).

STEARYL CITRATE • The ester of stearyl alcohol and citric acid (see both). A metal scavenger to prevent adverse effects of trace metals in foods and an antioxidant to prevent rancidity in margarine. GRAS. ASP

STEARYL DIMETHYLAMINE • See Stearyl Alcohol.

STEARYL ERUCATE • See Stearyl Alcohol and Erucic Acid.

STEARYL GLYCYRRHETINATE • The ester of stearyl alcohol and glycyrrhetinic acid (see both).

STEARYL HEPTANOATE • Ester of stearyl alcohol and heptanoic acid (see both). Used as a wax.

STEARYL LACTATE • An emulsifier that occurs in tallow and other animal fats as well as vegetable oils. Used to emulsify shortening in nonyeast-leavened bakery products and pancake mixes. Also used to emulsify cakes, icings, and fillings.

STEARYL MONOGLYCERIDYL CITRATE • The soft, practically tasteless, off-white, waxy solid used as an emulsion stabilizer in shortening with emulsifiers. Not over 0.15 percent in food. It is prepared by the chemical reaction of citric acid on monoglycerides of fatty acids (see). ASP

STEARYL OCTANOATE • The ester of stearyl alcohol and 2-ethylhexanoic acid. See Stearyl Alcohol.

STEARYL STEARATE • The ester of stearyl alcohol and stearic acid (see both).

STEARYL STEAROYL STEARATE • See Stearyl Alcohol.

STEARYL TARTRATE • The product of the esterification of tartaric acid with commercial stearyl alcohol. Used as a dough-strengthening additive.

S-(TETRAHYDRO-2,5-DIMETHYL-3-FURANYL) ETHANETHIOATE • Synthetic flavoring. EAF

STERCULEN • Sterculia. See Karaya Gum.

STERCULIA GUM • See Karaya Gum. GRAS

STERILANTS • Pesticide to try and keep insects and vertebrates from reproducing.

STEROIDS • Class of compounds that includes certain compounds of hormonal origin, such as cortisone, and used to treat inflammations caused by allergies. Cholesterol, precursors of certain vitamins, bile acids, alcohols, and many plant derivatives such as digitalis are steroids. Steroids can reduce white blood cell production, and reduce prostaglandins and leukotrienes. Natural and synthetic steroids have four rings of carbon atoms but have different actions according to what is attached to the rings. Cortisone and oral contraceptives are steroids.

STEROL • Any class of solid complex alcohols from animals and plants. Cholesterol is a sterol.

STEROYL MONOGLYCERIDYL CITRATE • A stabilizer in shortenings. See Monoglycerides and Citric Acid.

STEVIA REBAUDIANA • See Stevioside.

STEVIOSIDE • Sweetleaf. Candy Leaf. Flavoring ingredient equal in sweetness to sugar. Extract of the leaves of Stevia rebaudiana, a South American plant claimed to have antibacterial, antifungal, antiinflammatory, antimicrobial, antiviral, antiyeast, cardiotonic, diuretic, hypoglycemic, hypotensive, tonic, and vasodilator benefits. However, in animal experiments it was found to be toxic to pregnant rodents and to affect the kidneys. Insufficient testing has been conducted on stevioside to support a food additive petition for its use as a sweetener in the United States. In 1999, the JECFA, the World Health Organization, and the Scientific Committee for Food of the European Union reviewed stevioside and determined that on the basis of the scientific data currently available stevioside is not acceptable as a sweetener. Stevioside is allowed in food for sweetening purposes in ten countries. Since the 1970s stevioside has been used as a sweetener in Japan, where it is used alone or in combination with other sweeteners in beverages, tabletop sweeteners, chewing gum, pickles, dried seafoods, flavorings, and confectioneries. Used in the United States in the 1980s, then banned in 1991 and subsequently allowed in as a dietary supplement but not a food additive. A candidate for approval as an artificial sweetener in the United States at this writing. It would be used as a tabletop sweetener, in soft drinks, gum, sauces, and syrups if approved by the FDA. An herbal product, stevia has been proposed as a sugar substitute. However, the FDA has identified concerns about potential adverse health effects. Specifically, the FDA cautions that stevia may have a negative impact on reproduction, cancer development, and metabolism. Stevia cannot be sold as a sweetener but is available as a dietary supplement. The JECFA (see) noted that stevioside has shown some evidence of pharmacological effects in patients with high blood pressure or with type 2 diabetes at doses of about 12.3-25 mg/kg bw per day. The evidence

available was inadequate to assess whether these pharmacological effects would also occur at lower levels of dietary exposure, which could lead to adverse effects in some people—especially those with low blood pressure or insulindependent diabetes. The JECFA asked for more studies in humans with normal blood pressure, low blood pressure, or insulin-dependent diabetes.

ST. JOHN'S WORT • See Saint John's Wort. NIL

STONEROOT • Horse Balm. Used for its constituents of resin, saponin, and tannic acid (see all). An erect, smooth perennial; a strong-scented herb of eastern North America with pointed leaves. It produces a chocolate-colored powder with a peculiar odor and bitter, astringent taste. Soluble in alcohol.

STORAX • Styrax. Sweet Asian gum from Liquidambar spp. It is the resin obtained from the bark of an Asiatic tree. Grayish brown, fragrant semiliquid, containing also styrene and cinnamic acid (see both). Used in strawberry, fruit, and spice flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and toppings. Moderately toxic when ingested. Can cause urinary problems when absorbed through the skin. Can cause skin irritation, welts, and discomfort when applied topically. A common allergen. There was reported use of the chemical in 1999 and it had not been assigned for toxicology literature. It is still ASP.

STORAX OIL • See Storax. EAF

STPP • See Sodium Tripolyphosphate.

STRAWBERRY ALDEHYDE • Synthetic flavoring. GRAS

STRAWBERRY EXTRACT • See Strawberry Juice.

STRAWBERRY JUICE • Flavoring. Fresh ripe strawberries are reputed to contain ingredients that soften and nourish the skin. Widely used in natural cosmetics today. No scientific evidence of benefit or harm.

STRAWFLOWER EXTRACT • The extract of Helichrysum italicum, grown for its bright yellow, strawlike flowers. Used in coloring.

STREPTOMYCIN • An aminoglycoside antibiotic, it is given by injection and is active against streptococcal endocarditis, an infection of the heart in humans. It is used as an animal antibiotic in chickens, swine, and turkeys. The FDA limits residue to zero in these products, including eggs. EPA Genetic Toxicology Program. Potential adverse reactions in humans to streptomycin include ear problems, muscle problems, kidney dysfunction, local pain, irritation, and sterile abscesses at the site of injection and skin disorders. Has been implicated in aplastic anemia.

STRONTIUM HYDROXIDE • Colorless, water-absorbing crystals or white powder. Absorbs carbon dioxide from the air. Very alkaline in solution. Used in refining beet sugar and separating sugar from molasses. Irritating when applied to the skin.

STRUCTURED TRIGLYCERIDES • Used in infant formula for term and preterm infants at levels of up to 80 percent total fat intake. GRAS

STRYCHNINE • Used as a pesticide, particularly for killing small vertebrates, such as birds and rodents. Strychnine causes muscular convulsions and eventually death through asphyxia or sheer exhaustion. The most common source is from the seeds of the Strychnos nux vómica tree. Strychnine is one of the most bitter substances known. Its taste is detectable in concentrations as low as 1 ppm. It is highly toxic to humans but was once used in minute doses as a medication. It is banned in organic livestock production even though it is botanical.

STYRACIN • See Cinnamyl Cinnamate.

STYRAX • See Storax.

STYRENE • Obtained from ethylbenzene by taking out the hydrogen. Used in the manufacture of paper and paperboard and used as a chewing substance in chewing gum. May be irritating to the eyes and mucous membranes, and in high concentrations it is narcotic. ASP

STYRENE-DIVINYLBENZENE COPOLYMER CHLOROMETHYLATED, AMI-NATED OXIDIZED • See Styrene. NUL

STYRENE-DIVINYLBENZENE-METHYL ACRYLATE, SULFONATED TER-POLYMER • See Styrene Divinylbenzene Sulfonated Copolymer. NUL

STYRENE DIVINYLBENZENE SULFONATED COPOLYMER • Porous material used in the production of resins. See Styrene. NUL

STYRENE, DVB-ACRYLONITRILE-METHYL ACRYLATE, SULFONATED TETRAPOLYMER • See Styrene, Divinylbenzene and Acrylamide. NIL

STYRYLCARBINOL • See Cinnamyl Alcohol.

STYRYLPYRIDINIUM CHLORIDE, DIETHYL CARBAMAZINE • Used in animal feed to combat worms.

SUBACUTE • A zone between acute and chronic or the process of a disease that is not overt. Subacute endocarditis, for example, is an infection of the heart. It is usually due to a “strep germ” and may follow temporary infection after a tooth extraction.

SUBSTITUTE • Means the product is equivalent to the food it resembles. See Imitation.

SUCCINIC ACID • Occurs in fossils, fungi, lichens, etc. Prepared from acetic acid (see). Odorless; acid taste. The acid is used as a plant-growth retardant. A buffer and neutralizing additive in food processing. Has been employed medicinally as a laxative. Large amounts injected under the skin of frogs kills them. GRAS. ASP. E

SUCCINIC ANHYDRIDE • A starch modifier up to 4 percent. See Succinic Acid. NIL

SUCCINILSTEARIN • Stearoyl Propylene Glycol Hydrogen Succinate. The additive is the reaction product of succinic anhydride, fully hydrogenated vegetable oil, predominantly fatty acids, and propylene glycol (see both). An emulsifier in or with shortenings and edible oils intended for use in cakes, cake mixes, fillings, icings, pastries, and toppings, in accordance with good manufacturing practices. See Succinic Acid. NIL

SUCCINYLATED GELATIN • Used for making microcapsules for flavoring oils. NUL

SUCCINYLATED MONOGLYCERIDES • Surfactants (see) used as dough conditioners to add loaf volume and firmness. See Glycerides and Succinic Acid. ASP

SUCCISTEARIN • Stearoyl Propylene Glycol Hydrogen Succinate. The reaction product of succinic anhydride, fully hydrogenated vegetable oil and propylene glycol. The additive is used or intended for use as an emulsifier in or with shortenings and edible oils intended for use in cakes, cake mixes, fillings, icings, pastries, and toppings, in accordance with good manufacturing practice. NIL

SUCRALOSE • Splenda. An artificial sweetener made from sugar. Producers claim it has no aftertaste and is more stable. It can be used in cooking and is already sold in Canada and Latin America. Among its users are Cadbury Beverages and Corby Distilleries in liqueurs. It is used as a tabletop sweetener, in baked goods, fruit spreads, desserts, and confections, but its biggest use is expected to be in diet drinks. There were early reports of thymus shrinkage in animals and some reports of mutagencity. The EU ordered further studies and in 2000 concluded that at current use it is safe. Sucralose is promoted as “Made from sugar,” although its chemical makeup includes chlorine. It is six hundred times sweeter than table sugar. Sucralose does not provide calories because, unlike sucrose, it is not broken down and passes through the body virtually unchanged. It does not affect blood sugar levels or insulin production, and therefore may be safely used by people with diabetes. The FDA approved sucralose for use in 1998. Sucralose is found in products such as baked goods, nonalcoholic beverages, chewing gum, frozen dairy desserts, fruit juices, and gelatins. Sucralose has a good shelf life, is heat stable, and may be used in cooking. It is marketed under the brand name Splenda. The FDA allows the claim

Sucralose has a good shelf life, is heat stable, and may be used in cooking. It is marketed under the brand name Splenda. The FDA allows the claim for it to be "does not cause cavities." EAF. E

SUCROGLYCERIDES • Used as emulsifiers. Sucroglycerides are obtained by reacting sucrose with an edible fat or oil with or without the presence of a solvent. They consist of a mixture of mono- and diesters of sucrose and fatty acids together with mono-, di-, and triglycerides from the fat or oil. E

SUCROSE • Sugar. Cane Sugar. Saccharose. A sweetening additive and food, a starting additive in fermentation production, a preservative and antioxidant in pharmaceuticals, a demulcent, and a substitute for glycerin (see). Table sugar can stimulate the production of fat in the body, apart from its calorie content in the diet, and may be particularly fat producing in women on the "pill." Workers who handle raw sugar often develop rashes and other skin problems. GRAS. ASP

SUCROSE ACETATE ISOBUTYRATE • A mixture of esters (see) of sucrose with acetic and isobutyric acids (see both). Sucrose acetate isobutyrate produced liver damage in dogs but not in mice or rats. In three studies, a total of seventy-one human volunteers did not respond the same way as dogs did and did not seem to have any adverse effects. The committee decided to use the NOEL (see) of 2 grams per kg of body weight per day for rats—the lowest obtained in long-term toxicity studies—to allocate a temporary ADI of 0–10 mg per kg of body weight using a safety factor of 200. They also asked for further data that would explain the disparate effects of sucrose acetate isobutyrate on the liver functions in dogs compared with other species, in particular the human. ASP. E

SUCROSE BENZOATE • See Benzoic Acid.

SUCROSE DISTEARATE • A mixture of sucrose and stearic acid (see both).

SUCROSE FATTY ACID ESTERS • Sucrose Esters. Derived from sucrose (see) and edible tallow, the FDA gave permission in 1982 for their use as components of protective coatings for fruits. They are also used as emulsifiers, stabilizers, and texturizers. The FDA said that there was not a basis for GRAS determination. Application was resubmitted in 2001 for GRAS. The FDA in 2008 said the filing of the notice does not provide a basis for a GRAS determination. The FDA is amending the food additive regulations to provide for the safe use of sucrose oligoesters (sucrose esters of fatty acids with an average degree of esterification ranging from four to seven) as an emulsifier or stabilizer, at a level not to exceed 2 percent, in chocolate and in butter-substitute spreads. This action is in response to a petition filed by Mitsubishi Chemical Corp. ASP. E

SUCROSE LAURATE • A mixture of sucrose and lauric acid (see both).

SUCROSE LIQUID • See Sucrose. ASP

SUCROSE OCTAACETATE • Prepared from sucrose (see). A synthetic flavoring used in bitters, spice, and ginger ale flavorings for beverages. Used in adhesives; a denaturant for alcohol. ASP

SUCROSE OLIGOESTERS • See Sucrose Fatty Acid Esters. EAF

SUCROSE POLYESTER • See Olestra.

SUCROSE STEARATE • A mixture of sucrose and stearic acid (see both).

SUDAN RED • Red dyes used for coloring solvents, oils, waxes, petrol, and shoe and floor polishes. They are not allowed to be added to food in the UK and the rest of the EU. However, Sudan dyes have been found in a large number of food products containing contaminated chili powder, which was imported mainly from India. Fresh chilies are not affected. Sudan dyes have been shown to cause cancer in laboratory animals and these findings could also be significant for human health. Because Sudan dyes may contribute to the development of cancer in people, they are not considered safe to eat. But there is no immediate risk of illness. At the levels found in these foods, the risk is likely to be very small. The FSA is working with local authorities to stop all products containing Sudan dyes (this includes Sudan I, Sudan II, Sudan III and Sudan IV, which is also known as scarlet red) from being sold in the UK. It is also asking companies that produce and sell these products to make sure they are withdrawn and recalled. Cargoes of dried and crushed or ground chili and curry powders coming into any country in the EU must be accompanied by a certificate showing they have been tested and found to be free of Sudan dyes. Random sampling is also being carried out at ports and by local authorities. All consignments found to contain these dyes are destroyed.

SUGAR • A carbohydrate product made up of one, two, or more saccharose groups. The monosaccharide sugars—often called simple sugars—are composed of chains of 207 carbon atoms. Chief among the monosaccharides are glucose, dextrose, fructose, and levulose. Among the disaccharides are sucrose—cane or beet sugar—lactose found in milk, maltose found in starch, and cellobiose from cellulose (see). High polymer sugars occur as water-soluble gums such as arabic and tragacanth. Sugar is an important source of metabolic energy in foods and its formation in plants is an essential factor in the life process. It has many uses as a food additive other than just sweetening. It acts as a tenderizer by absorbing water and inhibiting flour gluten development, as well as slowing down starch gelling. It mixes air into shortening in the creaming process and caramelizes under heat, to provide cooked and baked foods with pleasing color and aroma. It speeds the growth of yeast by providing nourishment and helps to keep beaten eggs whipped. It delays coagulation of egg proteins in custards and helps the gelling of fruit jellies and preserves. It also helps prevent them from spoiling and keeps canned and frozen fruits looking appetizing and tender. It helps to make a wide variety of candies through varying degrees of recrystal-lization and enhances the smoothness and flavor of ice cream. Most people think of table sugar or sucrose when the word is mentioned. It contains only sixteen calories per teaspoon, something to consider when considering a sugar substitute.

SUGAR ALC • Listing on food labels for sugar alcohols (see).

SUGAR ALCOHOLS • These are monosaccharides. One of the most important is glycerol (see); others include inositol, mannitol, sorbitol, and xylitol (see all). Many so-called dietetic foods that are labeled "sugar free" or "no sugar added" in fact contain these sugar alcohols. They have fewer calories than sucrose (table sugar), but they can raise blood sugar levels. Foods containing sugar alcohols can cause stomach problems, including diarrhea if eaten in large quantities. Under EU rules, poly-ols—sugar alcohols—can only claim to contain 2.4 kcal/g of the sweetener, as opposed to 4 kcal/g for sugar.

SUGAR BEET • Beta vulgaris, a member of the Chenopodiaceae family, is a plant whose root contains a high concentration of sucrose. It is grown commercially for sugar. The sugar beet is directly related to the beetroot, chard beet, and fodder beet, all descended by cultivation from the sea beet. The European Union, the United States, and Russia are the world's three largest sugar beet producers, although only the EU and Ukraine are significant exporters of sugar from beet. Beet sugar accounts for 30 percent of the world's sugar production. In the United States, genetically modified sugar beets resistant to glyphosate (marketed by Monsanto as Roundup, a herbicide) were slated to be planted for the first time in the spring of 2008. Sugar from the biotechnology-enhanced sugar beet has been approved for human and animal consumption in the EU. This action by the EU executive body allows unrestricted imports of food and feed products made from (H7-1) glyphosate-tolerant (Roundup Ready) sugar beets.

SUGAR BEET EXTRACT FLAVOR BASE • Crystals are separated from beet syrup using a centrifuge. The separated molasses is reboiled and recentrifuged to remove additional sugar. Finally the molasses is treated with lime and mixed with raw juice to extract still more sugar. The crystallized sugar is dried in granulators, cooled and sold as granulated sugar, blended with flour to make powdered sugar, or mixed with molasses to make brown sugar. A flavoring in foods. Also used as a pink or red coloring. See Sucrose. ASP

SUGAR BEET FIBER • Beet Fiber. Sugar Beet Pulp. Natural fiber of sugar beets remaining after water extraction of the sugar from the mechanically sliced sugar beets. Exists in various grades from coarse fibrous flakes to fine powders. Used as an anticaking additive, binding additive, bulking additive, dietary supplement, dispersing additive, nutrient, stabilizing additive, texturizing additive, and thickening additive.

SUGAR BEET JUICE EXTRACT • See Sugar Beet Extract Flavor Base. EAF

L-SUGARS • Candidate for artificial sweeteners. No specific use given as yet.

SUGAR SOLID EXTRACT • See Sucrose.

SULFA ANTIBIOTICS • More than fifty compounds that contain both sulfur and nitrogen with a specificity for certain bacteria. Because of their toxicity and often serious side effects, their use in treating disease is limited, at least intentionally in humans. They are widely used, however, in treating animals and animal feeds.

SULFABROMOMETHAZINE SODIUM • 5-Bromosulfamethazine. A widely used sulfa antibacterial to treat cattle. The FDA limits residue to 0.1 ppm in uncooked edible tissues of cattle and 0.01 ppm in milk. Sulfa drugs can cause sensitivity to the sun. Mildly toxic by ingestion. Caused tumors and birth defects in experimental animals.

SULFACHLORPYRIDAZINE • A veterinary antibiotic. The FDA allows 0.1 ppm as residue in uncooked edible tissue of calves and swine. See Sulfa Antibiotics.

SULFADIMETHOXINE PLUS ORMETOPRIM • A feed additive, the FDA allows 0.1 ppm sulfa residue in uncooked edible tissues of chickens, turkeys, cattle, ducks, salmon, and catfish. The agency allows 0.01 ppm in milk. Ormetoprim residue is allowed at 0.1 ppm in edible tissues of chickens, turkeys, ducks, salmon, and catfish. See Sulfa Antibiotics.

SULFAETHOXYPYRIDAZINE • A feed additive. The residues allowed in edible tissues of cattle are 0.1 ppm and zero in milk and uncooked edible tissue of swine. It is used in the drinking water of cattle and swine. See Sulfa Antibiotics.

SULFAMERAZINE • Used in fish feed on fish farms. FDA tolerance is zero in edible tissues of trout as residue. See Sulfa Antibiotics.

SULFAMETHAZINE • An antibiotic used in cattle. The FDA permits 0.1 ppm as residue in the edible tissues of cattle, swine, turkeys, and chicken. See Sulfa Antibiotics.

SULFAMETHAZINE A (WITH CHLORTETRACYCLINE and PENICILLIN) or SULFAMETHAZINE B (WITH TYLOSIN) • Antibiotics used in animal feed. The FDA permits 0.1 ppm in uncooked edible tissues of chickens, turkeys, cattle, and swine. See Sulfa Antibiotics, Tetracyclines, Penicillin, and Tylosin.

SULFAMETHAZINE SODIUM • See Sulfa Antibiotics.

SULFAMIC ACID • A strong, white crystalline acid used chiefly as a weed killer, in cleaning metals, and as a softening additive. Used as a plasticizer and fire retardant for paper and other cellulose products; as a stabilizing additive for chlorine and hypochlorite, bleaching paper pulp; and as a catalyst for urea formaldehyde resin. Moderately irritating to the skin and mucous membranes. GRAS. ASP

6-SULFANILAMIDO-2,4-DIMETHOXYPYRIMIDINE • Abcid. Agribon. Albon. Bactrovet. A widely used sulfa antibacterial drug to treat cattle, poultry, and in animal feed. It is also used in catfish farming to prevent infections. The FDA limits residues to 0.1 ppm in chickens, turkeys, cattle, ducks, salmon, and catfish. Caused birth defects in experimental animals. Sulfa drugs can cause sensitivity to sunlight and allergic reactions.

SULFANITRAN • A sulfa antibiotic used to treat chickens. FDA residue limit is zero in chickens. Sulfa drugs can cause sensitivity to light and allergic reactions in humans.

SULFAQUINOXALINE • A sulfa drug used in animal feed. Moderately toxic by ingestion. Sulfa drugs can cause sensitivity to light and allergic reactions in humans.

SULFATE • A salt or ester of sulfuric acid (see). A chemical is “sulfated” to help control the acid-alkali balance.

SULFATED BUTYL OLÉATE • An emulsion used to dehydrate grapes to raisins. Made from oleic acid with butanol. See Oleic Acid and Butyl Alcohol.

SULFATED GLYCERYL OLÉATE • Produced by adding sulfuric acid to glyceryl oleate. See Sulfonated Oils.

SULFATED OIL • A compound to which a salt of sulfuric acid has been added to help control the acid-alkali balance.

SULFATED TALLOW • Fat from fatty tissues of sheep and cattle that becomes solid at 40° to 46° F. It is a defoaming additive in yeast and beet sugar production in “amounts reasonably required to inhibit foaming.” See Tallow Flakes for toxicity.

SULFATHIAZOLE COMBINED WITH CHLORTETRACYCLINE and PENICILLIN • Antibiotic compound used in animal feeds. See Sulfa Antibiotics, Tetracycline, and Penicillin.

SULFIDES • Inorganic sulfur compounds that occur free or in combination with minerals. They are salts of weak acid.

SULFITE DIOXIDE • See Sulfites.

SULFITES • Sodium, Potassium, and Ammonium. Preservatives, antioxidants, and antibrowning additives used in foods. Sulfites are also used for bleaching food starches and as a preventive against rust and scale in boiler water used in making steam that will come in contact with food. Some sulfites are used in the production of cellophane for food packaging. The FDA prohibits the use of sulfites in foods that are important sources of thiamine (vitamin B1), such as enriched flour, because sulfites destroy the nutrient. There are six sulfiting additives that are currently listed as GRAS chemical preservatives. They are sulfur dioxide, sodium sulfite, sodium and potassium bisulfite, and sodium and potassium metabisulfite (see all). Under the current listing, sulfiting additives may be used as preservatives in any food except recognized sources of vitamin B1. These additives have been used in many processed foods and in cafeterias and restaurants to prevent fruits, green vegetables, potatoes, and salads from turning brown, as well as to enhance their crispness. The FDA had sulfiting additives under review. As part of this review, a proposal to affirm the GRAS status of sulfur dioxide, sodium bisulfite, and sodium and potassium metabisulfite, with specific use limitations, was published in the Federal Register of July 9, 1982. The agency did not propose to affirm the GRAS status of sodium sulfite and potassium bisulfite because it had no evidence to indicate their current use in food. Reactions to sulfites can include acute asthma attacks, loss of consciousness, anaphylactic shock, diarrhea, and nausea occurring soon after ingesting sulfiting additives. There have been seventeen deaths that the FDA has determined were “probably or possibly” associated with sulfites. The FDA banned the use of the preservative on fresh fruits and vegetables and at this writing is reviewing a proposal to prohibit it on fresh, precut potatoes. The FDA decided in 1988 against extending its ban on the use of sulfites to a variety of foods sold in supermarkets and served in restaurants, including wine, dried fruit, some seafood, and condiments. Sulfites must be declared on the labels of wine and packaged foods sold in supermarkets when they are added in excess of 10 ppm. A citizens' petition was submitted by the Center for Science in the Public Interest, Washington, D.C., on October 28, 1982, that asked the agency to restrict the use of sulfiting additives to a safe residue level in food or require labels on those food products in which sulfiting additives must be used at higher levels to perform essential public health functions. In the meantime, the California Grape and Tree Fruit League recommended that the FDA affirm as GRAS sulfiting additives used in sulfur dioxide

fumigation within specific limitations and include its use as an ingredient to treat fresh grapes. Stating that the compound is essential to the marketing, transport, storage, and export of table grapes, the group claimed lack of any known substitute for the gaseous compound effective in preventing mold-rot and other storage fungi and in prolonging storage life. A spokesperson for the Wine Institute, which represents 460 domestic wine makers, said that many of the sulfur compounds in wine are natural parts of fermentation, but they are also added to many wines. Sulfites are still used in processed foods, dried fruits, wines, and beers. When dining in a restaurant, you have to have a lot of faith in your waiter if you are allergic to sulfites. Foods, especially potato products and some canned foods served in restaurants, could contain sulfites. You can ask, but you may not receive an informed answer. You have to be cautious about "prepared" products in general if you are sulfite sensitive. For example, lemon juice from a lemon may be fine, but from a bottle it may contain sodium bisulfite. The JECFA (see) concluded in June 1998 that "the potential exists for high consumers of sulfites to exceed the ADI, but the available data were insufficient to estimate the number of high consumers or the magnitude and duration of intake above the ADI." The committee is reviewing this additive's levels in dried fruits, jams, jellies, marmalades, fruit preparations including pulp and fruit toppings, dried vegetables, vegetables, nut and seed purees and spreads, white and semiwhite sugar, concentrates for fruit juice, wines, and fruit wines. ASP sulfur dioxide (E220) and other sulfites (E221, E222, E223, E224, E226, E227, and E228) are used as preservatives in a wide range of foods, in particular soft drinks, sausages, burgers, and dried fruits and vegetables. Sulfur dioxide is produced naturally when wine and beer are made and it is often added to wine to stop it from continuing to ferment in the bottle. Usually, most of the "head space" in a bottle of wine (the part of the bottle not filled with wine) is sulfur dioxide. Anyone who has asthma may react to inhaling sulfur dioxide. Very few people with asthma have had an attack after drinking acidic drinks containing sulfites, but this is not thought to be very common. Food labeling rules require prepacked food sold in the UK, and the rest of the EU, to show clearly on the label if it contains sulfur dioxide or sulfites at levels above 10 mg per kg or per liter (or if one of its ingredients contains it). Bear in mind that there could still be foods on the shelves that were produced before this law was introduced (November 2005).

SULFITE AMMONIA CARAMEL • Sulfite Ammonia Caramel. See Caramel. E

SULFITING AGENTS • See Sulfites. ASP

SULFOACETATE DERIVATIVES OF MONOGLYCERIDES and DIGLYCERIDES • Used as emulsifiers. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there were insufficient biological and other studies upon which to base an evaluation of them when they are used as food ingredients.

SULFOMYXIN • A sulfa drug used to combat bacteria in chickens and turkeys. The FDA limits residue to zero in uncooked edible tissues of chickens and turkeys. Sulfa drugs can cause sensitivity to light and allergic reactions in humans.

SULFONATED OILS • Sulfated. Prepared by reacting oils with sulfuric acid. Used in soapless shampoos and hairsprays as an emulsifier and wetting additive.

SULFOPROPYL CELLULOSE • Resin used in pesticides. See Cellulose and Sulfur Dioxide. EAF.

SULFO-p-TOLUENE • Sodium Chloramine. A water-purifying additive and a deodorant used to remove onion and weed odors in cheese. Toluene may cause mild anemia and is narcotic in high concentrations.

SULFUR DIOXIDE • A gas formed when sulfur burns. Used to bleach vegetable colors and to preserve fruits and vegetables; a disinfectant in breweries and food factories; a bleaching additive in gelatin, glue, and beet sugars; an antioxidant, preservative, and antibrowning additive in wine, corn syrup, table syrup, jelly, dried fruits, brined fruit, maraschino cherries, beverages, dehydrated potatoes, soups, and condiments. Should not be used on meats or on foods recognized as a source of vitamin A because it destroys the vitamin. Poisonous, highly irritating. Often cited as an air pollutant. On the EPA Extremely Hazardous Substances List and EPA Genetic Toxicology Program. Inhalation produces respiratory irritation and death when sufficiently concentrated. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no available evidence that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food. Sulfur dioxide is also a preservative, but not to be used in meats or in foods recognized as a source of vitamin B1. The following are food categories with common levels of sulfur dioxide: baked goods, 30 ppm; beer, 25 ppm; canned vegetables, 30 ppm; condiments and relishes, 30 ppm; dehydrated vegetables, 200 ppm. ASP. E

SULFURIC ACID • Oil of Vitriol. A clear, odorless, oily acid used to modify starch and regulate acidity-alkalinity balance in the brewing industry. It is corrosive and produces severe burns on contact with skin and other body tissues. Inhalation of the vapors can cause serious lung damage. Diluted sulfuric acid has been used to stimulate appetite and to combat overalkaline stomach juices. It is used as a topical caustic in cosmetic products. If ingested undiluted, it can be fatal. GRAS. ASP. E

SULFUROUS ACID • A solution of sulfur dioxide in water. It is toxic by ingestion and inhalation and very irritating to tissue. It is used in bleaching, paper manufacturing, wine manufacturing, brewing, and as a preservative for fruits, nuts, foods, and wines. There is reported use of the chemical; it has not yet been assigned for toxicology literature. EAF

SUNETTE • See Acesulfame Potassium.

SUNFLOWER SEED OIL • Oil obtained by milling the seeds of the large flower produced in Russia, India, Egypt, and Argentina. A bland, pale yellow oil, it contains vitamin E (see Tocopherols) and forms a "skin" after drying. Used in food, salad oils, and in resin and soap manufacturing.

SUNFLOWER SEED OIL GLYCERIDE • See Sunflower Seed Oil and Glycerides.

SUNSET YELLOW, ORANGE YELLOW • On the U.S. Codex Committee on Food Additives and Contaminants high priority list for toxicology studies. See FD and C Yellow No. 6. E.

SUPERGLYCERINATED FULLY HYDROGENATED RAPESEED OIL • Used in some margarines and emulsions. See Rapeseed Oil, Glycerin, and Hydrogenation.

SUPER-OV • Derived from pig pituitary glands, it is used for the induction of superovulation in cows for procedures requiring the production of multiple eggs at a single estrus. Follicle-stimulating hormone is not orally active; therefore, residues of this drug are said to be safe for human consumption, and therefore "no toxicological studies were required" by the U.S. government.

SURFACE-ACTIVE ADDITIVE • See Surfactants.

SURFACTANTS • These are wetting additives. They lower water's surface tension, permitting water to spread out and penetrate more easily. These surface-active additives are classified by whether or not they ionize in solution and by the nature of their electrical charges. There are four major categories—anionic, nonionic, cationic, and amphoteric. Anionic surfactants, which carry a negative charge, have excellent cleaning properties. They are stain and dirt removers in household detergents, powders, and liquids and in toilet soaps. Nonionic surfactants have no electrical charge. Since they are resistant to hard water and dissolve in oil and grease, they are especially effective in spray-on oven cleaners. Cationic surfactants have a positive charge. These are primarily ammonia derivatives and are antistatic and sanitizing additives used as friction reducers in hair rinses and fabric softeners. Amphoteric surfactants may be either negatively charged or positively charged depending on the acidity or alkalinity of the water. They are used for cosmetics where mildness is important, such as in shampoos and lotions. Surfactants may be classified as emulsifiers,

water. They are used for cosmetics where mildness is important, such as in shampoos and lotions. Surfactants may be classified as emulsifiers, dispersants, wetting and foaming additives, detergents, viscosity modifiers, or stabilizers. For example, in peanut butter, a surfactant keeps oil and water mixtures from separating; in cosmetics, it makes lotions more spreadable; salad dressings and cheeses are thickened by surfactants, which make them pour better.

SUSPENDED LUTEIN • Ingredient in term infant formula at a maximum level of 250 micrograms/liter. The FDA has no question about the notifier's request for GRAS status.

SUSTAMINE • A dipeptide (see peptide) claimed to boost energy. Self-affirmed. GRAS.

SWEET BIRCH • See Methyl Salicylate.

SWEET CLOVER EXTRACT • Extract of various species of Melilotus, grown for hay and soil improvement. It contains coumarin (see) and is used as a scent to disguise bad odors.

SWEET FLAG • See Calamus.

SWEET MARJORAM OIL • Pot Marjoram. Used in perfumery and hair preparations. The natural extract of the flowers and leaves of two varieties of the fragrant marjoram. Also a food flavoring.

SWEETENER 2000 • An artificial sweetener made by the company that brought us NutraSweet. It is not on the market as of this writing. See Aspartame.

SY/FL • FDA abbreviation for synthetic flavoring.

SYLVIC ACID • See Abietic Acid.

SYNBIOTICS • A combination of probiotics and prebiotics (see both).

SYNDIOTACTIC 1,2-POLYBUTADIENE • A petition to use this as a one-way disposable food packaging film was put in abeyance (see) by the FDA in 2003.

SYNERGISM • An interaction of two or more chemicals that results in an effect that is greater than the sum of their effects taken independently.

SYNTHETIC • Made in the laboratory and not by nature. For example, vanillin, made in the laboratory, may be identical to vanilla extracted from the vanilla bean, but vanillin cannot be called “natural.”

SYNTHETIC BEESWAX • A mixture of alcohol esters.

SYNTHETIC FATTY ALCOHOLS • Made from fatty alcohols (see) obtained by distillation. Used as substitutes for naturally derived fatty acids (see).

SYNTHETIC IRON OXIDE • For coloring sausage casings and for cat and dog food. Limited to 0.1 percent of weight of finished human food and 0.25 percent of weight of finished food for dogs and cats. Exempt from color certification.

SYNTHETIC LYCOPENE • Coloring made by synthetic lycopene as a crystalline material derived from chemical synthesis. See Lycopene. GRAS

SYNTHETIC PARAFFIN and SUCCINIC DERIVATIVES • Used as a coating on fresh citrus, muskmelons, and sweet potatoes. See Paraffin Wax and Succinic Acid.

SYNTHETIC SPERMACETI • See Spermaceti.

SYNTHETIC WAX • A hydrocarbon wax derived from various oils.

SYSTEMIC • Affecting the body generally; distributed throughout the body.

TAGALOSE, D • See D-Tagalose.

TAGETES • Meal, Extract, and Oil. Marigold. The meal is the dried, ground flower petals of the Aztec marigold, a strong-scented, tropical American herb, mixed with no more than 0.3 percent ethoxyquin, an herbicide and antioxidant. The extract is taken from tagetes petals. Both the meal and the extract are used to enhance the yellow color of chicken skin and eggs. They are incorporated in chicken feed, supplemented sufficiently with the yellow coloring xanthophyll. The coloring has been permanently listed since 1963 but is exempt from certification. The oil is extracted from the Aztec flower and used in fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin, desserts, and condiments. NUL

TAGETES OIL • Flavoring produced from the Tagetes glandulifera obtained by steam distillation just after the inflorescence of the crop and has a dark yellow to orange-yellow color and green odor with a sweet-fruity undertone. ASP

TAILORED TRYGLYCERIDES CONTAINING APPROXIMATELY 12 PERCENT MEDIUM-CHAIN FATTY ACIDS • Oil used in cooking, salad dressings, vegetable oil spreads, and frozen dinners. The FDA has no questions about the notifier's application for GRAS status. See Tailored Triglycerides Enriched in Omega-3 Fatty Acids from Fish Oil.

TAILORED TRIGLYCERIDES ENRICHED IN OMEGA-3 FATTY ACIDS FROM FISH OIL • Triglycerides (see) enriched with omega-3 fatty acids from fish oil. As a direct food ingredient in the food at levels that are no more than 36 percent of the levels. Used in baked goods and baking mixes, cereals, cheese products, chewing gum, condiments, confections and frostings, dairy products, egg products, fats and oils (except in infant formulas), fish products, frozen dairy desserts, gelatins and puddings, gravies and sauces, hard candy, jams and jellies, meat products, milk products, nonalcoholic beverages, nut products, pastas, plant protein products, poultry, processed fruit juices, processed vegetable juices, snack foods, soft candy, soup mixes, sugar substitutes, sweet sauces, toppings and syrups, and white granulated sugar. The FDA was notified by Twin Rivers Technologies, the producer, of potential self-approved GRAS status. The Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA) requires that the label of a food that is or contains an ingredient that bears or contains a “major food allergen” declare the presence of the allergen. FALCPA defines a “major food allergen” as one of eight foods or food groups (i.e., milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans) or a food ingredient that contains protein derived from one of those foods. Twin Rivers Technologies acknowledges that the FDA had previously raised concerns about the consumption of high levels of EPA and DHA fatty acids from fish oil and possible adverse effects of consumption on bleeding time, blood sugar, and low-density lipoprotein (bad) cholesterol levels. Twin Rivers Technologies concludes that its tailored triglycerides ingredient is self-determined GRAS for the intended uses. The FDA says based on the information provided by Twin Rivers Technologies, as well as other information available to the FDA, the agency has no questions at this time regarding Twin Rivers Technologies' conclusion that the tailored triglycerides ingredient is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of this ingredient. As always, it is the continuing responsibility of Twin Rivers Technologies to ensure that the food ingredients the firm markets are safe and are otherwise in compliance with all applicable legal and regulatory requirements.

TALC • French Chalk. Magnesium Silicate. The lumps are known as soap stone of steatite. An anticaking additive added to vitamin supplements to render a free flow; also to chewing-gum base, rice, herbs, spices, seasonings (including salt substitutes), and condiments (e.g., seasoning for instant noodles). Also used in animal feed. Gives a slippery sensation to powders and creams. In olive oil production, as a processing aid to increase yield and improve the clarity of the oil. Prolonged inhalation can cause lung problems because it is similar in chemical composition to asbestos, a known lung irritant and cancer-causing ingredient in its powdered state. There is no known acute toxicity, but there is a question about it being a cancer-causing additive upon ingestion. It is suspected that the high incidence of stomach cancer among the Japanese is due to the fact that the Japanese prefer that their rice be treated with talc. GRAS. ASP. E

TALLAMIDE DEA • See Tall Oil.

TALLAMPHOPROPIONATE • See Tall Oil.

TALL OIL • Liquid Rosin. A by-product of the wood pulp industry. Tall is Swedish for “pine.” Dark brown liquid. Acrid odor. A fungicide and cutting oil. It may be a mild irritant and sensitizer. GRAS. EAF

TALL OIL BENZYL HYDROXYETHYL IMIDAZOLINIUM CHLORIDE • See Quaternary Ammonium Compounds and Tall Oil.

TALL OIL ROSIN, GLYCEROL ESTER • Softener for chewing-gum base. See Tall Oil.

TALLOW ACID • See Tallow Flakes.

TALLOW ALCOHOL, HYDROGENATED • See Hydrogenated Tallow. ASP

TALLOW AMIDE • See Tallow Flakes.

TALLOWAMIDE DEA and MEA • See Tallow Acid.

TALLOW AMIDOPROPYLAMINE OXIDE • See Tallow Acid.

TALLOW AMINE • See Tallow Flakes.

TALLOW AMINE OXIDE • See Tallow Flakes.

TALLOW, BEEF • Adds body and aroma and improves mouthfeel in a variety of applications. Used for shortening in some varieties of commercial cookies, and oleo stearine, which is used for the making of some chewing gum. Free fatty acids derived from tallow are also used in the production of candles, fabric softeners, crayons, paper, explosives, and cement blocks. ASP

TALLOW FATTY ACIDS • See Tallow Flakes and Fatty Acids.

TALLOW FLAKES • Suet. Dripping. The fat from the fatty tissue of bovine cattle and sheep in North America. White, almost tasteless when pure, and generally harder than grease. Used as a defoaming additive in yeast and beet sugar production. In miniature pigs in one year, feeding tallow caused moderate to severe atherosclerosis (clogging of the arteries) similar to that in humans. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status for packaging with no limitations other than good manufacturing practices. EAF

TALLOW GLYCERIDES • A mixture of triglycerides (fats) derived from tallow.

TALLOW, HYDROGENATED, OXIDIZED, or SULFATED • Antifoaming additive. Used in defoaming additives. See Tallow Flakes and Hydrogenation. NIL

TALLOW IMIDAZOLINE • See Tallow Flakes.

TALLOWETH-6 • See Tallow Flakes.

TAMARIND EXTRACT • The extract of Tamarindus indica, a large tropical tree grown in the East Indies and Africa. Preserved in sugar or syrup, it is used as a natural fruit flavoring. The pulp contains about 10 percent tartaric acid (see). Has been used as a cooling laxative drink. GRAS. There is reported use of the chemical, but it has not yet been assigned for toxicology literature. ASP

TANGERINE, ESSENCE • Uncut, undiluted, and alcohol free. See Tangerine Oil. ASP

TANGERINE EXTRACT • Citrus reticulata. See Tangerine Oil. ASP

TANGERINE OIL • The oil obtained by expression from the peels of the ripe fruit from several related tangerine species. Reddish orange, with a pleasant orange aroma. Used in blueberry, mandarin, orange, tangerine, and other fruit flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. A skin irritant. GRAS. ASP

TANNIC ACID • Occurs in the bark and fruit of many plants, notably in the bark of the oak and sumac, and in cherries, coffee, and tea. It is used to clarify beer and wine, and as a refining additive for rendered fats. As a flavoring it is used in butter, caramel, fruit, brandy, maple, and nut flavorings for beverages, ice cream, ices, candy, baked goods, and liquor (1,000 ppm). Used medicinally as a mild astringent and when applied it may turn the skin brown. Low toxicity orally, but large doses may cause gastric distress. Can cause tumors and death by injection, but not, evidently, by ingestion. IARC review and EPA Genetic Toxicology Program (see both). The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amount that may be added to food. ASP

TANNIN • Used in alcoholic beverages only. See Tannic Acid.

TANSY • A common herb, Tanacetum vulgare, which the Greeks believed prolonged life. Strong aromatic odor and bitter taste. Flavoring used in alcoholic beverages only. NIL

TANSY OIL • Tanacetum vulgare. NUL

TAPIOCA STARCH • A preparation of cassava, the tapioca plant. Used for thickening liquid foods such as puddings, juicy pies, and soups. GRAS. ASP

TAR OIL • The volatile oil distilled from wood tar, generally from the family Pinaceae. Used externally to treat skin diseases, the principal toxic ingredients are phenols (very toxic) and other hydrocarbons such as the naphthalenes. Toxicity estimates are hard to make because even the U.S. Pharmacopoeia does not specify the phenol content of official preparations. However, if ingested, it is estimated that 1 ounce would kill. See Pine Tar Oil, which is a rectified tar oil used as a licorice flavoring.

TARA GUM • Peruvian Carob. Obtained by grinding the endosperms of the seeds of an evergreen tree common to Peru. The whitish yellow, nearly odorless powder that is produced is used as a thickening additive and stabilizer. See Locust Bean Gum. E TARAXACUM ERYTHROSPERUMUM • See Dandelion Leaf and Root.

TARRAGON EXTRACT • Artemisia dracunculus. The name is derived from the Arabic word tharkhoum and the Latin word dracunculus meaning “little dragon,” probably because of the way the root seems to coil up like a dragon. The extract is from the dried leaves of this small European perennial wormwood herb. Pale yellow oil extracted for its aromatic, pungent taste. Used in making pickles and vinegar. NUL

TARRAGON OIL • Estragon. Russian Tarragon. Little Dragon. Extracted by steam distillation from the leaves and the flowering tops of Atremisia dracunculus from the Compositae family. Used in folk medicine as an antirheumatic, appetite stimulant, deodorant, emmenagogue stimulant, and vermifuge. ASP

TARS • An antiseptic, deodorant, and bug killer. Any of the various dark brown or black bituminous, usually odorous, viscous liquids or semiliquids obtained by the destructive distillation of wood, coal, peat, shale, and other organic materials. Used as a licorice food flavoring. May cause allergic reactions.

TARTARIC ACID • Sodium Tartrate. Sodium Potassium Tartrate. Rochelle Salts. Described in ancient times as being a residual of grape fermentation. Widely distributed in nature in many fruits but usually obtained as a by-product of wine making. Consists of colorless or translucent crystals or a white fine-to-granular crystalline powder, which is odorless and has an acid taste. It is the acidic constituent of some baking powders and is used to adjust acidity in frozen dairy products, jellies, bakery products, beverages, confections, dried egg whites, food colorings, candies, and artificially sweetened preserves up to 4 percent. Used as a sequestrant, especially in wines; as an emulsifier; and as a grape and sour flavoring for candies, canned sodas and colas, preserves, baked goods, dried egg white, lemon meringue pie mix, pasteurized processed cheese, cheese food and cheese spread, and some types of baking powder. Large amounts may have a laxative effect. GRAS. ASP. E

TARTRATE, SODIUM POTASSIUM • Final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that it should continue its GRAS status with no limitations other than good manufacturing practices. See Sodium Potassium Tartrate.

TARTRAZINE • FD and C Yellow No. 5. Bright orange-yellow powder used in food, drugs, and cosmetics and as a dye for wool and silk. Those allergic to aspirin are often allergic to tartrazine. Allergies have been reported in persons eating sweet corn, soft drinks, and cheese crackers—all colored with Yellow No. 5. It is derived from coal tar. The British and the European Union Parliament want to ban this color because it reportedly exacerbates hyperactive behavior in children. Tartrazine (E102) is a yellow color used in a range of foods including soft drinks, sweets, and sauces. Studies have shown that eating foods or drinks containing tartrazine can cause nettle rash (urticaria), dermatitis (an allergic skin condition), asthma, or rhinitis (runny nose) in a very small number of people. The use of tartrazine has decreased in recent years. ASP. E

TAURINE • An amino acid found in almost every tissue of the body and high in human milk. Most infant soy protein formulas are now supplemented with taurine. It is also used as a nutritional supplement in feed for growing chicks. Taurine is almost absent from vegetarian diets. It is believed necessary for healthy eyes and it is an antioxidant. Irregular heartbeat is characteristic of lack of blood to the heart and may be partly due to loss of intracellular taurine, some researchers theorize. Much like magnesium, taurine affects membrane excitability by normalizing potassium flux in and out of the heart muscle cells. Supplementation may prevent digitalis-induced arrhythmias. Taurine may also lower blood pressure. In a group of nineteen young patients with borderline high blood pressure, some received six grams daily of taurine and others a placebo. After seven days, systolic and diastolic blood pressure fell significantly in patients receiving taurine. Epinephrine, which stimulates heartbeat, was blunted by taurine, suggesting that its anti-high blood pressure effect may be mediated by reduction in signals from the nervous system.

TAUROCHOLIC ACID • Cholic Acid. Cholyltaurine. Occurs as a sodium salt in bile. It is formed by the combination of the sulfur-containing amino acid, taurine, and cholic acid. It aids digestion and absorption of fats. It is used as an emulsifying additive in foods. GRAS. NUL

TBHQ • See Tertiary Butylhydroquinone.

TBS • See Tribromsalan.

TD • Toxic dose; the dose of a chemical that produces signs of toxicity.

TDlo • The lowest dose that produces signs of toxicity.

TEA • The abbreviation for triethanolamine (see).

TEA • The leaves, leaf buds, and internodes of plant and fragrant white flowers prepared and cured to make an aromatic beverage. Tea is a mild stimulant and its tonic properties are due to the alkaloid caffeine; tannic acid (see) makes it astringent. There is tremendous interest among researchers worldwide to identify those nutraceuticals in tea that may help prevent malignancies. Cultivated principally in China, Japan, Sri Lanka, and other Asian countries, tea leaves come from an evergreen of the Camellia family, Camellia sinensis, and are processed in different ways to produce green, black, and oolong tea. Each emerges with different chemical properties. To produce black tea, which most Americans drink, leaves are subjected to warmth for a few hours and heated to 200°F to finish the drying process. Green tea is popular in Asia and is not heated but simply steamed, rolled, and crushed. Oolong tea is less heated than black, but just enough to give it a different character from green. Green tea, which has been used in Japan for more than a thousand years, is now believed to have the most beneficial effects. GRAS. ASP

TEA-ABIETOYL HYDROLYZED ANIMAL PROTEIN • The salt of the condensation product of abietic acid and hydrolyzed animal protein (see both).

TEA-C12-15 ALCOHOLS SULFATE • See Triethanolamine, Alcohol, and Sulfate.

TEA-COCO-HYDROLYZED ANIMAL PROTEIN • See Hydrolyzed Animal Protein and Surfactants.

TEA-COCO-HYDROLYZED PROTEIN • See Proteins.

TEA-COCYL GLUTAMATE • A softener. See Glutamate.

TEA-EDTA • See Ethylenediamine Tetraacetic Acid.

TEA EXTRACT • Essential oil. See Tea. GRAS. ASP

TEA-HYDROGENATED TALLOW GLUTAMATE • A softener. See Glutamate.

TEA-LAUROYL GLUTAMATE • A softener. See Glutamate.

TEA-SORBATE • See Triethanolamine and Sorbic Acid.

TEA-STEARATE • See Triethanolamine and Stearic Acid.

TEA-SULFATE • See Triethanolamine and Sulfuric Acid.

TEA TREE OIL • Melaleuca alternifolia. Any of various shrubs or trees so named because their leaves are used as a substitute for tea leaves. The essential oil is obtained from the leaves and used as a germicide. ASP

TECHNICAL WHITE MINERAL OIL • A mineral supplement for animals. The ratio is 0.06 percent in total feed.

TEESTAR • Whole wheat crackers enriched with the bioactive reportedly reduces blood sugar levels among type II diabetics by almost 10–15 percent. The bioactive is derived from a single Indian herb works by slowing the process of carbohydrate breakdown in the body.

TEFLON • See Perfluorooctanoic Acid.

TEMPORARY ADI • This designation is used by the JECFA (see) when data are sufficient to conclude the substance is safe over the relatively short period of time but insufficient to conclude use of the substance is safe over a lifetime. A higher-than-normal safety factor is used when establishing a temporary ADI and an expiration date is established when appropriate data to resolve the safety issue should be submitted to the JECFA. A temporary ADI is listed as "not specified—food additives." The term is applied to a food substance of very low toxicity in which, on the basis of the available data (chemical, biochemical, toxicological, and other), the total dietary intake to achieve the desired effect does not, in the opinion of the JECFA, represent a hazard to health. For that reason, and for reasons stated in individual evaluations, the ADI in numerical form is not deemed necessary. A temporary ADI must be used within the bounds of good manufacturing practice, i.e., it should be technologically efficacious and should be used at the lowest level necessary to achieve this effect; not conceal inferior food quality or adulteration; and not create a nutritional imbalance.

TERA JAPÓNICA • See Catechu Extract.

TERATOGEN • Any substance capable of producing structural abnormalities of prenatal origin, present at birth or manifested shortly thereafter.

TERATOGENIC • From the Greek teraf (monster) and Latin genesis (origin): the origin or cause of a monster—or defective fetus.

TERATOGENICITY • The ability of a substance to produce irreversible birth defects or anatomical or functional disorders as a result of an effect on the developing embryo or fetus.

TERGITOL • Tergemist. Sodium Etasulfate. Lye peeling additive, poultry scald additive, washing water additive used on fruits, poultry, and vegetables. The FDA limits residue to 0.2 percent in wash water. Moderately toxic by ingestion and skin contact. A skin and eye irritant.

TERPENELESS OILS • An essential oil from which the terpene components have been removed by extraction and fractionation, either alone or in combination. The terpeneless grades are more highly concentrated than the original oil. Removal of the terpenes is necessary to inhibit spoilage, particularly of oils derived from citrus. It also makes the compound more soluble in alcohol. See Terpenes.

TERPENE RESIN • Moisture barrier on soft gelatin capsules and on powders of ascorbic acid (see) or its salts. Also used as a component of chewing-gum bases. See Terpenes. ASP

TERPENE RESIN, NATURAL • See Terpenes. ASP

TERPENE RESINS, SYNTHETIC • Synthetic resins such as ethylene vinyl acetate and polyethylene are used for chewing-gum bases, adhesives, packing, and many other uses in food processing. ASP

TERPENES • A class of unsaturated hydrocarbons (see). Naturally occurring hydrocarbons, emitted by many trees and plants. They mostly have very strong smells and are responsible for the aromas of the vegetation in which they are found. Terpenes can be thought of as being built from units of isoprene, C_5H_8, joined together into chains and rings. Monoterpenes, formula $C_{10}H_{16}$, constitute the major emissions from conifers and fruit trees. Sesquiterpenes, formula $C_{15}H_{24}$, are commonly found in citrus trees. Terpenes are very reactive and may contribute to diminution of air quality in forested areas. The name comes from turpentine, a liquid consisting of several terpene compounds distilled from the resin of pine trees. Terpenes are a large and varied class of hydrocarbons, produced primarily by a wide variety of plants, particularly conifers, though also by some insects such as swallowtail butterflies, which emit terpenes. Some terpenes are alcohols (e.g., menthol from peppermint oil), and some terpenes are aldehydes (e.g., citronellal). Terpenes are made up of isoprene (C5) units. Its removal from products improves their flavor and gives them a more stable, stronger odor. However, some perfumers feel that the removal of terpenes destroys some of the original odor. Has been used as an antiseptic.

a-TERPINENE • A terpene (see) isolated from oil of marjoram, nutmeg, and tea tree oil and other plants. Flavoring additive. ASP

g-TERPINENE • A terpene (see) found in coriander oil, tea tree oil, citrus, bergamot, and many other plants. Flavoring additive. ASP

TERPINEOL, ALPHA AND BETA • Colorless, viscous liquid with a lilaclike odor, insoluble in mineral oil and slightly soluble in water. It is primarily used as a flavoring additive but is also employed as a denaturant to make alcohol undrinkable. It has been used as an antiseptic. It can be a sensitizer. ASP

TERPINOLENE • A synthetic citrus and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Turpentine for toxicity.

ASP

TERPINYL ACETATE • Colorless liquid, odor suggestive of bergamot and lavender occurs naturally in cardamom. Slightly soluble in water and glycerol. Derived by heating terpineol with acetic acid (see both). Used in berry, lime, orange, cherry, peach, plum, and meat flavorings for beverages, ice cream, ices, candy, and baked goods. See Turpentine for toxicity. ASP

a-TERPINYL ANTHRANILATE • A synthetic fruit flavoring additive. Derived by heating terpineol with anthranilic acid (see both). Used as a synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Turpentine for toxicity. ASP

TERPINYL BUTYRATE • A synthetic fruit flavoring additive. Derived by heating terpineol with butyric acid (see both). Used as a synthetic fruit flavoring additive for beverages, ice cream, ices, candy, chewing gum, and baked goods. See Turpentine for toxicity. ASP

TERPINYL CINNAMATE • A synthetic fruit flavoring additive. Derived by heating terpineol with cinnamic acid (see both). Used as a synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Turpentine for toxicity. ASP

TERPINYL FORMATE • Formic Acid. A synthetic fruit flavoring additive. Derived by heating terpineol with formic acid (see both). Used as a synthetic fruit flavoring additive for beverages, ice cream, ices, candy, liqueurs, and baked goods. See Turpentine for toxicity. ASP

TERPINYL ISOBUTYRATE • A synthetic fruit flavoring additive. Derived by heating terpineol with isobutyric acid (see both). Used as a synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Turpentine for toxicity. ASP

TERPINYL ISOVALERATE • A synthetic fruit flavoring additive. Derived by heating terpineol with isovaleric acid (see both). Used as a synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Turpentine for toxicity. NIL

TERPINYL PROPIONATE • A synthetic fruit flavoring additive, colorless with a lavender odor. Derived by heating terpineol with propionic acid (see both). Used as a synthetic fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Turpentine for toxicity. ASP

TERT • The abbreviation for tertiary.

TERTIARY • The folding of a protein into a three-dimensional structure. The tertiary structure of a protein is its overall shape, also known as its fold. This shape helps make chemicals more stable.

TERTIARY BUTYLHYDROQUINONE • TBHQ. This antioxidant was put on the market after years of pushing by food manufacturers to get it approved. It contains petroleum-derived butane and is used either alone or in combination with the preservative-antioxidant butylated hydroxyanisole (BHA) and/or butylated hydroxytoluene (BHT) (see both). Hydroquinone combines with oxygen very rapidly and becomes brown when exposed to air. The FDA said that TBHQ must not exceed 0.02 percent of its oil and fat content. Death has occurred from the ingestion of as little as 5 grams. Ingestion of a single gram (a thirtieth of an ounce) has caused nausea, vomiting, ringing in the ears, delirium, a sense of suffocation, and collapse. Industrial workers exposed to the vapors—without obvious systemic effects—suffered clouding of the eye lens. Application to the skin may cause allergic reactions. ASP

TESTOSTERONE PROPIONATE • Agovirin. Androgen. Androsan. Testoviron. TP. Uniteston. Vulvan. The male hormone, a steroid (see) produced by cells of the testicles. It is used to increase growth in cattle. The FDA limits residue to 0.60 ppb in muscle, 2.6 ppb in fat, 1.9 ppb in kidney, and 1.3 ppb in liver of heifers. Moderately toxic by ingestion. Given by injection or tablet, it stimulates target tissues to develop normally in androgen-deficient men. It is used to treat eunuchs and male hormonal-change symptoms. It is used for breast engorgement in nonnursing mothers and to treat breast cancer in women one to five years postmenopausal. Potential adverse reactions in women include acne, edema, oily skin, weight gain, hairiness, hoarseness, clitoral enlargement, changes in libido, flushing, sweating, and vaginitis with itching. In males, used to treat in prepuberty, premature epiphyseal closure, priapism, growth of body and facial hair, phallic enlargement; in postpuberty, testicular atrophy, scanty sperm, decreased ejaculatory volume, impotence, enlargement of breasts, and epididymitis. In both sexes, edema, gastroenteritis, nausea, vomiting, diarrhea, constipation, changes in appetite, bladder irritability, jaundice, liver toxicity, and high levels of calcium in the blood.

1,2,4,5-TETRACHLOROBENZENE • Used as an intermediate or building block to make herbicides, insecticides, and defoliants. It is also used to make other chemicals like 2,4,5-trichlorophenol and 2,4,5-trichlorophenoxyacetic acid. 1,2,4,5-Tetrachlorobenzene can enter your lungs if you breathe contaminated air. It can enter your body if you eat contaminated food or be absorbed through your skin if you come into contact with the substance. The U.S. Environmental Protection Agency established an oral reference dose (RfD) of 0.34 milligrams per kilogram per day for oral exposure to 1,2,4,5-tetrachlorobenzene. The RfD is an estimate of the highest daily oral exposure humans can be exposed to without resulting in harmful effects. It is one of the seven EPA's highest priority toxic chemicals for reduction. See Benzene.

2,4,4,4-TETRACHLORODIPHENYL SULFONE • Tetradifon. Tedion. A pesticide. A white crystalline powder. The FDA allows a residue of 10 ppm in dried figs from use on growing crops; 120 ppm in dried hops; 8 ppm in dried tea. It is number 164 on the CERCLA Priority List of Hazardous Substances (see). See Tetrachloroethylene.

TETRACHLOROETHYLENE • Perchlorethylene. Tetrachloroethane. Ethylene Tetrachloride. 1,1,2,2-Tetrachloroethylene. Perchlor. Carbon Bichloride. A clear, colorless, nonflammable liquid with an etherlike smell, it is the main solvent used in the dry-cleaning process. Used in food packaging. The FDA limits residue to 0.3 percent in finished foamed polyethylene. This chemical enters your body when you breathe its vapors in the air. Liquid “perc” can be absorbed through your skin, to a limited extent. The most common effects of overexposure are irritation of the eyes, nose, throat, or skin. Like most organic solvents, it affects the brain the same way as drinking alcohol does. The symptoms of short-term overexposure usually clear up within hours after exposure stops. The mildest effects may start occurring at exposure levels of about 1,090 ppm. Effects occur more quickly and become more noticeable and serious as the exposure levels increase. Effects of this chemical on the nervous system include feeling “high,” dizziness, headache, nausea, vomiting, fatigue, weakness, confusion, slurred speech, loss of balance, and poor coordination. At very high exposure (above 5,000 to 10,000) it can cause loss of consciousness and even death. Some studies, according to the California State Hazard Evaluation and Information System, show that overexposure to such organic solvents over months or years may have long-lasting and possibly permanent effects on the nervous system. The symptoms of these long-term effects include fatigue, poor muscle coordination, difficulty in concentrating, loss of short-term memory, and personality changes such as increased anxiety, nervousness, and irritability. Tetrachloroethylene causes cancer in laboratory animals at exposure levels close to the level of what is legally allowed in the workplace. Contamination of drinking water with this chemical in Massachusetts and New Jersey has been implicated in clusters of leukemia and birth defects among residents. In any case, do not use perc around an open flame or intense ultraviolet light. Like most solvents containing chlorine, perc can break down into very hazardous compounds such as phosgene, hydrochloric acid, and chlorine.

TETRACHLOROISOPHTHALONITRILE • Bravo. Termil. TCPN. A fungicide used on broccoli, cabbage, cantaloupe, carrots, cauliflower, celery, citrus oil, cucumber, lettuce, onions, potatoes, tomatoes, and watermelon. Fungicide residue tolerance of 10 ppm in citrus oil. Cyanide products are on the Community Right-to-Know List (see) and the EPA Genetic Toxicology Program (see). Causes cancer in experimental animals. Mildly toxic by ingestion.

TETRACHLORVINPHOS • A white powder that inhibits the transmission of nerve signals, it is used as an insecticide. Used as a feed additive for cattle and swine. The FDA limits residue to 0.00015 pound per 100 pounds of body weight of cattle and horses when used in animal feed.

Limitation of 0.00011 pound per 100 pounds of body weight of swine when used in animal feed. Found to be carcinogenic in feed by the National Cancer Institute. On the Community Right-to-Know List (see). Poisonous by ingestion. Also caused reproductive problems in experimental animals. See Dichlorvinos.

TETRACYCLINE • Achromycin. Antibiotic introduced in 1953, tetracycline antibiotics are among the most widely prescribed. Used to treat cattle, chickens, lambs, swine, and turkeys. The FDA limits residues to 0.25 ppm in calves, swine, sheep, chickens, and turkeys. In humans, tetracyclines are used to treat acne, bronchitis, pneumonia, syphilis, gonorrhea, inflammation of the tube that carries urine, and to prevent chest infections. Also used to treat Rocky Mountain spotted fever, brucellosis, relapsing fever, cholera, trachoma, and arthritis due to infection, syphilis, gonorrhea, chlamydia, trachoma, shigellosis, rickettsia, and mycoplasma. Tetracyclines are also used to prevent and treat eye infections. Potential adverse effects of oral tetracyclines include nausea, vomiting, and diarrhea, drop in white blood cells, dizziness, headache, pressure on the brain, sore throat, sore tongue, trouble swallowing, loss of appetite, colitis, inflammation around the anus, liver problems, kidney problems, and diarrhea. Tetracyclines may cause sensitivity to sunlight and result in a rash and discoloration of the skin. If tetracycline is taken during pregnancy, a child may have discolored teeth. Oral tetracyclines must be used with extreme caution if kidney or liver problems are present. The effects of antibiotics such as tetracycline in meat eaten by humans is a matter of controversy. It is believed by many scientists that it causes resistance to antibiotics used by humans and may cause allergic reactions in sensitive persons, even in minute amounts. d-TETRADECALACTONE • Pheromone (see). Flavoring that occurs naturally in butter and coconut oil and used in butter, cream, dairy, fat, and tallow. Toxicity not determined. ASP

TETRADECANAL • See Myristaldehyde.

TETRADECANOIC ACID • See Ethyl Myristate.

(Z)-8-TETRADECENAL • A pheromone-based (see) flavoring for baked goods, gelatins, ices, fish products, reconstituted vegetables, seasonings, and many other food products. Determined GRAS by FEMA (see).

(Z)-9-TETRADECENAL • Nomate Vantage. Pesticide that is harmful to humans, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity. Toxic to aquatic organisms. This pesticide is banned, or severely restricted in many countries including the United States. EAF

TETRADECYL ALDEHYDE • See Myristaldehyde.

TETRAETHYLENE GLYCOL • Colorless or pale yellow liquid used as a finishing additive on twine used to tie meat. Mildly toxic by ingestion. See Glycols.

TETRAETHYLENEPENTAMINE CROSSLINKED WITH EPICHLORO HYDRIN • Used in processing. See Epichlorohydrin. NUL

TETRAFLUOROETHYLENE • This compound is used primarily for the production of polytetrafluoroethylene resins (which are used in mold coatings, electrical insulation, filter cloths, electrical tapes, gaskets, and Teflon products). This chemical is also used as a propellant for food product aerosols. NOISH (see) considers it mildly toxic by inhalation. It can act as an asphyxiant and may have other toxic properties. The National Toxicology Program, however, suspects it of being a neurotoxin (nerve damager). See Teflon.

1,2,5,6-TETRAHYDROCUMINIC ACID • Flavoring with a sweaty odor. See Cuminic Acid. NIL

TETRAHYDROCURCUMINOIDS • Curcuminoids from turmeric (see both) without the yellow color.

4,5,6,7-TETRAHYDRO-3,6-DIMETHYLBENZOFURAN • Synthetic flavoring. ASP

TETRAHYDROFURAN • Butylene oxide. Oxolane. A colorless liquid with an etherlike odor, it is used as a solvent for packaging materials. The FDA limits it to 1.5 percent of film. Moderately toxic by ingestion. Causes mutations in experimental animals. Human systemic effects by inhalation. Affects consciousness. Irritating to eyes and mucous membranes. See Furans.

TETRAHYDROFURFURYL ACETATE • Flavoring. Colorless liquid; honey, maple, bready aroma. See Fufuryl Acetate. ASP

TETRAHYDROFURFURYL ALCOHOL • Clear colorless flavoring with a mild, warm, oily, caramel aroma. See Furyl Alcohol. ASP

TETRAHYDROFURFURYL BUTYRATE • Colorless flavoring liquid; heavy sweet aroma reminiscent of apricot and pineapple. See Butric Acid. ASP

TETRAHYDROFURFURYL CINNAMATE • Flavoring. Colorless slightly viscous liquid; sweet, persistent, balmy, vinous aroma. See Cinnamic Acid. ASP

TETRAHYDROFURFURYL PROPIONATE • Colorless flavoring with a fruity, earthy, phenolic, medicinal aroma. See Furfuryl Alcohol. ASP

TETRAHYDROGERANYL HYDROXYL STEARATE • See Stearic Acid and Hydroxylation.

TETRAHYDROLINALOOL • Flavoring. Colorless liquid with a distinct floral odor. See Linalool. ASP

TETRAHYDRO-4-METHYL-2-(2-METHYLPROPEN-1-YL)PYRAN • Colorless mobile liquid, powerful, distinctive geranium top note. See Geranium. ASP

TETRAHYDRO-PSEUDO-IONONE • Flavoring agent. The JECFA's latest evaluation in 2002 found the ADI (see) acceptable. There was no safety concern at current levels of intake when used as a flavoring agent. See Ionone. ASP

5,6,7,8-TETRAHYDROQUINOXALINE • A musty, nutty flavor that occurs naturally in cocoa, coffee, filberts, peanuts, and sesame seed. A waxlike, colorless to light yellow solid, it is used in cheese, chocolate, corn, nut, pecan, and popcorn flavorings. ASP

TETRAHYDROXYPROPYLETHYLENEDIAMINE • Clear, colorless, thick liquid, a component of the bacteria-killing substance in sugarcane. It is strongly alkaline and is used as a solvent and preservative. It may be irritating to the skin and mucous membranes and may cause skin sensitization.

TETRAIODOFLUORESCEIN SODIUM • FD and C Red No. 3. Brown powder used as a color additive for candy, cherries, and confections. EPA Genetic Toxicology Program (see). Moderately toxic by ingestion. See FD and C Red No. 3.

TETRAKIS (HYDROXYMETHYL) PHOSPHONIUM CHLORIDE • Catalyst, humectant, emulsifier, and plasticizer.

a-(P-[1,1,3,3-TETRAMETHYLBUTYL]PHENYL)-OMEGA-HYDROXYPOLY-(OXYETHYLENE)(1 MOL) • An estrogen affector. See Phenol. NIL a-{P-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL}-OMEGA-HYDROXYPOLY-(OXY-ETHYLENE) • See Phenol. EAF

a-(P-[1,1,3,3-TETRAMETHYLBUTYL]PHENYL)-OMEGA-HYDROXYPOLY-(OXYETHYLENE)(GREATER THAN 1 MOL) • An estrogen affector. NIL

TETRAMETHYL DECYNEDIOL • See Fatty Alcohols.

TETRAMETHYL ETHYLCYCLOHEXENONE (MIXTURE OF ISOMERS) • Synthetic flavoring. See Cyclohexenone. ASP

1,5,5,9-TETRAMETHYL-13-OXATRICYCLO(8.3.0.0(4,9))TRIDECANE • Synthetic flavoring used in cigarettes. ASP

TETRAMETHYL PYRAZINE • White crystals or powder with a fermented soybean odor. Used as a flavoring additive in various foods. Moderately toxic by ingestion. GRAS

2,3,5,6-TETRAMETHYLPYRAZINE • Synthetic flavoring with a nutty, musty, chocolate odor; chocolate taste. The JECFA's safety evaluation found the ADI acceptable and there was no safety concern at current levels of intake when used as a flavoring agent. See Pyrazines.

2,4,5,8-TETRAMETHYL-1,2,5,6-TETROXOCANE • Metason. Slug-Tox. A pesticide to kill slugs and other parasites on strawberries. Human poison by ingestion. Can cause convulsions. Causes mutations in experimental animals.

TETRAMETHYLTHIURAM • Sprayed on some bananas. Seed disinfectant and fungicide. Can cause contact dermatitis. Irritating to mucous membranes.

TETRA POTASSIUM PHOSPHATE • TKPP. An emulsifier. See Tetrasodium Pyrophosphate.

TETRA POTASSIUM PYROPHOSPHATE • An emulsifier used in cheese and as a sequestering additive in cheese and ice cream. Also used in cleaning compounds, oil-well drilling, water treatment, and as a general sequestering additive to remove rust stains. Produced by molecular dehydration of dibasic sodium phosphate. It is alkaline and irritating and ingestion can cause nausea, diarrhea, and vomiting. GRAS for packaging. See Tetrasodium Pyrophosphate.

TETRASODIUM EDTA • Sodium Edetate. Powdered sodium salt that reacts with metals. A sequestering additive and chelating additive (see both). Can deplete the body of calcium if taken internally. See Ethylenediamine Tetraacetic Acid.

TETRASODIUM PYROPHOSPHATE • TSPP. Used in cheese emulsification and as a sequestering additive in cheese and ice cream. Also used in cleansing compounds, oil-well drilling, water treatment, and as a general sequestering additive to remove rust stains. A sequestering additive, clarifying additive, and buffering additive for shampoos. Produced by molecular dehydration of dibasic sodium phosphate. Insoluble in alcohol. It is alkaline and irritating and ingestion can cause nausea, diarrhea, and vomiting. GRAS for packaging. GRAS

TEXTURIZER • A chemical used to improve the texture of various foods. For instance, canned tomatoes, canned potatoes, and canned apple slices tend to become soft and fall apart unless, for example, the texturizer calcium chloride (see) of its salts are added, which keep the product firm.

TFC • The abbreviation for tricloflucarban, a disinfectant.

THALOSE • A blend of food-grade acidulants (see) that contains propylene glycol and citric, lactic, phosphoric, and tartaric acids (see all), and water and salt. Adding this compound to sugar permits a reduction in the amount required to achieve a desired sweetness (1 ounce of liquid thalose added to 32 pounds of sugar causes the perceived sweetness to be increased by 90 percent). One pint added to sugar will result in a saving of 500 pounds of sugar without reducing sweetness. Thalose itself is not sweet and does not alter the flavor or aroma of the foods to which it is added. It does not contribute calories but will reduce the caloric level of the end product by lowering the amount of carbohydrates in the compound. Thalose can be used in beverages, bakery and confectionery products, and in ice cream, as long as the physical properties of the sugar are not needed (sugar is often used as a thickening additive and texturizer). All of the substances contained in this extender are GRAS and comply with the FDA provision for food-grade ingredients.

THAMNIDIUM ELEGANS • A grayish white mold used for aging meat. It is related to the tropical bread mold.

THAUMATIN • A mixture of intensely sweet-tasting proteins extracted from the fruit of a West African plant, Thaumatococcus daniellii. It has about two thousand to three thousand times the sweetness of sugar. It does contain calories. The fruits of the plant have been used for centuries by the West Africans as a source of sweetness. It is also sold in Japan. Because of problems with stability, taste profile, and compatibility, thaumatin is used primarily as a flavor enhancer at levels below the sweet-taste threshold. EAF. E

THAUMATIN B, RECOMBINANT • Genetically altered amino acid. On priority list to be evaluated. EAF

THBP • Antioxidant in fats and oils. See 2-4-5-Trihydroxybutyrophenone.

L-THEANINE • Ingredient in several food categories up to 250 milligrams per serving. The FDA has no questions about the substance being listed as GRAS.

THEASPIRANE • Intense fresh-fruity flavoring. It is used in essence of rose, haw, litchi, strawberry, and tobacco. NUL

THEINE • See Caffeine.

THEOBROMA OIL • Cacao Butter. Cocoa Butter. Yellowish white solid with chocolatelike taste and odor. Derived from the cacao bean. Widely used in confections. May cause allergic reactions in the sensitive.

THEOBROMINE • The alkaloid found in cocoa, cola nuts, tea, and chocolate products, closely related to caffeine. It is used as a diuretic, smooth muscle relaxant, heart stimulant, and blood vessel dilator. In 1992, the FDA proposed a ban on theobromine sodium salicylate in oral menstrual drug products because it has not been shown to be safe and effective for its stated claims. ASP

THERMALLY OXIDIZED SOYA BEAN OIL INTERACTED WITH MONO and DIGLYCERIDES OF FATTY ACIDS • See Soybean Oil and Fatty Acids. E

THIABENDAZOLE HYDROCHLORIDE • A mold retardant used on animal feed, apples, bananas, beef, citrus fruit, lamb, milk, pears, pheasants, pork, potato processing waste, rice hulls. FDA limits are 0.1 ppm in cattle, goats, sheep, pheasant, and swine; 0.05 ppm in milk; 33 ppm in dried apple pomace; 150 ppm in dry or wet grape pomace; 30 ppm in potato processing waste; and 8 ppm in rice hulls when used for animal feed. Moderately toxic by ingestion. Deleted by the EU. Reportedly only one company, Hikal Chemical Industries Limited in India, now produces it and cautions it should be applied very safely for acidity relief. Hikal notes, however, with the emergence of better products over the years, this chemical is no longer applied on a large scale for treating acidity.

THIAMINE • See Thiamine Hydrochloride. ASP

THIAMINE HYDROCHLORIDE • A coenzyme of vitamin B1. A white crystalline powder used as a dietary supplement in prepared breakfast cereals, peanut butter, poultry, stuffing, baby cereals, skimmed milk, bottled soft drinks, enriched flours, enriched farina, cornmeal, enriched macaroni and noodle products, and enriched bread and rolls. Acts as a helper in important energy-yielding reactions in the body. Practically all B1 sold is synthetic. The vitamin is destroyed by alkalies and alkaline drugs such as phenobarbital. GRAS. ASP

THIAMINE MONONITRATE • A coenzyme of vitamin B1. A white crystalline powder used as a diet supplement and to enrich flour. GRAS. ASP

THIAMUTILIN • Tiamulin. Crystals from acetone (see) used in animal feed and as an animal drug to combat bacterial infections. Moderately toxic by ingestion and injections under the skin.

THIAZOLE • Colorless or pale yellow liquid. Widely used in the manufacture of synthetic flavorings for drinks, frozen food, nuts, meat, and spices and in organic synthesis of fungicides, dyes, and rubber accelerators. ASP

2-(THIAZOL-4-YL)BENZIMIDAZOLE • Thiabendazole. Arbotect. TBDZ. Mycozol. White to tan odorless compound used as a fungicide in animal feed and for citrus fruit and to control fungal diseases in seed potatoes. Used therapeutically in animals to combat worms and fungus infections. Poisonous by ingestion. Caused birth defects in experimental animals.

THIAZOLYLSULFANILAMIDE • Sulzol. Thiazamide. An antibiotic used to treat infections in swine. Human poison.

THIBETOLIDE • See Pentadecalactone.

THICKENERS • Many natural gums and starches are used to add body to mixtures. Pectin (see), for instance, which is used in fruits naturally low in this gelling additive, enables manufacturers to produce jams and jellies of a marketable thickness. Algin (see Alginates) is used to make salad

dressings that will not be runny. Also used to add body to lotions and creams. Those usually employed include such natural gums as sodium alginate and pectins.

THIDIAZURON • A pesticide used on cottonseed hulls. The FDA's residue tolerance is 0.05 ppm in milk; 0.1 ppm in eggs; and 0.2 ppm as residue in meat, fat, and meat by-products of cattle, sheep, and poultry.

2-THIENYL DISULFIDE • Synthetic flavoring. ASP

2-THIENYL MERCAPTAN • A synthetic flavoring additive that occurs naturally in coffee. Used in coffee flavoring for candy and baked goods. ASP

THIETHYL CITRATE • An antioxidant used primarily in dried egg whites. See Citric Acid. GRAS

THIOACETIC ACID • Used in the synthesis of organic compounds (rubber chemicals, curing agents, crosslinking agents, metallurgy, pesticides, pharmaceuticals). It causes tearing. See Thiol. EAF

THIOBIS (DODECYL PROPIONATE) • White crystalline flakes with a sweet odor used as an antioxidant in fats, oils, and packaging materials. FDA regulations limit to 0.005 percent migrating from food packaging. An eye irritant.

THIOCYANATE • Colorless or white crystals derived from cyanide. Used in animal feeds as a growth stimulant.

THIODICARB • An insecticide used on cottonseed and soybean hulls. The FDA permits 0.8 ppm on cottonseed hulls and 0.4 ppm on soybean hulls. See Carbamate.

2,2'-(THIODIMETHYLENE)-DIFURAN • Synthetic roastedlike flavoring. ASP

THIODIPROPIONIC ACID • An acid freely soluble in hot water, alcohol, and acetone. Used as an antioxidant in general food use. Percent of fat or oil, including essential oil, content of food is up to 0.02. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amounts that can be added to food. ASP

THIOGERANIOL • Synthetic flavoring. See Geraniol. ASP

THIOL • Indicates the substance belongs to organic compounds resembling alcohols but having the oxygen of the hydroxyl group replaced by sulfur. Stinky. Used in gas lines to warn of leaks. Term has been changed officially from mercaptan since the latter was thought to indicate the presence of mercury.

THIOPHANATE, METHYL • A fungicide. The FDA residue tolerance in or on dried apple pomace feed to animals is 40 ppm.

THIOPHENE • Thiofuran. Thiophene and its derivatives exist in petroleum or coal. Thiophene derivatives are also found in natural plant pigments. Biotin, a water-soluble B-complex vitamin, is a reduced thiophene derivative. Thiophene moiety is found in cephalothin antibiotics. Thiophene is used as a solvent and chemical intermediate. Its derivatives are used in manufacturing dyes, aroma compounds, and pharmaceuticals. Thiophene is an analog to furan and pyrrole (see both). Harmful if swallowed. Skin and eye irritant.

THIOUREA • A banned antioxidant. BAN

THISTLE, BLESSED • Holy Thistle. Extract of the prickly plant Cnicus benedictus. Cleared for use as a natural flavoring in alcoholic beverages only. Also called cardin, it is an annual herb. The plant is a native of southern Europe and is cultivated in gardens all over the world. It has been used in medicine since A.D. 100. Once believed to be a panacea, it has been credited with reducing excess fluid. EAF

THREONINE • L form only. An essential amino acid (see); the last to be discovered (1935). Prevents the buildup of fat on the liver. Occurs in whole eggs, skim milk, casein, and gelatin. On the FDA list for further study. GRAS. ASP

4-THUJANOL • An alcohol from thuja oil (see). ASP

THUJA OIL • A constituent of many essential oils. Usually derived from the needles of white cedar. Colorless liquid, almost insoluble in water. Ingestion may cause convulsions. It is used in flavorings and perfumery.

THYME • Thymus is a genus of about 350 species of aromatic perennial herbaceous plants and subshrubs to 40 cm tall, in the family Lamiaceae and native to Europe, North Africa, and Asia. The most common species are garden thyme and lemon thyme. A number of species have different chemotypes. A member of the mint family, thyme is a perennial evergreen shrub. Ancient Egyptians used thyme in embalming. The ancient Greeks used it in their baths and burned it as incense in their temples, believing that thyme was a source of courage. It was thought that the spread of thyme throughout Europe was thanks to the Romans, as they used it to purify their rooms and to “give an aromatic flavor to cheese” and liqueurs.” In the European Middle Ages, the herb was placed beneath pillows to aid sleep and ward off nightmares. In this period, women would also often give knights and warriors gifts that included thyme leaves as it was believed to bring courage to the bearer. Used as a flavoring. See Thyme Oil. ASP

THYME EXTRACT • Natural flavor isolated by physical methods. See Thyme Oil. EAF

THYME OIL • A seasoning from the dried leaves and flowering tops of the wild creeping thyme grown in Eurasia and throughout the United States, Thymus vulgaris and Thymus zygis. Colorless, yellow, or red, with a pleasant odor. Used in sausage, spice, and thyme flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, condiments, meats, and soups. Used as a flavoring in cough medicines. May cause contact dermatitis and hay fever. GRAS. ASP

THYME OLEORESIN • Dark, greenish brown, viscous, semisolid that smells like fresh thyme. ASP

THYME, WHITE OIL • Obtained from the plant and used in fruit, liquor, and thyme. Used in fruit, peppermint, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. Oral dose as medicine is 0.067 grams. It can cause vomiting, diarrhea, dizziness, and cardiac depression when taken in sufficient amounts. See Thyme Oil. GRAS

THYME, WILD OR CREEPING EXTRACT • Thymus serpyllum. NUL

THYMOL • Obtained from the essential oil of lavender, origanum oil, and other volatile oils. It destroys mold, preserves anatomical specimens, and is a topical anti-fungal additive with a pleasant aromatic odor. Used in fruit, peppermint, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. It is omitted from hypoallergenic cosmetics because it can cause allergic reactions. Oral dose as medicine is 0.067 grams. It can cause vomiting, diarrhea, dizziness, and cardiac depression when taken in sufficient amounts. GRAS. ASP

THYMOL IODIDE • A dietary supplement. In animal feed a source of trace minerals. GRAS

THYMUS CAPITATUS • Spanish Origanum. Flavoring. See Origanum Oil.

THYROID • The thyroid is a butterfly-shaped gland located in the neck with a “wing” on either side of the windpipe. The gland produces thyroxine, which controls the rates of chemical reactions in the body. Generally, the more thyroxine, the faster the body works. Thyroxine needs iodine to function.

TIAMULIN • See Thiamutilin.

TIGLIC ACID • See Allyl Tiglate.

TIN CHLORIDE • Colorless crystals used as an antioxidant and reducing additive (see) in asparagus and in carbonated beverages. The FDA limits it to 20 ppm in asparagus packed in glass. Poison by ingestion.

TIN COMPOUNDS • A silver-white metal, tin is soluble in acids. Elemental tin has low toxicity, but most of its compounds are toxic. Rapidly increasing in industrial use as polyvinyl stabilizers, catalysts, wood preservatives, marine antifouling agents, agricultural fungicides, insecticides, and moth and other insect repellents for use on fabrics. Several preliminary investigations revealed that one tin compound, methyltin, may act, in the environment, the same as mercury, a known nerve toxin. Other tin compounds known to be potent nerve toxins in mammals and inhibitors of oxygen uptake are trimethyltin and triethyltin. Tin is a trace element found in fresh and canned foods. Amounts found in fresh food is relative to the amount of tin found in the soil where the food is grown. There are still many unknowns about the mineral's effect on the body, although future research may reveal more. It is found in soil, air, and canned goods. Different types of canned foods have various levels of tin. For example, more tin is ingested in foods in unlacquered cans than in lacquered cans. Infants and small children, on a body weight basis, are more likely than adults to consume higher levels of tin from a single source such as canned juice. Furthermore, it is acknowledged that factors other than tin levels may play a role in potentiating adverse effects, and yet others may serve to moderate potential toxic effects. In the absence of more specific details pertaining to these factors as well as information on the chemical forms of tin that cause acute gastric irritation, it was impossible to incorporate such considerations into the evaluation of tin compounds. It was concluded from the limited human data available that tin concentrations as low as 150 µg/g in one incident involving canned beverages and 250 µg/g in other canned foods may produce acute manifestations of gastric irritation in certain individuals, but it was also noted that some canned products containing levels up to 700 µg/g of tin caused no detectable toxic effects. Human and laboratory animal studies suggest the effects of low levels of the mineral may lead to increased fatigue, depression, and even asthma. Toxicity symptoms include a shortened life span. Sources include air pollution, tin cans, tin foil, and food additives. Long-term health effects are associated with consuming tin. The Food Standards Agency of Britain says tin can cause stomach upsets such as nausea, vomiting, diarrhea, abdominal cramps, and bloating in some sensitive people at levels above 200 milligrams per kilogram. This is the maximum legal amount of tin that can be present in canned foods. Therefore, the JECFA (see) recommended efforts be made to keep tin levels in canned foods as low as practicable. In this regard, tin concentrations in canned foods should be limited to those consistent with the application of good manufacturing practices. The committee converted the previously established tolerable daily intake of 14 mg of inorganic tin per kg of body weight into a PTWI (see) and emphasized that this value was applicable to chronic tin exposure.

TINCTURE • Solution in alcohol of the flavors derived from plants obtained by mashing or boiling.

TIPA • The abbreviation for triisopropanolamine (see).

TIPA-STEARATE • See Stearic Acid.

TITANIUM DIOXIDE • Occurs naturally in minerals. Used chiefly as a white pigment and as an opacifier; also a white pigment for candy, gum, and marker ink. A pound has been ingested without apparent ill effects. In high concentrations the dust may cause lung damage. It has been permanently listed for use as a food color with a limit of 1 percent by weight of finished food since 1966. ASP. E

TITANIUM HYDROXIDE • See Titanium Dioxide.

TITANIUM OXIDE • See Titanium Dioxide.

TOASTED PARTIALLY DEFATTED COOKED COTTONSEED FLOUR • Used as a food coloring. It is exempt from certification.

a-TOCOPHEROL ACETATE • A dietary supplement. See Tocopherols. GRAS a-TOCOPHERYL ACID SUCCINATE • Vitamin E Succinate. Obtained by the distillation of edible vegetable oils and used as a dietary supplement and as an antioxidant for fats and oils. ASP

TOCOPHEROLS • Vitamin E. Obtained by the vacuum distillation of edible vegetable oils. Protects fat in the body's tissues from abnormal breakdown. Experimental evidence shows vitamin E may protect the heart and blood vessels and retard aging. Used as a dietary supplement and as an antioxidant for essential oils, rendered animal fats, or a combination of such fats with vegetable oils. Helps form normal red blood cells, muscle, and other tissues. GRAS. ASP

TOCOPHEROL-RICH EXTRACT • See Tocopherols. E

TOLERANCE • A legal limit, established by the EPA, for the maximum amount of a pesticide residue that may be present in or on a food. Temporary tolerances, which cover residues resulting from an experimental use, generally expire after one year. Tolerance also means the capacity to withstand pesticide treatment without adverse effect on normal growth and function. It also may refer to the ability to tolerate an allergen.

TOLUALDEHYDE GLYCERYL ACETAL • A synthetic chocolate, fruit, cherry, coconut, and vanilla flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

TOLUALDEHYDES (MIXED o, m, p) • Synthetic berry, loganberry, fruit, cherry, muscatel, peach, apricot, nut, almond, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, gelatin desserts, and maraschino cherries. ASP

TOLU BALSAM • Extract and Gum. Extract from the Peruvian or Indian plant, Myroxylon spp. Contains cinnamic acid and benzoic acid (see both). Used in butter, butterscotch, cherry, and spice flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. The gum is used in fruit, maple, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, and syrups. Mildly antiseptic and may be mildly irritating to the skin. ASP

TOLUENE • Toluol. Methyl Benzene. Used in water-purifying additives, to remove odors in cheese, and in a number of food-processing compounds. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency (EPA). Obtained from petroleum or by distilling balsam Tolu. May cause mild anemia if ingested, and it is narcotic in high concentrations. Being tested at the Frederick Cancer Research Center for possible cancer-causing effects. It can cause liver damage and is irritating to the skin and respiratory tract. Although halogenated hydrocarbons like toluene are assumed responsible for health risks, the long-term effects of low-level exposure to them in drinking water of at least twenty cities are unknown. There is concern about the role of toluene on the brain and nervous system because symptoms have been observed in workers chronically exposed in jobs such as spray painting. The chronic high-dose exposures seen in toluene abuse such as glue sniffers have been associated epidemiologically with sudden death secondary to irregular heartbeat, liver, and neurologic disorders. The current U.S. standard is 200 ppm in eight hours and maximum peaks up to 500 ppm for ten minutes. NIOSH (see) currently recommends that toluene exposures be limited to 100 ppm. Brief exposure to 100 ppm causes statistical impairment of reflexes and thinking. Exposure to 800 ppm causes severe fatigue, confusion, and staggering that may persist for several days. Exposure to 10,000 ppm can cause loss of consciousness and death. It is a high priority for study by the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). p-TOLYLACETALDEHYDE • Synthetic flavoring. See Tolyl Acetate. ASP

TOLYL ACETATE • Acetic Acid. A synthetic butter, caramel, fruit, honey, nut, and spice flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and gelatin desserts

o-TOLYL ACETATE • Acetic Acid. A synthetic butter, caramel, fruit, honey, and cherry flavoring for beverages, ice cream, ices, candy, baked goods,

chewing gum, and gelatin desserts. ASP

p-TOLYL ACETATE • Acetic Acid. A synthetic butter, caramel, fruit, honey, nut, and spice flavoring for beverages, ice cream, ices, candy, baked goods, chewing gum, and condiments. ASP

4-(p-TOLYL)-2-BUTANONE • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

p-TOLYL ISOBUTYRATE • A synthetic fruit flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

p-TOLYL LAURATE • Dodecanoic Acid. A synthetic butter, caramel, fruit, honey, and nut flavoring for beverages, ice cream, ices, candy, and baked goods. NIL p-TOLYL PHENYLACETATE • A synthetic butter, caramel, fruit, honey, and nut flavoring for beverages, ice cream, ices, candy, and baked goods. ASP

TOLYLACETALDEHYDE • A synthetic berry, loganberry, fruit, cherry, muscatel, peach, apricot, nut, almond, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, gelatin desserts, chewing gum, and maraschino cherries. p-TOLYALDEHYDE • Colorless liquid derived from benzene. Used in perfumes and flavoring additives.

2-(p-TOLYL) PROPIONALDEHYDE • A synthetic caraway flavoring additive for beverages, ice cream, ices, candy, baked goods, and liqueurs. ASP

o-TOLYL SALICYLATE • Synthetic flavoring. NIL

TOMATO EXTRACT • Tomatine. Extract from the fruit of the tomato, Lycopersicon esculentum. Used as a fungicide and as a precipitating additive. Nontoxic.

TOMATO LYCOPENE • Results of a study published in the November 2007 American Journal of Clinical Nutrition suggest that supplementing the diet with tomato lycopene may interfere with the insulinlike growth factor (IGF) system and thereby possibly decrease cancer risk. The FDA determined in 2004 there was no credible evidence to support claims about consumption of tomato lycopene and a reduced risk of prostate cancer and sent an enforcement letter about not using the claim. Based on the information provided by San-Ei, a producer of lycopene, however, it agreed that lycopene could be determined GRAS according to other information available to the FDA; therefore, the agency has no questions at this time (2006) regarding producer San-Ei's conclusion that concentrated tomato lycopene extract is GRAS under the intended conditions of use, as an ingredient in nonalcoholic beverages, including carbonated beverages. The agency has not, however, made its own determination regarding the GRAS status of the subject use of concentrated tomato lycopene extract. EAF

TOMATO PULP POWDER • Ingredient in baked goods, ground meat products, meat analogs, dairy products, soups, and sauces. LycoRed informed the FDA of its determination that the addition of tomato pulp powder to other foods is GRAS while acknowledging that the use of tomato pulp powder in some of the foods is impractical and nonviable in the marketplace and, therefore, does not contribute to lycopene exposure. Based on the information provided by LycoRed, the supplement dated September 15, 2006, and other information available to the FDA, the agency has no questions at this time regarding LycoRed's conclusion that tomato pulp powder is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of tomato pulp powder.

TONKA • Tonka Bean. Coumarouna Bean. Black-brown seeds with a wrinkled surface and brittle, shining, or fatty skins. A vanillalike odor and a bitter taste. Used in the production of natural coumarin (see) in flavoring extracts. Food containing any added coumarin as such or as a constituent of tonka beans or tonka extract is deemed to be adulterated. Banned from food in the United States because of its coumarin content. See Coumarin.

TORMENTIL EXTRACT • The extract of the roots of Potentilla erecta.

TORULA YEAST • Dried Candida utils. Flavoring in food. See Yeast.

TOTAL CARB • Label listing for total carbohydrates. See Carbohydrates.

TOUCH OF NATURE • A sweetener made from both sap extracts and crushed leaves of nature's taste tree, grown in the Brazilian rain forest.

TOXAPHENE • Chlorinated camphene containing 67–69 percent chlorine. Yellow waxy solid with a pleasant pine odor, it is used as an insecticide in soybean oil. FDA regulations set a residue tolerance of 6 ppm in soybean oil from use on growing crop. Human poison by ingestion. Can be absorbed through the skin. Causes cancer and birth defects in experimental animals. Lethal amounts of toxaphene can enter the body through the mouth, lungs, and skin.

TRAGACANTH • See Gum Tragacanth. GRAS. ASP. E

TRAILBLAZER • A fat-based replacer for fat. It is a microparticulated protein product (MPP) similar to Simplesse (see). It is made from whey protein or milk and egg protein. It has about 1 to 4 calories per gram and is approved for use in frozen dessert-type foods. The FDA says that whey-based MPP conforms to the definition of whey protein concentrate (see) such as the fat replacer Dairy-Lo, a GRAS substance. Therefore, it can be used in other foods, including reduced-fat versions of butter, sour cream, cheese, yogurt, salad dressing, margarine, mayonnaise, baked goods, coffee creamers, soups, and sauces.

TRANS FATS • Trans means “across” in Latin. See Trans Fatty Acids.

TRANS FATTY ACIDS • A polyunsaturated (see) fatty acid in which some of the missing hydrogen atoms have been put back by hydrogenation (see). Trans fatty acids are the building blocks of hydrogenated fats. Trans fatty acids, also known as trans fats, are found naturally in small quantities in some foods, including beef, pork, lamb, butter, and milk. But most trans fatty acids in the diet come from hydrogenated foods. Oils are hydrogenated to give a more desirable quality to food or make foods last longer. Hydrogenation enables some types of peanut butter to have a creamier consistency and is used to make stick margarine from vegetable oil. In the 1960s, doctors told us to eat margarine instead of butter to lower our cholesterol levels and protect our hearts. The amount of butter consumed by Americans is now half of what it was in 1961. In 1992, reports from the U.S. Department of Agriculture researchers and scientific institutions in Europe stated that margarines, which develop trans fatty acids during the processing to form “sticks,” may be as bad or worse for our cholesterol levels and our hearts. The sale of margarine immediately plummeted after publicity about the research. In the body, trans fatty acids act like saturated fats and tend to raise blood cholesterol levels. It's wise to be prudent in how much you consume, especially if you have high cholesterol levels already. What types of foods contain trans fatty acids? Look on the label for the phrase “partially hydrogenated vegetable oil,” which is found in stick margarine, vegetable shortening, and some prepared foods like cakes, cookies, crackers, and commercially fried foods. Scientific reports have confirmed the relationship between trans fat and an increased risk of coronary heart disease. On July 11, 2003, the FDA published a final rule requiring manufacturers to list trans fatty acids, or trans fat, on the label. Manufacturers had until January 1, 2006, to list trans fat on the nutrition label. The FDA estimated that by three years after that date, trans fat labeling will have prevented from 600 to 1,200 cases of coronary heart disease and 250 to 500 deaths each year. Three years later, however, without an interpretive footnote or further information on recommended daily value, many consumers do not know how to interpret trans fat, according to a study by marketing researchers at the University of Arkansas. In fact, without specific prior knowledge about trans fat and its negative health effects, consumers, including those at risk for heart disease, may misinterpret nutrient information provided on the panel, which is required by the U.S. Food and Drug Administration. Unlike other panel categories, such as cholesterol, total fat, and especially saturated fat, trans fat does not have an accompanying percentage of recommended daily value. For example, consider food items that have 4 grams of trans fat,

Compared with levels of fat and saturated fat found on the Nutrition Facts panel, this amount might appear low. With an absence of general knowledge about trans fat, the typical consumer might easily conclude that the item has a favorable level of trans fat. However, 4 grams of trans fat is high; it is approximately 70 percent of the total daily consumption for the average U.S. consumer. New York City became the first city to ban trans fats at restaurants—from the corner pizzeria to high-end bakeries.

TRANS-3-HEXENOL • Intensely green, somewhat bitter, earthy, fatty odor. Works well in green, leafy vegetable flavors. Declared GRAS by FEMA (see).

TREFOIL, SWEET • Meliotus caerulea. Trigonella caerulea. Powdered leaves and flowers used in Switzerland to flavor and color cheese, also to flavor breads, soups, potato dishes, and greens. Grown as a fodder crop and spice in most Mediterranean countries. Related to fenugreek. NUL

TREHALOSE • A sugar found naturally in mushrooms, honey, lobster, and shrimp, trehalose improves the fruity aroma and the levels of healthy polyphenol, according to new research published in the Journal of Food Engineering. The report said adding trehalose to strawberry cream improves color, aroma, and the anthocyanin (see) content of the finished fillings.

TRENBOLONE • A synthetic anabolic steroid. A male sex hormone given to cattle to "build up," to stimulate growth, weight gain, strength, and appetite. Abuse of these drugs has caused problems, especially among young athletes who wish to build muscle and strength. Uncontrolled use can cause liver damage and cancer. On February 27, 1991, anabolic steroids became controlled drugs requiring security ordering and record keeping for humans. Increased tumors were evident in long-term studies of rats fed trenbolone. The FDA limits residues to 50 ppb in the muscle of beef, 100 ppb in liver, 300 ppb in kidney, and 400 ppb in fat in cattle. The JECFA (see) set a marginal no-effect level at 0.1 mg/kg diet equal to approximately 2 mg/kg of body weight. The committee set an ADI (see) of 0-0.02 mg/kg of body weight. The EU will not permit U.S. red meat to be imported with this growth promoter.

TRENBOLONE ACETATE and ESTRADIOL • Hormones used as implants in feedlot cattle. As residues in cattle, see Trenbolone and Estradiol.

TRIACETIN • Glyceryl Triacetate. Primarily a solvent for hair dyes. Also a fixative in perfume and used in toothpaste. A colorless, somewhat oily liquid with a slight fatty odor and a bitter taste. Obtained from adding acetate to glycerin (see both). Soluble in water and miscible with alcohol. Large subcutaneous injections are lethal to rats. GRAS. ASP

TRIACETYL GLYCERIN • Colorless, oily liquid with a fatty odor and taste, it is used as a flavoring additive, a humectant (see), plasticizer, solvent, and carrier for food additives. Used in baked goods, baking mixes, beverages, candy, chewing gum, confections, fillings, frostings, frozen dairy desserts, dessert mixes, gelatins, and puddings. Poison by ingestion. An eye irritant.

TRIAMMONIUM CITRATE • Citric acid triammonium salt. Buffering agent. E

TRIBASIC CALCIUM PHOSPHATE • Tricalcium Diorthophosphate. Tricalcium Phosphate. An anticaking additive and calcium supplement in grain products used in packaged cake mixes, candy, baked goods, gelatin desserts, powdered beverage mixes, seasoning mixes, powdered soups, and sugar. Too much phosphorus in the form of phosphates from processed foods could upset the body's mineral balance, particularly calcium, and could adversely affect teeth, bones, and kidneys.

TRIBROMSALAN • TBS. 3,4',5-Tribromosalicylanilide. Used in medicated cosmetics; an antiseptic and fungicide. Irritating to the skin and may cause allergic reaction when skin is exposed to the sun. Salicylanilide is an antifungal compound used to treat ringworm. TBS is in the most popular soaps to kill skin bacteria. Used as a germicide, frequently replacing hexachlorophene.

TRIBUTYL ACETYLCITRATE • Synthetic fruit flavoring additive for beverages. NIL

TRIBUTYL CITRATE • The triester of butyl alcohol and citric acid (see both), it is a pale yellow, odorless liquid used as a plasticizer, antifoam additive, and solvent for nitrocellulose. Low toxicity.

TRIBUTYLCRESYLBUTANE • Used as a stabilizer. See Phenol.

TRIBUTYRIN • Glyceryl Tributyrate. A colorless, somewhat oily liquid that occurs naturally in butter. It has a characteristic odor and bitter taste. It is soluble in alcohol. Used as a flavoring additive in beverages, ice cream, candy, baked goods, margarine, and puddings. Moderately toxic by ingestion. See Glycerol and Butyric Acid. GRAS

TRICALCIUM PHOSPHATE • The calcium salt of phosphate (see). An anticaking additive in table salt and vanilla powder, and a dietary supplement. Used as a bleaching additive in flour at not more than 6 ppm by weight alone or in combination with potassium alum, calcium sulfate (see), and other compounds. Also used as a polishing additive in dentifices. See Calcium Phosphate. GRAS

TRICALCIUM SILICATE • Used in table salt and baking powder as an anticaking additive up to 2 percent. On the FDA list to be studied for subacute, mutagenic, teratogenic, and reproductive effects. GRAS

TRICETETH-5 PHOSPHATE • See Phosphoric Acid and Cetyl Alcohol.

TRICHLORETHYLENE • TCE. A nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers. Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical. In food, TCE is used to decaffeinate coffee powder. It is also used in spice oleoresins as a solvent. Moderate exposure can cause symptoms similar to alcohol inebriation, and its analgesic and anesthetic properties make it useful for short operations. High concentrations have a narcotic effect. Deaths have been attributed to irregular heart rhythm. Tests conducted by the National Cancer Institute showed that this chlorinated hydrocarbon caused cancer of the liver in mice. Rats failed to show significant response, a fact that may be attributed to the cancer resistance of the strain used. Despite the species difference in cancer response, the NCI concluded that the TCE test clearly showed the compound caused liver cancer in mice. The findings are considered definitive for animal studies and serve as a warning of possible carcinogenicity in humans. However, the extent of the possible human risk cannot be predicted reliably on the basis of these studies alone. A related compound, vinyl chloride (see), does cause liver cancer in humans. FDA residue tolerance in decaffeinated ground coffee, 25 ppm (0.0025 percent); decaffeinated soluble (instant) coffee extract, 10 ppm (0.001 percent); spice oleoresins, 30 ppm. In 1997, the NTP (see) put it on the list for review as a carcinogen. NUL

(2,2,2-TRICHLORO-1-HYDROXYETHYL)DIMETHYL PHOSPHONATE •

Anthon. Chloroftalm. Chlorophos. Chlorofos. Dimetox. Dipterax. Dipterex. Trichlorfon. Widely used insecticide for the control of flies and roaches and also to fight worms in animals. Used in animal feed and on citrus pulp. FDA limits it to 2.5 ppm in dried citrus pulp when used for animal feed. Inhibits nerve signals. Poison by ingestion, inhalation, and other routes except skin.

1,2,4-TRICHLOROBENZENE • It is used as an intermediate or building block to make herbicides, substances that destroy or prevent the growth of weeds. It is also used as a solvent, a degreaser, and a lubricant. You can be exposed to it if you breathe contaminated air or eat contaminated food, specifically fish, or if your skin comes into contact with it. If you work in an industry that makes or uses 1,2,4-trichlorobenzene, you can be exposed by breathing it while it is being made or used. No information is available on the short- or long-term health effects of 1,2,4-

trichlorobenzene in humans. However, animal studies show that rats exposed to the substance by injection experienced an enlargement of the adrenal glands located near the kidney. The U.S. EPA established a reference dose (RfD) of 0.01 milligrams per kilograms a day of 1,2,4-trichlorobenzene. The RfD is an estimate of the highest daily oral exposure humans can be exposed to without resulting in harmful effects. This chemical is on the EPA's top ten priority toxic list. It is number sixteen on the CERCLA Priority List of Hazardous Substances (see).

TRICHLOROMETAFOS • Dermaphos. Ronnel. Fenchlorphos. White powder widely used as an insecticide in animal feed. Chlorophenol compounds are on the Community Right-to-Know List (see). Poisonous by ingestion. Causes birth defects in experimental animals. Inhibits nerve transmission.

2,4,5-TRICHLOROPHENOL • The paper and pulp mills use 2,4,5-trichlorophenol as a fungicide to destroy or prevent fungi from growing. It is also used as an herbicide and to make other pesticides. It can get into the body by breathing contaminated air or it can be absorbed through the skin. The most common source of exposure is for workers in an industry that makes 2,4,5-trichlorophenol or for individuals responsible for applying pesticides. Low levels of 2,4,5-trichlorophenol can be found in air, food, and drinking water. If your skin comes into contact with 2,4,5-trichlorophenol, it may burn. It can also irritate your eyes, nose, throat, and lungs. There is no information on the effects of long-term exposure to 2,4,5-trichlorophenol on humans. However, animal studies show that long-term exposure in rats through diet caused some slight decline in the liver and kidneys. No information is available on whether 2,4,5-trichlorophenol can cause cancer in humans. It is on the EPA's top priority list for study.

TRICLOPYR • A preemergent herbicide. FDA residue tolerance is 0.01 ppm in milk; 0.05 ppm in meat, fat, and meat by-products of cattle, goats, hogs, and sheep; and 0.5 ppm in liver and kidneys of cattle, goats, hogs, and sheep.

TRICYCLAZOLE • A fungicide used on rice. The FDA tolerance for residues are 30 ppm in rice bran, rice hulls, and rice polishings.

TRICYCLOHEXYLTIN HYDROXIDE • TCTH. Cyhexatin. A pesticide used on animal feed. FDA residue tolerance is 8 ppm in dried apple pomace, and dried citrus pulp resulting from application to growing crops; 90 ppm in dried hops; 4 ppm in dried prunes. Irritating to the eyes.

2-TRIDECANONE • Natural insecticide found in wild tomatoes, Lycopersicon hirsutum f. glabratum; a compound seventy-two times more abundant in the wild tomato than in the cultivated tomato L. esculentum. Used as a flavoring. The JECFA (see) has no safety concern about this additive. ASP

2-TRIDECENAL • A synthetic citrus and flavoring for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

TRIETHANOLAMINE • A coating additive for fresh fruit and vegetables and widely used in surfactants (see). Used in flume water for washing sugar beets prior to slicing operation. Its principal toxic effect in animals has been attributed to over-alkalinity. Gross pathology has been found in the gastrointestinal tract in fatally poisoned guinea pigs. It is an irritant. ASP

TRIETHANOLAMINE STEARATE • Made from ethylene oxide. A viscous moisture absorber, used in making emulsions. May be irritating to the skin and mucous membranes, but less so than many other amines (see).

TRIETHYL CITRATE • Citric Acid. Ethyl Citrate. Odorless, practically colorless, bitter; also used in dried egg as a sequestering additive (see) and to prevent rancidity. Citrates may interfere with laboratory tests for blood, liver, and pancreatic function, but have no known skin toxicity. GRAS. ASP. E

TRIETHYLENE GLYCOL • Prepared from ethylene oxide and ethylene glycol (see both). Used as a solvent. See Polyethylene Glycol for toxicity. ASP

TRIETHYLENETETRAMINE CROSS-LINKED WITH EPICHLOROHYDRIN • Processing additive. See Epichlorohydrin. NUL

TRIFLUMIZOLE • Fungicide used in animal feed. FDA residue tolerances are 2 ppm in apple pomace; 25 ppm in grape pomace; and 8 ppm in raisin waste.

TRIFLUOROMETHANE SULFONIC ACID • A catalyst used in the production of cocoa butter substitute. Toxic by inhalation. Slightly irritating to the skin. NIL

TRIFLURALIN • Used primarily as an herbicide on grass to control broadleaf weeds and on crops such as fruits and vegetables, flowers, shrubs, cotton, and soybeans. You can be exposed to trifluralin if you breathe contaminated air or touch lawns or crops that have been treated with trifluralin. Exposure can occur if you eat fish that have been exposed to trifluralin-contaminated water. Another source of exposure is through your workplace or farm. If you apply the herbicide, you can also be exposed. Trifluralin could be released to water from agricultural runoff. There is very little information available on the short- and long-term effects on humans. However, animal studies show that trifluralin is moderately toxic to rats, mice, and rabbits who were exposed to it for a short period by inhalation, ingestion, or skin contact. Dogs exposed to trifluralin for long periods of time showed weight loss, changes in blood, and an increase in their liver weight. The offspring of mice that were fed trifluralin showed abnormalities in the skeleton. The fetuses of pregnant mice and rats that were fed trifluralin experienced a decrease in their weight. Rats who were fed trifluralin developed tumors in their urinary tract and in the thyroid. The EPA (see) has determined that trifluralin could possibly cause cancer in humans. It is on the EPA's priority list for chemicals to be studied.

TRIFORINE • Brolly. Denarin. Funginex. Nimrod T. Saprol. Triforine DC. Triforine is a fungicide in mixed formulations with carbendazim, permethrin, man-cozeb, and bupirimate. In the United States, triforine is marketed for use on almonds, apples, asparagus, blueberries, cherries, hops, ornamentals, peaches, and roses. Triforine is a “restricted use” pesticide (RUP) with an EPA toxicity classification of I (highly toxic). Outside the United States, triforine is used on the previously mentioned commodities plus beans, cereals, cotton, cucurbits, grapes, hops, mangoes, mushrooms, sugar beets, tobacco, and vegetables. It is also marketed on ornamentals in the home and garden market. It is used as a fungicide for animal feed and hops. FDA limits residue to 60 ppm in hops when used for animal feed.

TRIFURAN • A pesticide used in peppermint and spearmint oil. FDA residue tolerance is 2 ppm.

TRIGLYCERIDES • Most of the body's fat tissue is in the form of triglycerides, stored for use as energy. Triglycerides can come from fat we eat, or fat that we make in our bodies from carbohydrates. Chemically, the triglyceride molecules consist of fatty acids joined to a glycerol molecule. Too many triglycerides in the blood is called hypertriglyceridemia, which is a risk factor for heart disease. People on low-carb diets rarely have triglycerides above normal (150 mg/dL).

2-4-5-TRIHYDROXYBUTYROPHENONE • THBP. An antioxidant used alone or in combination with other antioxidants. Total antioxidant not to exceed 0.02 percent of the oil or fat content of any product. Also used in the manufacture of food packaging materials, with a limit of 0.005 percent in food. On the FDA list for further study of this widely used additive. May not be listed on labels. NIL

TRIHYDROXY STEARIN • Isolated from cork and used as a thickener.

TRIISOPROPANOLAMINE • TIPA. A crystalline, white solid. A mild base used as an emulsifying additive. A component of a coating used for fresh fruits and vegetables.

TRIISOSTEARIN • See Glycerin and Isostearic Acid.

TRILAURIN • See Lauric Acid.

TRILAURYL CITRATE • See Lauryl Alcohol and Citric Acid.

TRIMETHYLAMINE • Miscellaneous uses. Colorless gas at room temperature easily liquefied. Derived from the interaction of methanol and ammonia. Used in insecticides, quaternary ammonium compounds (see), and plastics. ASP p -TRIMETHYLBENZYL ALCOHOL • Synthetic flavoring. ASP

4-(2,6,6-TRIMETHYLCYCLOHEXA-1,3-DIENYL)BUT-2-EN-4-ONE • Flavoring additive for which the JECFA (see) said in 1998 there was no safety concern. ASP

2,6,6-TRIMETHYLCYCLOHEXA-1,3-DIENYL METHANAL • Synthetic flavoring. ASP

2,6,6-TRIMETHYL-2-CYCLOHEXANE-1-ONE CARBOXALDEHYDE • Nicomol. Crystals from diluted acetic acid. Odorless and tasteless. Breaks down fats. ASP

3,3,5-TRIMETHYLCYCLOHEXANOL • Synthetic flavoring.

2,6,6-TRIMETHYLCYCLOHEXANONE • Synthetic flavoring.

2,6,6-TRIMETHYL-1-CYCLOHEXEN-1-ACETALDEHYDE • Synthetic flavoring.

2,6,6-TRIMETHYLCYCLOHEX-2-ENE-1,4-DIONE • Synthetic flavoring.

4-(2,6,6-TRIMETHYLCYCLOHEX-1-ENYL)BUT-2-EN-4-ONE • Synthetic flavoring.

2,2,3-TRIMETHYLCYCLOPENT-3-EN-1-YL ACETALDEHYDE • Synthetic flavoring.

2,4,5-TRIMETHYL DELTA-3-OXAZOLINE • Yellow to orange liquid with a strong, nutlike odor. Used as a synthetic flavoring additive in various foods. GRAS

2,4,6-TRIMETHYL-4H-1,3,5-DITHIAZINE • Synthetic flavoring in baked goods, beverages, breakfast cereal, fats, oils, and gravies, meat products, grains, processed vegetables, snack foods, and soups. Declared GRAS by FEMA (see).

3,7-11-TRIMETHYL-2,6,10-DODECTRIENAL • Synthetic flavoring in baked goods, beverages, breakfast cereal, chewing gum, confectionery frostings, fats and oils, fruit ices, gelatins, gravies, instant coffee, jams, milk products, seasonings, soft candy, and soups. Declared GRAS by FEMA (see).

3,5,5-TRIMETHYLHEXANAL • Synthetic flavoring. ASP

3,5,5-TRIMETHYL-1-HEXANOL • Synthetic flavoring. ASP

(2,6,6-TRIMETHYL-2-HYDROXYCYCLOHEXYLIDENE)ACETIC ACID GAMMA-LACTONE • Antioxidant. EAF

1,3,3-TRIMETHYL-2-NORBORNANYL ACETATE • Antioxidant. ASP

2,2,4-TRIMETHYL-1,3-OXACYCLOPENTANE • Synthetic flavoring. ASP

2,6,10-TRIMETHYL-2,6,10-PENTADECATRIEN-14-ONE • Synthetic flavoring. ASP

2,3,4-TRIMETHYL-3-PENTANOL • Synthetic flavoring. EAF

2,3,6-TRIMETHYLPHENOL • See Phenol. EAF

2,3,5-TRIMETHYLPYRAZINE • Synthetic nutty flavoring. ASP

2,4,5-TRIMETHYLTHIAZOLE • Synthetic earthy flavoring. ASP

2,2,6-TRIMETHYL-6-VINYLTETRAHYDROPYRAN • Synthetic lime flavoring. NIL

TRIPHOSPHATES • Emulsifiers and stabilizers. See Phosphates. E

TRIPOLYPHOSPHATE • A phosphorus salt. A sequestering additive (see) in foods. Can be irritating because of its alkalinity. May cause esophageal stricture if swallowed. Moderately irritating to the skin and mucous membranes. Ingestion can cause violent vomiting. GRAS

TRIPOTASSIUM ORTHOPHOSPHATE • Acidity regulator, sequestrant, emulsifier, texturizing agent, stabilizer, moisture retention agent. See Phosphates.

TRIPROPYLAMINE • Clear liquid, ammonialike odor. Used in dyes, agrochemi-cals, pharmaceuticals, rubber and plastic additive industries, cosmetics, and catalyst (zeolite). Toxic if inhaled or swallowed. Corrosive. Harmful in contact with skin. Severe skin irritant. The JECFA last evaluated this flavoring additive in 2005. The committee determined the ADI (see) “as conditional” but pointed out there was no safety concern at current levels of intake when used as a flavoring agent. The evaluation is conditional because the estimated daily intake is based on the anticipated annual volume of production. The conclusion of the safety evaluation of this substance was to be revoked if use levels or poundage data were not provided before the end of 2007. As of this writing, no action has been taken. EAF

TRISODIUM-3-CARBOXY-5-HYDROXY-1-p-SULFOPHENYL-4-p-SULFO-

PHENYLAZOPYRAZOLE • See FD and C Yellow No. 5.

TRISODIUM CITRATE • Antioxidant, emulsifier, sequestrant, stabilizer. ASP

TRISODIUM EDTA • See Tetrasodium EDTA.

TRISODIUM HEDTA • Mineral suspending additives. See Sequestering Additive.

TRISODIUM HYDROXY EDTA • See Tetrasodium EDTA.

TRISODIUM HYDROXYETHYL ETHLENEDIAMINETRIACETATE • See

Tetrasodium EDTA.

TRISODIUM NITRILOTRIACETATE • Sodium salt of nitrilotriacetic acid. A sequestering additive (see). NIL

TRISODIUM NTA • See Sequestering Additive.

TRISODIUM PHOSPHATE • Obtained from phosphate rock. Highly alkaline. An emulsifier in cheese; the FDA allows residue in cheese less than 3 percent of weight. It is also used in fruit jellies. Approved by the European Union to clean chicken carcasses. For many decades food regulators were hesitant to endorse the use of antimicrobial substances by poultry processors. They were worried that such use of antimicrobials would mask unhygienic practices and would induce resistance of the microflora present on the surface of treated products. But the existence of outbreaks of salmonella and other infectious agents make the use wise, and the antimicrobials would probably pose no risk. Phosphorus was formerly used to treat rickets and degenerative disorders and is now used as a mineral supplement for foods; also in incendiary bombs and tracer bullets. Can cause skin irritation from alkalinity. GRAS

TRISTEARIN • In many animal and vegetable fats, especially hard ones like tallow and cocoa butter, it is used in surfactants and quaternary ammonium compounds.

TRISTEARYL CITRATE • The triester of stearyl alcohol and citric acid (see both).

2,3,5-TRITHIA-HEXAMINE • Synthetic flavoring in baked goods, beverages, breakfast cereal, chewing gum, confectionery frostings, fats and oils,

2,5,5-TRIMETHYLHEXANAL • Synthetic flavoring in baked goods, beverages, breakfast cereal, chewing gum, confectionery frostings, fats and oils, fruit ices, gelatins, gravies, instant coffee, jams, milk products, seasonings, soft candy, and soups. Declared GRAS by FEMA (see).

TRITHIAHEXANE • A flavoring used in baked goods, beverages, cheese, gravies, snack foods, and many other food products. Determined GRAS by FEMA (see).

TRITHIOACETONE • Synthetic flavoring with a musty note commonly found in fruit flavors. Used in black currant, grapefruit, peach, and tropical fruit flavorings. ASP

TRITHION • Acarithion. Akarithion. Endyl. Trithion Miticide. Insecticide and miticide used in animal feed, grapefruit, lemons, limes, oranges, tangelos, tangerines, and dried tea. The FDA's insecticide residue tolerance is 20 ppm on dried tea and 10 ppm in dehydrated citrus pulp and citrus meal when used for cattle feed. On the EPA Extremely Hazardous Substances List. Poisonous by ingestion and skin contact. Inhibits nerve transmission.

TRITICALE • A man-made cross between wheat (see Dog Grass Extract) and rye (secale), but more nutritious than wheat. The protein content of bread made with it is 10 percent higher and its essential amino acid, lysine (see), exceeds wheat bread by 50 percent. A number of novel products are being made from it, including ethnic breads. Triticale is intended for baked goods, ready-to-eat cereals, and malt products; also used as a thickener, emulsifier, fortifier, and supplement. Now used mostly for forage.

TRITICUM • See Dog Grass Extract. GRAS

TROMETHAMINE • Made by the reduction (see) of nitro compounds, it is a crystalline mass used in the manufacture of surfactants (see). Used medicinally to correct an overabundance of acid in the body.

TRUE FIXATIVE • This holds back the evaporation of the other materials. Benzoin is an example. See Fixative.

TRYPSIN FROM ANIMAL TISSUE • An enzyme formed in the intestine. It is administered as a drug in the treatment of indigestion. GRAS. NUL

TRYPTOPHAN • L form only. A tremendous amount of research is now in progress with this amino acid (see). First isolated in milk in 1901, it is now being studied as a means to calm hyperactive children, induce sleep, and fight depression and pain. It is not believed to be completely harmless and has been suspected of being a cocar-cinogen and to affect the liver when taken in high doses. Like niacin, it is capable of preventing and curing pellagra. It is a partial precursor of the brain hormone serotonin and is indispensable for the manufacture of certain cell proteins. In cosmetics, it is used to increase the protein content of creams and lotions. Causes cancer in experimental animals. The FDA called for further study of this additive. ASP

TUBEROSE LACTONE • Flavoring used in baked goods, instant coffee and tea, jams, jellies, meat products, nut products, snack foods, soft candy, soups, sugar substitutes, and many other food products. Determined GRAS by the Expert Panel of the Flavor and Extract Manufacturers Association. EAF

TUBEROSE OIL • Derived from a Mexican bulbous herb, Polianthes tuberosa, commonly cultivated for its spike of fragrant white single or double flowers that resemble small lilies. Used in peach flavorings for beverages, ice cream, ices, candy, and baked goods. Tuberose is used in perfumes. Can cause allergic reactions. GRAS. ASP

TUMERIC • See Turmeric.

TUNA OIL • Rich in omega-3 polyunsaturated fatty acids (omega-3 PUFAs), especially eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which have various physiological functions. GRAS

TUNG NUT OIL • Chinawood Oil. Drying oil used to waterproof packaging materials. Toxic by ingestion. Causes contact dermatitis (skin rash). Ingestion causes nausea, vomiting, cramps, diarrhea, thirst, dizziness, lethargy, and disorientation. Large doses can cause fever, irregular heartbeat, and respiratory effects.

TUNU EXTRACT • Tuno. From a Central American tree, Castilla fallax, closely related to the rubber tree. Cleared for use as a natural masticatory substance of vegetable origin in chewing-gum base. ASP

TURMERIC • Tumeric. Derived from an East Indian herb, Curcuma longa. Aromatic, with a pepperlike but somewhat bitter taste. The cleaned, boiled, sun-dried, pulverized root is used in coconut, ginger ale, and curry flavorings for puddings, condiments, meats, soups, and pickles; also for yellow coloring used to color sausage casings, oleomargarine, shortening, and marker ink. The extract is used in fruit, meat, and cheese flavorings for beverages, condiments, meats, soup bases, and pickles. The oleoresin (see) is obtained by extraction with one or more of the solvents acetone, ethyl alcohol, ethylene dichloride (see all), and others. It is used in spice flavorings for condiments, meats, pickles, and brine. Both turmeric and its oleoresin have been permanently listed for coloring food since 1966. It is exempt from certification. GRAS. ASP

TURMERIC OLEORESIN • The color additive turmeric oleoresin is the combination of flavor and color principles obtained from turmeric, Curcuma longa, by extraction using any one or a combination of solvents. In two-year animal studies, turmeric oleoresin ingestion was also associated with increased incidences of ulcers, hyper-plasia, and inflammation of the forestomach, cecum, and colon in male rats and of the cecum in female rats. In female mice, ingestion of diets containing turmeric oleoresin was also associated with an increased incidence of thyroid gland follicular cell hyperplasia. The induction of cancer by the additive was equivocal. ASP

TURPENTINE • Gum and Steam Distilled. Any of the various resins obtained from a species of pine trees. A yellowish, viscous exudate with a characteristic smell, both forms are used in spice flavorings for baked goods. Steam-distilled turpentine is also used in candy. It is the oleoresin from a species of pines. Readily absorbed through the skin. Irritating to the skin and mucous membranes. In addition to being a local skin irritant, it can cause allergic reactions. It is also a central nervous system depressant. Death is usually due to respiratory failure. As little as 15 milliliters has killed children. NIL.

TURPENTINE, STEAM DISTILLED • The essential oil can be separated from pine rosin by steam distillation. See Turpentine. ASP

TVP • Textured vegetable protein. Made from soy. A dry product, it requires rehydration.

TWO PERCENT MILK • See Milk.

TYLOSIN • Tylon. Tylan. Antibiotic from Streptomycetes fradiae used for beef, chicken, eggs, milk, pork, and turkey. FDA limitations are 0.2 ppm in chickens, turkeys, cattle, swine, and eggs; 0.05 ppm in milk. Moderately toxic by ingestion.

TYLOSIN and SULFAMETHAZINE • Used in swine feeds. Residues of tylosin (see) in edible tissue of swine is tolerated by the FDA at 0.2 ppm and residues of sulfamethazine is 0.1 ppm. Both are antibiotics.

TYRAMINE • A derivative of tyrosine (see), it is a chemical present in mistletoe and many common foods and beverages. It raises blood pressure but usually causes no problem because enzymes in the body hold it in check. When drugs are used that inhibit the major enzyme that restrains its actions, monoamine oxidase (MAO) (see), the blood pressure can shoot up to dangerous levels when foods and beverages containing significant levels of tyramine are ingested. Among the foods that are high in tyramine are cheese, beer, wines, pickled herring, chicken livers, yeast extract, canned figs, raisins, bananas, avocados, chocolate, soy sauce, fava beans, meat tenderizers, eggplant, tea, cola, beef liver, and yogurt. Among the

drugs that inhibit the enzyme and may lead to a serious rise in blood pressure are the MAO inhibitors; anti-TB drugs, such as isoniazid; and anticancer drugs, such as procarbazine. EAF

TYROSINE • L form. Widely distributed amino acid (see), termed nonessential because it does not seem to be necessary for growth. It is used as a dietary supplement. It is a building block of protein. The FDA has asked for further study of this additive. GRAS. ASP

TYROSINE ETHYL ESTER HYDROCHLORIDE • Derived from an amino acid. See Tyrosine and Ester. NUL

U • Symbol meaning “kosher” (see).

UL • The abbreviation for tolerable upper (intake) level. The highest level of daily nutrient intake that can be consumed by individuals in the general population without posing a risk of adverse health effects.

ULTRAMARINE BLUE • A color additive occurring naturally in the mineral lapis lazuli. Used for packaging material and a salt for animal feed only. FDA limitation of 0.5 percent of salt. It is used for external use only. No longer permitted for use as a drug coloring. NUL

UMAMI • The tongue is sensitive to five flavors—salt, sweet, bitter, sour, and “umami” in the Japanese language, the taste of MSG. There is no analogous word to describe this taste quality in the English language. “Umami” is used by the Japanese to describe the taste of MSG as well as the meaty taste of certain fish and broth. The substances that constitute the umami taste can be divided in two main groups: one is the a-amino acid group, represented by monosodium glutamate and the other is the 5'-nucleotid group, represented by inosine 5'-monophosphate (IMP) and guanosine monophosphate (GMP) and their derivatives. Umami taste receptors were only confirmed a few years ago by researchers at the University of Miami School of Medicine. Umami taste sensation can highlight sweetness, lessen bitterness, and counterbalance saltiness. Indeed, proper use of umami taste could even contribute to a 50 percent salt reduction without compromising consumer acceptance. Glutamic acid and monosodium glutamate (MSG) are often used as an umami taste activator. Previously, studies have shown that inosine 5'-monophosphate disodium salt (1a, IMP) and guanosine 5'-phosphate (GMP) can enhance the taste of glutamate.

2,4-UNDECADIENAL • Synthetic flavoring. ASP

2,5-UNDECADIENAL • Synthetic flavoring. NIL

2,3-UNDECADIONE • A synthetic butter flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

y-UNDECALACTONE • Peach Aldehyde. Colorless to light yellow liquid with a peachy odor. Derived from undecylenic acid with sulfuric acid. A synthetic fruit flavoring, colorless or yellow, with a strong peach odor. Used for beverages, ice cream, ices, candy, baked goods, gelatin desserts, and chewing gum. Used also in perfumery. ASP

UNDECANAL • A synthetic flavoring additive. Colorless to slightly yellow, with a sweet, fatty odor. Used in lemon, orange, rose, fruit, and honey flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

9-UNDECANAL • A synthetic citrus and fruit flavoring for beverages, ice cream, ices, candy, baked goods, and chewing gum.

10-UNDECANAL • A synthetic citrus, floral, and fruit flavoring additive for beverages, ice cream, ices, and candy.

1-UNDECANOL • Colorless liquid with a citrus odor used in perfumery and as a flavoring in baked goods, beverages, chewing gum, frozen dairy, hard candy, and imitation dairy. ASP

2-UNDECANOL • Essential oil from Ruta chalapensis. Antifoaming additive, perfume fixative, and plasticizer. NIL

3-UNDECANONE • A synthetic flavoring additive that occurs naturally in rue and hops oil. Used in citrus, coconut, peach, and cheese flavorings for beverages, ice cream, ices, candy, baked goods, and puddings. ASP

10-UNDECENOIC ACID • Occurs in sweat. Obtained from ricinoleic acid (see). Used as an antifungal additive. ASP

2-UNDECENOL • White to slightly yellow liquid with a sweet floral odor used as a flavoring additive in beverages, soups, and various foods. GRAS. NIL

10-UNDECEN-1-YL ACETATE • A synthetic citrus and fruit flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

UNDECYL ALCOHOL • A synthetic lemon, lime, orange, and rose flavoring additive for beverages, ice cream, ices, candy, and baked goods. ASP

N-UNDECYLBENZENESULFONIC ACID •See Castor Oil and Sulfonated Oils. ASP

UNDECYLPENTADECANOL • See Fatty Alcohols.

UNSAPONIFIABLE • Matter extracted by ether from a liquid alkaline solution after complete saponification of a fat or oil. Saponification involves a chemical reaction in which a liquid alkali such as hydroxide forms an alcohol with the sodium salt of the acid involved in the mixture. The process is usually carried out on fats and oils. Usually, a process by which triglycerides are reacted with sodium or potassium hydroxide to produce glycerol and a fatty acid salt, called “soap.”

UNSAPONIFIABLE OLIVE OILS • The oil fraction not broken down in the refining of olive fatty acids. See Olive Oil.

UNSAPONIFIABLE RAPESEED OIL • The oil fraction not broken down in the refining of rapeseed oil fatty acids. See Rapeseed Oil.

UNSAPONIFIABLE SHEA BUTTER • The fraction of shea butter that is not broken down during processing.

UNSAPONIFIABLE SOYBEAN OIL • The fraction of soybean oil that is not broken down in the refining recovery of soybean oil fatty acids.

UNSATURATED FATS • Unsaturated fats contain one or more double-bond carbon linkages and are usually liquid at room temperature. Vegetable oils and fish oils most frequently contain unsaturated fats. Among the unsaturated fats are caproleic, lau-roleic, myristoleic, palmitoleic, oleic, petroselinic, vaccenic, linoleic, linolenic, eleaostearic, gadoleic, arachidonic, and erucic. See also Fat and Monounsaturated Fat.

UPC • The abbreviation for universal product code.

UREA • Carbamide. A product of protein metabolism and excreted from human urine. Used in yeast food and wine production up to 2 pounds per gallon. It is used to “brown” baked goods such as pretzels and consists of colorless or white odorless crystals that have a cool salty taste. Medicinally, urea is used as a topical antiseptic and as a diuretic to reduce body water. Its largest use, however, is as a fertilizer, and only a small part of its production goes into the manufacture of other urea products. The Joint Expert Committee on Food Additives considered urea for evaluation only in relation to its use in chewing gum. Chewing gum may contain up to 3 percent urea, and intake from this source could be up to 300 mg of urea per day. Since urea is a natural end product of amino acid metabolism in humans and approximately 20 grams per day are excreted in the urine in adults (proportionately less in children), the committee concluded that the use of urea levels of up to 3 percent in chewing gum was of no toxicological concern. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that urea should continue its GRAS status with no limitations other than good manufacturing practices. ASP

UREASE • An enzyme from Lactobacillius fermentum. Used to inhibit urethane formation in wine. Urethane is used in pesticides and fungicides and is toxic by ingestion. Urethane was also the first cancer-causing additive demonstrated to pass through the placenta and affect the fetus. GRAS. NUL

URETHANE • A known carcinogen for several species of animals, and, as such, must be viewed as a potential carcinogen for humans as well. The degree of risk to humans, though, is not known. The FDA says scientific data are simply too limited to assess the risk posed by low levels of the

chemical in alcoholic beverages. Concern in this country over urethane (also called ethyl carbamate) began in November 1985 with news reports that Canadian authorities had detected the chemical in certain wines and distilled spirits. At that time, the FDA and the Bureau of Alcohol, Tobacco, and Firearms (ATF) began looking for ways to reduce or eliminate urethane in alcoholic beverages. Levels of urethane may be affected not only by temperature, but by other conditions as well, including the type of soil and fertilizer used to grow the raw products, such as grapes, the type of grape used in wine making, and even by the weather. These conditions may cause significant differences in the level of urethane even from one production lot to another of the same brand. After production, levels can still be increased substantially in some products—particularly wines—by shipping, storage, and handling practices. See Polyurethane.

URIDINE • A white odorless powder that is related to urea (see) and is important in carbohydrate metabolism. It is being studied for its potential brain benefit.

UROCANIC ACID • Prepared from histidine (see).

URSOLIC ACID • Bearberry. Privet Fruit. Found in leaves and berries of Arctostaphylos uva-ursi. Used as an emulsifying additive in foods.

USDA • The abbreviation for the United States Department of Agriculture.

USNIC ACID • Antibacterial compound found in lichens. Pale yellow, slightly soluble in water.

UVA-URSI • Arctostaphylos uva-ursi. Bearberry. An astringent used to treat bladder problems, it is believed that its action is due to the high concentration of the antiseptic arbutin. In passing through the system, arbutin yields hydroquinone, a urinary disinfectant. Leaves from the plant uva-ursi also contain anesthetic principles that numb pain in the urinary system and the herb has been shown to have antibiotic activity. Crude extracts of uvaursi reportedly possess some anticancer property. In 1992, the FDA proposed a ban on uva-ursi in oral menstrual drug products because it had not been shown to be safe and effective for its stated claims.

VALBAZEN • Albendazole. Zental. A worm medicine for animals. Moderately toxic by ingestion. Causes birth defects in experimental animals.

VALENCENE WOODY • Colorless to pale yellow synthetic flavoring with an orange, citrus odor. ASP

VALERAL • See Valeraldehyde.

VALERALDEHYDE • Pentanal. A synthetic flavoring additive that occurs naturally in coffee extract. Used in fruit and nut flavorings for beverages, ice cream, ices, candy, and baked goods. Has narcotic properties and is a mild irritant. ASP

VALERIAN • Valeriana officinalis. A perennial native to Europe and the United States, it was reputed as a love potion. Used as a flavoring. Its vapor was found to kill the bacillus of typhoid fever after forty-five minutes. It has been reported that it also helps concentration and energy. Prolonged use of valerian may result in side effects such as irregular heartbeat, headaches, uneasiness, nervousness, and insomnia. Very large doses may cause paralysis. ASP

VALERIC ACID • Pentanoic Acid. Occurs naturally in apples, cocoa, coffee, oil of lavender, peaches, and strawberries. A synthetic flavoring additive used in butter, butterscotch, fruit, rum, and cheese flavorings for beverages, ice cream, ices, candy, and baked goods. Usually distilled from valerian root. It occurs naturally in oils from certain marine animals and plants and is used in flavorings, perfumes, plasticizers, and pharmaceuticals. Also used in peeling solutions for fruits and vegetables. Moderately toxic by ingestion. A corrosive irritant to skin, eyes, and mucous membranes. ASP

VALERIC ALDEHYDE • See Valeraldehyde.

VALEROLACTONE, GAMMA • A synthetic vanilla flavoring additive for beverages, ice cream, ices, candy, and baked goods. Moderately toxic by ingestion. A skin irritant. ASP

VALINE • L form. An essential amino acid (see). Occurs in the largest quantities in fibrous protein. Nutritional sources of valine include cottage cheese, fish, poultry, peanuts, sesame seeds, and lentils. It is indispensable for growth and nitrogen balance. The FDA had asked for further study of L-valine as a food additive in 1980. The European Food Safety Authority (EFSA) (see) recently decided whether L-valine produced by a genetically modified E. coli K-12 strain with a 98 percent degree of purity is safe for target animals, consumers, users, and the environment. The modified L-valine is intended to supplement valine from natural sources. GRAS. ASP

VANADIUM TETRACHLORIDE • Prepared by chlorination of vanadium metal and used as a catalyst that, for example, processes ethanol to acetaldehyde (see both). Toxic by ingestion, inhalation, and skin absorption.

VANASPATI • Indian purified hydrogenated vegetable oil; similar to margarine and usually fortified with vitamins A and D. Used in candy. Also used to prepare ghee (see).

VANAY • See Triacetin.

VANILLA, ABSOLUTE • Vanilla spp. Vanilla Absolute. A perennial herbaceous climbing vine up to eighty-two feet high, with green stems and large white flowers that have deep narrow trumpets. Vanilla absolute is produced by further extraction from the resin, which is obtained by solvent extraction from the “cured” vanilla bean. Vanilla is native to Central America and Mexico and cultivated mainly in Madagascar and Mexico. Vanilla is also cultivated in Tahiti, the Comoro Islands, East Africa, and Indonesia, although the pods are often processed in Europe or the United States. EAF

VANILLA EXTRACT • Extracted from the full-grown unripe fruit of the vanilla plant of Mexico and the West Indies. Contains not less than 35 percent aqueous ethyl alcohol (see) and one or more of the following ingredients: glycerin, propylene glycol, sugar (including invert sugar), and corn syrup (see all). Used in many foods and beverages as a flavoring. GRAS. ASP

VANILLAL • See Ethyl Vanillin.

VANILLIC ACID • 4-hydroxy-3-methoxybenzoic acid. An odorless crystalline phenolic acid. Found in some varieties of vanilla, formed by oxidation of vanillin, and used chiefly in the form of esters as food preservatives. EAF

VANILLIN • Occurs naturally in vanilla (see) and potato parings but is considered an artificial flavoring. Odor and taste of vanilla. Made synthetically from eugenol (see); also from the waste of the wood pulp industry. One part vanillin equals 400 parts vanilla pods. Used in butter, chocolate, fruit, root beer, and vanilla flavorings for beverages, ice cream, ices, candy, baked goods, gelatin desserts, puddings, syrups (30,000 ppm), toppings, margarine, chocolate products, and liqueurs. May migrate from paper and paperboard to food. The lethal dose in mice is 3 grams (30 grams to the ounce) per kilogram of body weight. A skin irritant that produces a burning sensation and eczema. May also cause pigmentation of the skin. GRAS. ASP

VANILLIN ACETATE • Vanillin. A synthetic spice and vanilla flavoring additive for beverages, ice cream, ices, candy, and baked goods. See Vanillin. ASP

VANILLIN 1,2-BUTYLENE GLYCOL ACETAL • Synthetic flavoring. See Vanillin. EAF

VANILLIN ISOBUTYRATE • Synthetic flavoring. See Vanillin. EAF

VANILLYL BUTYL and ETHYL ETHER • Synthetic flavorings. See Vanillin. ASP

VANILLYLIDENE ACETONE • Synthetic flavoring. See Vanillin. ASP

VEGETABLE CARBON • Produced by the carbonization of vegetable material such as wood, cellulose residues, peat, and coconut and other shells. The raw material is carbonized at high temperatures and consists essentially of finely divided carbon. It may contain minor amounts of nitrogen, hydrogen, and oxygen. Some moisture may be absorbed by the product after manufacture. It may be activated at high temperature in the presence of steam or carbon dioxide. The JECFA says that when used in accordance with good manufacturing practice as a filtrating and clarifying agent no residues should result in food. E

VEGETABLE GUMS • Includes derivatives from quince seed, karaya, acacia, tragacanth, Irish moss, guar, sodium alginate, potassium alginate, ammonium alginate, and propylene glycol alginate. Every one is subject to deterioration and always needs a preservative. They are mostly used as thickeners. May cause allergic reactions in hypersensitive persons. ASP

VEGETABLE JUICE • Used in food colorings consistent with good manufacturing practices. Permanently listed for coloring since 1966. Does not require certification. ASP

VEGETABLE OILS • Peanut, sesame, olive, and cottonseed oil obtained from plants and used in many food additives. See Vegetable Oils, Brominated.

VEGETABLE OILS, BROMINATED • Peanut, sesame, and cottonseed oil obtained from plants. Used in fruit-flavored beverages where not prohibited by standards. FDA tolerance is less than 15 ppm. See Bromates.

VEGETARIAN • According to the Vegetarian Resource Group, less than 1 percent of Americans are true vegetarians. Such people never eat meat, fish, or poultry, although they may eat foods derived from animals such as dairy products and eggs. There are even fewer vegans, strict vegetarians who avoid all animal-derived foods—even honey.

VERATRALDEHYDE • A synthetic fruit, nut, and vanilla flavoring additive for beverages, ice cream, ices, candy, baked goods, and puddings. Derived from vanillin. May have narcotic and irritant effects but there is no specific data. ASP

VERBENOL • An alcohol made from Verbena officinalis. NIL

VERONICA • Extract of Veronica officinalis, a small herb of wide distribution that has pink or white flowers. Flavoring in alcoholic beverages only. EAF

VERVAIN, EUROPEAN • Verbena officinalis. A class of medicinal plants used as a flavoring in alcoholic beverages only. NIL

VERXITE GRANULES and FLAKES • Hydrated magnesium-aluminum iron silicate. Soft and resilient. Used as an anticaking and blending additive in ruminant feeds.

VERXITE GRITS • Used as a roughage replacement in ruminant feeds.

VERY LOW SODIUM • Less than 35 mg per serving.

VET • FDA abbreviation for a veterinary drug that may leave residue in edible tissues of animals or in edible animal products.

VETIVER OIL • Vetiverol. Khus-Khus. Stable brown to reddish brown oil from the roots of a fragrant grass. It has an aromatic to harsh woodsy odor. Used as a flavoring in alcoholic beverages only. EAF

VETIVERYL ACETATE • Slightly viscous pale green-yellow liquid. Odor resembles vetiver although much milder and having a sweet fresh note. GRAS. ASP

VIBURNUM EXTRACT • Haw Bark. Black Extract. Extract of the fruit of a hawthorn shrub or tree. Used in fragrances and in butter, caramel, cola, maple, and walnut flavorings for beverages. Has been used as a uterine antispasmodic. VIBURNUM PRUNIFOLIUM • See Viburnum Extract.

VINEGAR • Used for hundreds of years to remove lime soap after shampooing. It is a solvent for cosmetic oils and resins. Vinegar is about 4 to 6 percent acetic acid. Acetic acid occurs naturally in apples, cheese, grapes, milk, and other foods, but may cause an allergic reaction in those allergic to corn.

VINEGAR NAPHTHA • See Ethyl Acetate.

VINYL • Made from acetylene with various other substances to form plastics.

VINYL ACETATE • Used as film former and as a starch modifier not to exceed 2.5 percent in modified starch (see). Vapors in high concentration may be narcotic. Canada has put it on its Toxic Ingredients List. NUL o-VINYLANISOLE • See Anisole and Vinyl. ASP

VINYL CHLORIDE • Chloroethylene. Prepared from ethylene dichloride and alcoholic potassium, it is a colorless gas that becomes liquid upon freezing. It is one of the most frequently used vinyl compounds and is a very hazardous chemical by all avenues of exposure. It may be narcotic in high concentrations. If spilled on the skin, rapid evaporation causes local frostbite. It has been banned from aerosol sprays. It is used for many polyvinyl compounds in paper coating, adhesives, and refrigerants. It is permitted by the FDA for use in adhesives and in food-contact coatings. Information on toxic effects associated with vinyl chloride exposure in humans has been developed from industrial exposure situations. Epidemiologic studies of workers exposed to vinyl chloride showed an association between exposure to vinyl chloride and increased risk of cancer at multiple organ sites, including the liver, brain, lung and lymph glands and blood system. A no-effect level in experimental animals has not been established. Human exposure to vinyl chloride in food as a result of its migration from food contact material should be reduced to the lowest levels that are technologically achievable. It is number four on the CERCLA Priority List of Hazardous Substances (see).

VINYL CHLORIDE-VINYLIDENE CHLORIDE COPOLYMER • Used as a coating on fresh citrus fruits. Vinyl chloride was banned in hairsprays because it is a cancer-causing additive. It is a proven liver cancer-causing additive in people who work with the compound. Vinylidene chloride is an irritant to mucous membranes, narcotic in high concentrations, and has caused liver and kidney injury in experimental animals. NUL

P-VINYLPHENOL • Synthetic flavoring. In 2000, the JECFA said it had no safety concern at current levels of intake when used as a flavoring agent. NIL VIOLA ODORATA • See Violet Extract and Violet Leaves.

VIOLAXANTHIN • Natural orange-red coloring isolated from yellow pansies and Valencia orange peel. Soluble in alcohol. See Xanthophyll.

VIOLET EXTRACT • Flowers and Leaves. Green liquid with typical odor of violet. It is taken from the plant widely grown in the United States. Used in berry, violet, and fruit flavorings for beverages, ice cream, ices, candy, and baked goods. Also used in face powders and for coloring inorganic pigments. May produce skin rash in the allergic. GRAS

VIOLET LEAVES, ABSOLUTE • Essential Oil of Viola odorata. There is reported use of the chemical; it has not yet been assigned for toxicology literature. See Violet Extract. GRAS. EAF

VIOLET, SWISS • Viola calcarata. See Violet Extract. NIL

VIRGINIAMYCIN • Eskalin. Pristinamycin. Staphlyomycin. White powder used as an antibiotic from Streptomyces for chickens and swine. FDA limits residue in swine of 0.4 ppm in kidney, skin, and fat; 0.3 ppm in liver; 0.1 ppm in muscle. In broiler chickens, the limit is 0.5 ppm in kidney, 0.3 ppm in liver, 0.2 ppm in skin and fat, 0.1 ppm in muscle. Moderately toxic by ingestion.

VIRIDINE • See Phenylacetaldehyde Dimethyl Acetal.

VITAMINS • Vitamins are organic compounds that are nutritionally essential in small amounts to control metabolic processes and cannot be synthesized by the body. Vitamins are usually classified by their solubility, which to some degree determines their stability, occurrence in foodstuffs, distribution in body fluids, and tissue storage capacity. Each of the fat-soluble vitamins A, D, E, and K has a distinct and separate physiological role. Several are among those supporting antioxidant efforts to depress the effects of metabolic by-products called free radicals, which are thought to cause degenerative changes related to aging. Most of the water-soluble vitamins are components of essential enzyme systems. Many are involved in the reactions supporting energy metabolism. These vitamins are not normally stored in the body in appreciable amounts and are normally excreted in small quantities in the urine. Thus, a daily supply is desirable to avoid depletion and interruption of normal physiological functions.

VITAMIN A • Acetate and Palmitate. A yellow viscous liquid insoluble in water. An antiinfective, antixerophthahnic vitamin, essential to growth and development. Deficiency leads to retarded growth in the young, diminished visual acuity, night blindness, and skin problems. Insoluble in water. Toxic when children or adults receive more than 100,000 units daily over several months. Recommended daily dietary allowance is 1,500 units for infants and 4,500 units for adults and 2,000-3,500 units for children. It is used to fortify mellorine (vegetable-fat imitation ice cream), skim milk, dietary infant formula, blue cheese, Gorgonzola cheese, milk, and oleomargarine (1 pound of margarine contains 15,000 USP units of vitamin A). Vitamin A is also used in lubricating creams and oils for its alleged skin-healing properties. Can be absorbed through the skin. GRAS

VITAMIN B2 • Riboflavin, Lactoflavin. Formerly called vitamin G. Riboflavin is a factor in the vitamin B complex and is used in emollients. Every

plant and animal cell contains a minute amount. Helps to metabolize protein, carbohydrate, and fat; maintains healthy skin, eyes; aids formation of red blood cells and antibodies. Symptoms of deficiency include sores or cracking around the mouth, skin problems, and eye disorders. It is necessary for healthy skin and respiration, protects the eyes from sensitivity to light, and is used for building and maintaining human body tissues. A deficiency leads to lesions at the corners of the mouth and to changes in the cornea.

VITAMIN B_3 • See Niacin.

VITAMIN B5 • See Pantothenic Acid.

VITAMIN B6 • Pyridoxine. Beesix. Hexa-Betalin. Hexacrest. Nestrex. Rodex. Vitabee 6. Metabolizes protein, helps produce red blood cells, and maintains proper functioning of nervous system tissue. Vitamin B6 is believed to act as a partner for more than one hundred different enzymes. A number of the brain chemicals that send messages back and forth between nerves depend upon it for formation. A deficiency in this vitamin is known to cause depression and mental confusion. The occurrence of seizures in experimental animals in response to vitamin B6 antagonists has been observed by many. Similar seizures observed in human infants made vitamin B6 deficient inadvertently when they were fed a commercial infant formula in which the vitamin had not been properly preserved. Certain substances that deplete B6 also produce deficiency seizures. Vitamin B6 also reportedly helps rid the body tissues of excess fluid that causes some of the symptoms of premenstrual tension. Estrogen and cortisone deplete B6. Storage over a long period of time diminishes the vitamin.

VITAMIN B_9 • See Folic Acid.

VITAMIN B12 • Cyanocobalamin. Anacobin. Bedoce. Betalin 12. Bioglan B12. Crystamine. Cyano-Gel. Dodex. Kaybovite. Poyamin. Redisol. Rubesol 1000. Rubramin. Sigamine. Alpha-Ruvite. Codroxomin. Droxomin. Helps form red blood cells; maintains healthy nervous system. Deficiency symptoms include anemia, brain damage, and nervousness. More than one in five older Americans may need to take vitamin B12 by injection to prevent neurological disorders, because their stomach acid does not enable them to absorb the vitamin from foods. The condition, known as atrophic gastritis, affects at least 20 percent of people over the age of sixty. Recommended daily allowance: neonates and infants to six months, 0.3 mcg. Potential adverse reactions include blood clots in veins, transient diarrhea, itching, hives, and severe allergic reactions with IV or injection. Aminoglycosides, colchicine, para-aminosalicylic acid, and chloramphenicol (see all) cause malab-sorption of vitamin B12. Cobalt and its compounds are on the Community Right-to-Know List (see) and on the EPA Genetic Toxicology Program (see). Causes adverse reproductive effects in experimental animals. GRAS. ASP

VITAMIN B COMPLEX FACTOR • See Panthenol. ASP

VITAMIN C • See Ascorbic Acid.

VITAMIN D • Vitamin D is a fat-soluble vitamin that is naturally present in very few foods, added to others, and available as a dietary supplement. It is also produced in the body when ultraviolet rays from sunlight strike the skin and trigger vitamin D production. Vitamin D obtained from sun exposure, food, and supplements is biologically inert and must undergo two processes in the body for activation. The first occurs in the liver and converts vitamin D to calcidiol. The second occurs primarily in the kidney and forms the physiologically active calcitriol. Vitamin D is essential for promoting calcium absorption in the gut and maintaining adequate serum calcium and phosphate concentrations to enable normal mineralization of bone and prevent low blood calcium and muscle spasms. It is also needed for bone growth and bone remodeling. Without sufficient vitamin D, bones can become thin, brittle, or misshapen. Together with calcium, vitamin D also helps protect older adults from osteoporosis. Vitamin D has other roles in human health, including modulation of neuromuscular and immune function and reduction of inflammation. Vitamin D is a steroid hormone precursor that has recently been found to play a role in a wide variety of diseases. Current research indicates vitamin D deficiency plays a role in causing seventeen varieties of cancer as well as heart disease, stroke, hypertension, autoimmune diseases, diabetes, depression, chronic pain, osteoarthritis, osteoporosis, muscle weakness, muscle wasting, birth defects, and periodontal disease. The prevalence of minor depression in older persons is high (13 percent) and both decreased serum 25(OH)D levels and increased serum PTH levels can, in theory, be treated with higher dietary intake of vitamin D3 or calcium and increased exposure to daylight, according to Dutch researchers. “Low levels of the vitamin and higher blood levels of the parathyroid hormone (PTH) were associated with higher rates of depression among 1,282 community residents aged between 65 and 95,” according to results published in the Archives of General Psychiatry. “This large population-based study shows, for the first time, an association of depression status and depression severity with decreased serum 25(OH)D levels and increased serum Parathyroid levels in older people.” Dr. Witte Hoogendijk from the Vrije Universiteit Amsterdam said, “Underlying causes of vitamin D deficiency such as less sun exposure as a result of decreased outdoor activity, different housing or clothing habits, and decreased vitamin intake may be secondary to depression, but depression may also be the consequence of poor vitamin D status. In other words, are these biological changes a cause or a consequence of depression.” GRAS

VITAMIN D2 • Calciferol. A pale yellow, oily liquid, odorless, tasteless, insoluble in water. Nutritional factor added to prepared breakfast cereals. Mellorine (vegetable fat imitation ice cream), vitamin D milk, evaporated and skim milks, margarine, infant dietary formulas, enriched flour, self-rising flour, enriched cornmeal and grits, enriched macaroni and noodle products (250-1,000 USP units), enriched farina and enriched bread, rolls, etc. Vitamin D speeds the body's production of calcium and has been found to cause calcium deposits and facial deformities and subnormal IQs in children of mothers given too much vitamin D. Nutritionists recommend 400 units per day for pregnant women. Some women taking vitamin pills and vitamin-enriched milk and foods consume as much as 2,000 to 3,000 units daily. Used for its alleged skin-healing properties in lubricating creams and lotions. The absence of vitamin D in the food of young animals can lead to rickets, a bone-affecting condition. It is soluble in fats and fat solvents and is present in animal fats. Absorbed through the skin. Its value in cosmetics has not been proven. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on amounts that can be added to food.

VITAMIN D3 • Activated 7-dehydrocholesterol. Approximately as effective as vitamin D2 (see). The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that there is no evidence in the available information that it is a hazard to the public when used as it is now and it should continue its GRAS status with limitations on the amounts that can be added to food. Unilever United States, Inc., filed a petition in August 2003 proposing that the food additive regulations be amended to provide for the safe use of vitamin D3 as a nutrient supplement in certain foods for special dietary use, such as meal replacement products. The high rate of natural production of vitamin D3 cholecalciferol in the skin is the single most important fact every person should know about vitamin D because it has such profound implications for the natural human condition and snack replacement products.

VITAMIN E • See Tocopherols. ASP

VITAMIN E ACETATE • See Tocopherols.

VITAMIN E SUCCINATE • See Tocopherols.

VITAMIN G • See Riboflavin.

VITAMIN H • See Biotin.

VITAMIN K • Recommended daily allowance for adults has not been established, but the safety and adequate daily dietary intake level is listed at 0.07 to 0.14 mg. It is necessary for blood clotting. Current research seems to indicate it helps maintain bone mass in the elderly and prevents osteoporosis (see). Vitamin K antagonizes the action of anticoagulants and has been used as an antidote in managing overdosages or excessive responses to the latter. The excessive use of vitamin K-containing substances—drugs or dietary items such as green leafy vegetables—should be avoided in patients receiving anticoagulants. ASP

VITAMIN K2 • Nutrient used in dairy. GRAS.

VIVERRA CIVETTA SCHREBER • See Civet, Absolute.

VIVERRA ZIBETHA SCHREBER • See Civet, Absolute.

VIVINAL • A whey- and milk-based prebiotic (see). GRAS.

VOLATILE FATTY ACIDS INCLUDING ISOBUTYRIC ACID, ISOVALERIC ACID, METHYL BUTYRIC ACID, M-VALERIC ACID • Used in dairy cattle feeds as a source of energy. See all.

VOLATILE OILS • The volatility in oils is the tendency to give off vapors, usually at room temperature. The volatile oils in plants such as peppermint or rose produce the aroma. The volatile oils in plants stimulate the tissue with which they come in contact whether they are inhaled, ingested, or placed on the skin. They can relax or stimulate, irritate or soothe, depending upon the treatment and concentration.

WALNUT HULL EXTRACT • An extract of the husk of the nut of Juglans spp. The English walnut tree, Juglans regia (fam. Juglandaceae), also known as European walnut, has been used medicinally for thousands of years, particularly for treating skin disorders. English walnut is native to southeastern Europe, Asia Minor, India, and China. The leaves, bark, and husks of black walnut, Juglans nigra, native to North America, have also been used traditionally as medicines by American Indians and later by European settlers. The bark of black walnut was chewed for toothaches, and the inner bark was used as a laxative. The fruit husk was chewed for colic, the juice used on ringworm, and poulticed for inflammation. The leaves are considered astringent, and an insecticidal against bedbugs and mites (i.e., scabies). Used in walnut flavorings for beverages, ice cream, ices, candy, and baked goods. Also used for brown coloring. ASP

WALNUT LEAVES EXTRACT • Flavoring. Black walnut has long been used in European folk herbalism for internal cleansing and detoxifying. The leaves of black walnut are most often used to treat hemorrhoids as well as liver and gallbladder problems. In folk medicine, black walnut leaf was also given to relieve headache, hepatitis, and skin conditions. Black walnut juice is believed to cure herpes, eczema, and worms. The compound, juglone, isolated from black walnut, has been shown to be a laxative, to fight worms, and to have strong activity against bacteria and abnormal growths. Walnuts are used to treat various glandular disorders, including thyroid problems, and studies have shown the fresh juice of green walnuts boosted thyroxine at least 30 percent. Its most prominent use today is as a vermifuge to expel parasites (worms) from the body. See Walnut Hull Extract. ASP

WALNUT SHELL POWDER • The ground shell of English walnuts, Juglans regia. See Walnut Hull Extract.

WASHES FOR FRUITS AND VEGETABLES • Potassium bromide; sodium dodecylbenzenesulfonate; sodium hypochlorite; sodium 2-ethyl-1 hexylsulfate; sodium n-alkylbenzene sulfonate; sodium mono- and dimethyl-naphthalenesulfonates; alkylene oxide extracts of alkyl alcohols and phosphate esters of alkylene oxides. The chemicals are rinsed off by water, although some residues may remain.

WATER • Although deficiencies of other nutrients can be sustained for months or even years, a person can survive only a few days without water. Experts rank water second only to oxygen as essential for life. In addition to offering true refreshment for the thirsty, water plays a vital role in all bodily processes. It supplies the medium in which various chemical changes of the body occur, aiding in digestion, absorption, circulation, and lubrication of body joints. For example, as a major component of blood, water helps deliver nutrients to body cells and removes waste to the kidneys for excretion. Average adults need about sixty-four ounces of fluid each day for optimal health. Although experts generally advise drinking several glasses of water a day, the need for fluid can also be met by consuming a variety of foods and beverages.

WATER SOLUBLE TOMATO CONCENTRATE • Ingredient in yogurt drinks, fruit juices, and fruit flavored drinks. At 3 grams per serving the FDA has no questions about the application for GRAS status but says some uses may require a color additive listing.

WATERCRESS EXTRACT • Extract obtained from Nasturtium officinale.

WAX, PARAFFIN • Component of chewing-gum base and of certain cheeses. See Paraffin Wax.

WAXES • Obtained from insects, animals, petroleum, and plants. Waxes made in the United States are vegetable, petroleum, or bug based. One of the most common vegetable waxes, carnauba (see), is made from a palm leaf. Waxes from petroleum are the same as those used as chewing-gum bases. The shellac used on some products is made from the secretion of the lac bug, native to Pakistan and India. More than twenty varieties of fruits and vegetables, including cantaloupe, eggplant, oranges, peaches, grapefruit, rutabagas, persimmons, squash, cucumbers, sweet potatoes, and tomatoes are waxed. Waxing reduces the loss of moisture and keeps produce from dehydration. Some waxes are cosmetic. For example, oranges are waxed because consumers prefer a shiny surface rather than the natural dull matte of the rind. Beeswax is a substance secreted by the bee's special glands on the underside of its abdomen. The wax is glossy and hard but plastic when warm. Insoluble in water but partially soluble in boiling alcohol. Used in candy and vegetable coatings as well as for packaging. Waxes are generally nontoxic but may cause allergic reactions in the hypersensitive depending upon the source of the wax. It is also difficult to know which items have been waxed. Some foreign imports may use beef tallow, for example, which is undesirable in vegetarian or kosher diets. In many cases, pesticides and fungicides are added to waxes to help prevent decay. The wax is mainly used to keep produce fresh longer by sealing in moisture. The FDA does have regulations requiring all waxed products at the supermarket to be labeled as such, either with a card listing the specific ingredients in the wax above the bin or on the bin or container itself. (Have you seen such a listing?) Some companies, according to the Cornell University professor of food science Joseph Regenstein, Ph.D., switch waxes three times a day depending on environmental conditions. If you want to reduce the waxes on fruits and vegetables, wash them with warm water, and when appropriate scrub with a brush.

WAXY MAIZE • Corn Starch. The soft, sticky material from the inside of the corn kernel. GRAS

WETTING ADDITIVE • Any of numerous water-soluble additives that promote spreading of a liquid on a surface or penetration into a material such as skin. It lowers surface tension for better contact and absorption. See Surfactants.

WHEAT • A cereal grain that yields a fine white powder. Wheat is avoided by some allergic people. Bread, cakes, crackers, cookies, pretzels, pastries, and noodles are made of wheat; also breakfast foods such as Cream of Wheat, pablum, Grapenuts, Wheaties, puffed wheat, shredded wheat, and bran; sauces, soups, gravies; Postum, Ovaltine, malted milk; sausages, hamburger, and meat loaf. Nontoxic.

WHEAT BRAN • The broken coat of Triticum aestivum. About 14.5 percent of the kernel. In addition to indigestible cellulose, it contains 86 percent of niacin, 73 percent of pyridoxine, 50 percent of pantothenic acid, 42 percent of riboflavin, 33 percent of thiamine, and 19 percent of protein. See Wheat Germ.

WHEAT BRAN LIPIDS • An extract of the coat of wheat. See Wheat Germ.

WHEAT FLOUR • Milled from the kernels of wheat, Triticum aestivum. See Wheat Starch.

WHEAT GERM • The golden germ of the wheat is high in vitamin E. About 2.5 percent of the whole wheat kernel. The germ contains about 64 percent of thiamine, 26 percent of riboflavin, and 21 percent of pyridoxine. See Tocopherols.

WHEAT GERM EXTRACT • See Tocopherols.

WHEAT GERM OIL • See Tocopherols.

WHEAT GLUTEN • A mixture of proteins present in wheat flour and obtained as an extremely sticky, yellowish gray mass by making a dough and then washing out the starch. It consists almost entirely of two proteins, gliadin and glutenin. It contributes to the porous and spongy structure of bread. Used in powders and creams as a base. GRAS. ASP

WHEAT GLUTEN ISOLATE HYDROLYZED; PEA PROTEIN ISOLATE • The pea protein isolate is obtained from pea flour. Used in wine making. The FDA says it has no questions about the GRAS status, although the agency has not evaluated the potential allergen.

WHEAT STARCH • A product of cereal grain. Swells when water is added. A minor part of starch production in the United States. May migrate

from cotton and cotton fabrics used in dry food packaging. May cause allergic reactions such as red eyes and stuffy nose. GRAS. ASP

WHEY • The serum that remains after removal of fat and casein (see) from milk. Used as a texturizer, processing aid, and nutritional extender. Fermented whey is used as a dietary source of protein and nitrogen for cattle. GRAS. ASP

WHEY, DELACTOSED • The whey product that results from condensed whey after lactose has been crystallized and harvested from it. Delactosed whey, which is also referred to as "mother liquor," is composed of whey proteins, residual lactose, and minerals. ASP

WHEY, DEMINERALIZED • Formulation of physiologically suitable infant foods necessitates reduction of protein and mineral levels from bovine milk, rich in lactose and whey proteins and containing appropriately low levels of essential minerals. Demineralized whey is an ideal ingredient for infant formula. Demineralization of whey permits formulation of infant foods with a gross composition closest to mother's milk. To manufacture this product, a top-quality raw whey is selected, then demineralized and spray-dried. This operation suppresses the salted flavor and it contains proteins with nutritional and functional properties. It is used in confectionery, chocolate, and ice cream. It can be substituted for skim milk powder. ASP

WHEY, FERMENTED, AMMONIATED, CONDENSED • Thirty percent of dietary crude protein in animal feed for cattle. Provides source of protein and nonprotein nitrogen.

WHEY, PARTIALLY DEMINERALIZED AND PARTIALLY DELACTOSED • Dried whey and dried skim milk are by-products of the cheese and fluid milk industry. Whey contains most of the water-soluble components of milk, including lactose, lactalbumin, and lactoglobulin protein, minerals, and water-soluble vitamins. Dried whey contains approximately 70 percent lactose (milk sugar), whereas dried skim milk contains 50 percent. The mineral and lactose (see) components are reduced by processing. GRAS. NIL

WHEY PROTEIN CONCENTRATE • Milk Serum. Serum Lactis. The water part of milk remaining after the separation of casein (see). Cleared by the U.S. Department of Agriculture's Meat Inspection Department to bind and extend imitation sausage, and for use in soups and stews. Also used as source of protein and non-protein nitrogen for cattle. GRAS. ASP

WHEY, REDUCED LACTOSE • Used in frozen desserts. GRAS

WHITE CEDAR LEAF OIL • Oil of Arborvitae. Stable, pale yellow volatile oil obtained by steam distillation from the fresh leaves and branch ends of the eastern arborvitae. Has a strong camphoraceous and sagelike scent. Used as a flavoring additive. See Cedar for toxicity.

WHITE FLAG EXTRACT • See Orris.

WHITE LILY EXTRACT • Extract of the bulbs of Lilium candidum. Edible bulbs that were made into soup by the Indians, the lily is used in perfumery.

WHITE MINERAL OIL • Obtained from petroleum and used in baked goods. See Mineral Oil.

WHITE NETTLE EXTRACT • Obtained from the flowers of Lamium album. See Nettles.

WHO • The abbreviation for the World Health Organization. The WHO is the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends. The Joint Expert Committee on Food Additives (JECFA) has been meeting since 1956 to evaluate the safety of food additives, contaminants, naturally occurring toxicants, and residues of veterinary drugs in food. The JECFA has evaluated more than fifteen hundred food additives, approximately forty contaminants and naturally occurring toxicants, and residues of approximately ninety veterinary drugs. At times, the committee develops principles for the safety assessment of chemicals in food that are consistent with current thinking on risk assessment and take account of recent developments in toxicology and other relevant sciences, such as exposure assessment.

WHOLE FISH PROTEIN CONCENTRATE • Dietary supplement for household use only. FDA tolerance is less than 20 mg per day when consumed regularly by children up to eight years of age. When used in manufactured food, less than 8 ppm total fluoride content of finished food. For household use only. Package size, less than one pound. Less than 8 ppm total fluoride content of finished food when used in manufactured food.

WILD GINGER • Canadian Oil. See Snakeroot Oil.

WILD MARJORAM EXTRACT • Extract of the flowering ends of Origanum vulgare. Yellow or greenish yellow liquid containing about 40 percent terpenes (see). Used in flavoring and perfumery. See Marjoram Oil.

WILD MINT EXTRACT • Extract of the leaves and tender twigs of Mentha arvensis. The Cheyenne Indians prepared a decoction of the ground leaves and stems of wild mint and drank the liquid to check nausea. Pulegone and thymol (see) are derived from an oil of wild mint. Its odor resembles peppermint. Used in flavoring. See Peppermint.

WILD THYME EXTRACT • The flowering tops of a plant grown in Eurasia and throughout the United States. The dried leaves are used as a seasoning in foods. Has also been used as a muscle relaxant. GRAS

WILLOW LEAF EXTRACT • The extract of the leaves of the willow tree species Salix. The willow has been used for pain-relieving and fever-lowering properties since ancient Greece. The American Indians used willow baths to cool fevers, and indeed, the extract of willows contains salicylic acid, a close cousin of aspirin.

WINTERGREEN EXTRACT • Gaultheria procumbens. Flavoring. EAF

WINTERGREEN OIL • Extract and Oil. Menthyl Salicylate. Checkerberry Extract. Obtained naturally from betula, sweet birch, or teaberry oil. Present in certain leaves and bark but usually prepared by treating salicylic acid with methanol (see both). Wintergreen extract is used in root beer and wintergreen flavorings for beverages and candy (5,000 ppm). The oil is used for checkerberry, raspberry, teaberry, fruit, nut, root beer, sassafras, spice, and wintergreen flavorings for beverages, ice cream, ices, candy, baked goods (1,500 ppm), and chewing gum (3,900 ppm). It is also used in external analgesics and counterirritants, glass window cleaning preparations, nonprescription decongestants, other pharmaceutical preparations acting on the skin, and in toilet bowl cleaners. Wintergreen is a strong irritant. Ingestion of relatively small amounts may cause severe poisoning and death. The average lethal dose in children is 10 milliliters and in adults 30 milliliters. It is very irritating to the mucous membranes and skin and can be absorbed rapidly through the skin. Like other salicylates, it has a wide range of interaction with other drugs, including alcohol, antidiabetic medications, vitamin C, and tranquilizers. There is reported use of the chemical; it was not assigned for toxicology literature in 1999. According to RTECS (see) it is a suspected gastrointestinal or liver toxicant, neurotoxicant, and reproductive toxicant, and according to the NTP (see) it is a suspected respiratory toxicant. ASP

WOOD ROSIN • The exudate from a living Southern pine tree. Pale yellow to amber, slight turpentine odor. Used as a coating for fresh citrus fruits.

WOODRUFF • Master of the Woods. Used as a flavoring in alcoholic beverages only. Made of the leaves of an herb grown in Europe, Siberia, North Africa, and Australia, Asperula odorata. It is a symbol of spring and has a clean, fresh smell. EAF

WORMWOOD • Absinthium. A European woody herb with a bitter taste, used in bitters and as a liquor flavoring for beverages and liquors. The

WORMWOOD • Absinthium. A European woody herb with a bitter taste, used in bitters and as a liquor flavoring for beverages and liquors. The extract is used in bitters, liquor, and vermouth flavorings for beverages, ice cream, candy, and liquors, and in making absinthe. The oil is a narcotic substance. Used in bitters, apple, vermouth, and wine flavorings for beverages, ice cream, ices, candy, baked goods, and liquors. In large doses or frequently repeated doses, it is a narcotic poison, causing headache, trembling, and convulsions. Ingestion of the volatile oil or of the liquor, absinthe, may cause gastrointestinal symptoms, nervousness, stupor, coma, and death.

WORT • The liquid extracted from the mashing process during the brewing of beer or whiskey, wort contains sugars fermented by brewing yeast to produce alcohol. After the barley is malted it is ground to grist, mashed, and mixed with hot water. It's then steeped in a complex and slow heating process that enables enzymes to convert the starch in the malt into sugars. At the end of the mashing, hot wort is filtered, boiled, cooled, and the yeast is added to start the fermentation. Before the mashing of the barley, other grains known as adjuncts can be added to create varietal beers such as wheat beer and oatmeal stout and to create grain whiskey, or to lighten the body (and cut costs) as in American-style lagers. In beer making, it is known as “sweet wort” until the hops have been added, after which it is then “hopped wort.” NIL

XANTHAN GUM • A gum produced by a pure culture fermentation of a carbohydrate with Xanthomonas campestris. Also called corn sugar gum. The U.S. Department of Agriculture has asked for the use of xanthan gum as a necessary ingredient in packaging meat and poultry products. It is now used to thicken, suspend, emulsify, and stabilize water-based foods, such as dairy products and salad dressings. It is also used as a "pseudo plasticizer" in salad dressings to help them pour well. In animal feeds it is used as a stabilizer, thickener, and suspending additive. FDA tolerance is 0.25 percent in liquid feeds for ruminants; 0.1 percent in calf milk replacer. GRAS. ASP. E

XANTHAN GUM REDUCED PYRUFATE • Used in foods in general, excluding meat and poultry products. Application for GRAS. See Xanthan Gum.

XANTHENE • Colorants are divided into acid and basic groups. They are the second-largest category of certified colors.

XANTHOPHYLL • Vegetable Lutein. A yellow coloring originally isolated from egg yolk, now isolated from petals of flowers. Occurs also in colored feathers of birds. One of the most widespread carotinoid alcohols (a group of red and yellow pigments) in nature. Provisionally listed for use in food. Although carotinoids can usually be turned into vitamin A, xanthophyll has no vitamin A activity. EAF

XANTHOXYLUM AMERICANUM • Zanthoxylum. Ash Bark. Toothache Tree. Angelica Tree. The dried bark or berries of this tree, which grows in Canada south to Virginia and Missouri, is used to ease the pain of toothaches, to soothe stomachs, and as an antidiarrheal medicine.

XYLANASE DERIVED FROM FUSARIUM VENENATUM and BACILLUS SUBTILLIS • Enzymes used for fermentation. They have not been reported to cause allergic reactions or toxicity. GRAS

XYLENE • One of the top thirty chemicals produced in the United States in terms of volume. It is used as a solvent (a liquid that can dissolve other substances) in the printing, rubber, and leather industries. Along with other solvents, xylene is also used as a cleaning agent, a thinner for paint, and in varnishes. It is found in small amounts in airplane fuel and gasoline. Xylene is used as a material in the chemical, plastics, and synthetic fiber industries and as an ingredient in the coating of fabrics and papers. Isomers of xylene are used in the manufacture of certain polymers, such as plastics. You may also come in contact with xylene from a variety of consumer products, including cigarette smoke, gasoline, paint, varnish, shellac, and rust preventives. Many of the effects seen after exposure to xylene could have been caused by exposure to other chemicals that were in the air with xylene. P-xylene is number 185 on the CERCLA Priority List of Hazardous Substances (see).

XYLENOL • A white crystalline solid that is derived from coal tar and is toxic by ingestion and skin absorption. It is used as a disinfectant and as a solvent. Xylenols are also used as insecticides and miticides and used in the manufacture of antioxidants. Xylenol caused cancer when painted on the skin of mice. Also suspected of being a cardiovascular or blood toxicant and gastrointestinal or liver toxicant by RTECS (see). ASP

XYLITOL • Formerly made from birch wood, but now made from waste products from the pulp industry. Xylitol is a naturally occurring sweetener found in the fibers of many fruits and vegetables, including various berries, corn husks, oats, and mushrooms. It can be extracted from corn fiber birch, raspberries, plums, and corn. Xylitol is roughly as sweet as sucrose but with only two-thirds the calories. Xylitol has been reported to have diuretic effect but this has not been substantiated. It is used in chewing gum and as an artificial sweetener. It has been reported to sharply reduce cavities in teeth but costs more than sugar. The reason is that, unlike sugar, it doesn't ferment in the mouth. Therefore, it is sold for foods that stay in the mouth for some time, such as gum, toffee, and mints. FDA preliminary reports cited it as a possible cancer-causing additive. Xylitol is now used in eleven European countries and the United States and Canada. It is also used in large amounts in the former Soviet Union as a diabetic sweetener. Xylitol was evaluated by the JECFA (see) in Geneva, April 11–20, 1983. On the basis of submitted data, the committee accepted that the adverse effects observed in British studies, in which cancer-prone rats were fed large doses of xylitol, were species-specific and could not be extrapolated to humans. Therefore, no limit on daily intake was set, and no additional toxicological studies were recommended. It can cause stomach upsets when taken in large amounts. It may be of benefit to diabetics since xylitol metabolization does not involve insulin. ASP. E

D-XYLOSE • Xylo-Pfan. Wood Sugar. A natural 5-carbon sugar (pentose) obtained from the xylan-rich portion of hemicellulose from plant cell walls and fiber. It is used for flavor and color enhancement. It is used in human food and pet food industries, and in the production of savory flavors. It is also used to produce golden brown color in food applications such as batters and breadcrumbs. Combined with amino acids it is used to produce meat flavors and other notes such as roast beef, roast pork, chicken, baked potato, and baked goods. In medicine, it is used for evaluating intestinal absorption and diagnosing malabsorptive states. ASP

YARA YARA • See b-Naphthyl Methyl Ether.

YARROW • Milfoil. A strong-scented, spicy, wild herb, Achillea mille-folium, used in liquor, root beer, and spice flavorings for beverages and liquor. Also used in shampoos. Its astringent qualities have caused it to be recommended by herbalists for greasy skin. According to old herbal recipes, it prevents baldness when the hair is washed regularly with it. Used medicinally as an astringent, tonic, and stimulant. May cause a sensitivity to sunlight and artificial light, in which the skin breaks out and swells. EAF

YEASTS • Fungi that is a dietary source of folic acid. Yeast produces enzymes that will convert sugar to alcohol and carbon dioxide. It is used in enriched farina, enriched cornmeal and corn grits, and in bakery products. It is employed as a flavoring additive and flavor enhancer. It is used in hot dogs, hamburger, and frankfurter buns and rolls, pretzels, milk fortified with vitamins, meat fried in cracker crumbs, mushrooms, truffles, cheeses of all kinds, vinegars, ketchup, barbecue sauce, fermented brews, and all dried fruits. Any yeast is a type of one-celled fungus. Ordinary yeast produces the enzymes invertase and zymase, which eventually convert cane sugar to alcohol and carbon dioxide in the fermentation process. Some of the living organisms pressed into damp starch, or other absorbent material, give a product known as “baker's yeast,” which is not as potent as brewer's yeast. GRAS. ASP

YEAST AUTOLYSATE • This substance is used as a culture medium and a food flavoring; it is made by breaking down yeast with intracellular enzymes. ASP

YEAST AUTOLYZED • Consists of concentrations of yeast cells that are allowed to die and break up, so that the yeast's digestive enzymes break its proteins down into simpler compounds. Glutamate is found inside the cells, mostly bound to proteins. When the yeast proteins are broken down by autolysis to form autolyzed yeast, these release “free” glutamate. Autolyzed yeast extract is also the primary source of monosodium glutamate for the food industry.

YEAST, DRIED • The dry cells of any suitable strain of Saccharomyces cerevisiae or Candida utilis. It can be obtained as a by-product from the brewing of beer or by growing on media not suitable for beer production. Dried yeast serves as a source of protein and vitamin B complex. ASP

YEAST, DRIED IRRADIATED • Dietary supplement used in enriched farina as source of vitamin D. NUL

YEAST EXTRACT • See MSG.

YEAST, HYDROLYZED • Concentrated soluble components of hydrolyzed brewer's or baker's yeasts, a by-product of brewing. They provide a good source of B vitamins. The final report to the FDA of the Select Committee on GRAS Substances stated in 1980 that while no evidence in the available information on hydrolyzed yeast demonstrates a hazard to the public at current use levels, uncertainties exist, requiring that additional studies be conducted. The FDA said GRAS status should continue while tests were being completed and evaluated. NUL

YEAST, MALT SPROUT EXTRACT • Used as a flavor enhancer. See Yeasts. ASP

YEAST and TORULA YEAST, DRIED • Dietary supplement used in food to provide total folic acid content. See Yeasts.

YELLOW BEESWAX • Obtained from bee honeycombs, it is brittle with a honeylike odor and a balsamic taste. It is used in the manufacture of wax paper, candles, cosmetics, shoe polish, and in pharmaceutical ointments and plasters. May cause allergic reactions. GRAS

YELLOW NO. 5 • All foods containing this coloring, which is the most widely used color additive in foods, drugs, and cosmetics, are supposed to identify it on the label. The FDA ordered this so that those allergic to it could avoid it. See Tartrazine and Salicylates.

YELLOW PRUSSIATE OF SODA • Sodium Ferrocyanide. An anticaking additive, it is used in table salt to prevent the formation of clumps and keep it free-flowing. The additive is produced by heating sodium carbonate and iron with organic materials. The average daily diet in the United States contains 0.6 milligrams of sodium ferrocyanide per person. The JECFA (see) considers 1.5 milligrams daily an acceptable and safe intake for a 132-pound human. ASP

YELLOW WAX • See Beeswax.

YERBA SANTA • Eriodictyon californicum. Holy Weed. Consumptive's Weed. Bear's Weed. Eriodictyol. Eriodictyon Glutinosum. Gum Bush. Holy Herb. Mountain Balm. Sacred Herb. Tarweed. Wigandia Californicum. It was given its name “holy weed” by Spanish priests impressed with its medicinal properties. The aromatic leaves were boiled to make a tea to treat coughs, colds, asthma, pleurisy, tuberculosis, and pneumonia, and a poultice of the leaves was applied to painful joints. Unlike many medicinal herbs, yerba santa actually has a pleasant taste. It has been used as a general food flavoring. In the United States and Britain, Eriodictyon californicum was formally used for conditions including influenza, bacterial pneumonia, asthma, bronchitis, and tuberculosis starting in the late 1800s until the 1960s (when drug regulations became more stringent around proof of efficacy). Subsequently, the extracts remained GRAS (see) as a flavor for foods, beers, and pharmaceuticals (such as to hide the bitterness of quinine). Contains flavones with antioxidant properties and is promoted for a number of health conditions. There have been no reports of significant side effects or adverse reactions, except occasional allergic reaction. Nonetheless, safety in young children, pregnant or nursing women, or those with severe liver or kidney disease has not been established. ASP.

YERBA SANTA FLUID EXTRACT • Fruit flavoring derived from evergreen shrubs, Eriodictyon californicum, grown in the Southwest. Used in beverages, ice cream, ices, candy, and baked goods. At this writing, yerba tea drinks are being promoted as being rich in antioxidants, B vitamins, and minerals. The product producers also claim that because of its high nutrient content, yerba aids in weight loss as an appetite suppressant; increases energy and vitality; stimulates mental alertness and better concentration; enhances mood and relieves stress; and “Unlike coffee, yerba maté does not make one hyper or anxious and has no toxicity.” See Yerba Santa. GRAS. ASP

YLANG-YLANG OIL • A light yellow, very fragrant liquid obtained in the Philippines from flowers of Cananga odorata. Used in raspberry, cola, violet, cherry, rum, and ginger ale flavorings for beverages, ice cream, ices, candy, baked goods, chewing gum, and icing. Used in perfumes, cosmetics, and soap. GRAS. EAF

YOGURT • A dairy product produced by the action of bacteria or yeast on milk. EAF

YUCCA EXTRACT • Mohave Extract. Joshua Tree. Adam's Needle. Derived from a southwestern U.S. plant, Yucca spp., and used as a root beer flavoring for beverages, ices, and ice cream. ASP

YUCCA, JOSHUA-TREE • See Yucca Extract.

ZANTHOXYLUM • Xanthoxylum. Ash Bark. Toothache Tree. Angelica Tree. The dried bark or berries of this tree, which grows in Canada south to Virginia, and Missouri, is used to ease the pain of toothaches, to soothe stomachaches, and as an antidiarrheal medicine. A member of the rue family.

ZEARALENONE • ZEA. A potent nonsteroidal estrogenic mycotoxin produced by several Fusarium spp. (see). It has been implicated in numerous poisonings caused by the ingestion of toxins of fungal origin in farm animals, especially in pigs. Zearalenone is heat stable and is found worldwide in a number of cereal crops, such as maize, barley, oats, wheat, rice, and sorghum and also in bread. Zearalenone was shown to be produced on corn by Fusarium isolates from Australia, Europe, and North America and in New Zealand, the Philippines, Thailand, and Indonesia. The occurrence of zearalenone in food and feed was also demonstrated in South America, Africa, China, and the former USSR. Fusarium isolates from bananas can also produce zearalenone. A PMTDI (see) of 0.5 μg/kg bw was established. Zearalenone can be excreted into milk after lactating cows are fed it in high doses. Zearalenone or zearalanol was suspected to be the causative agent in an epidemic of premature menarche in girls aged six months to eight years in Puerto Rico. Although the FDA failed to detect any of the estrogen growth promoters used in food, natural sources of estrogenic compounds have not been ruled out. A statistically significant correlation was found between the pubertal changes and consumption of meat products and soya-based formula, but the associations explained only 50 percent of the investigated cases. An increased incidence of early menarche was also reported from southeastern Hungary, and zearalenone was found at concentrations of 19–100 μg/ml in serum and in samples of foods that had been consumed by the patients; however, the report lacked detailed information. Significant residues have been found elsewhere in eggs, wheat, cereal, and corn. See EDSTAC.

ZEAXANTHIN • A naturally occurring xanthophyll (see) pigment that is related to carotenoid but has no provitamin A activity. It is used as a nutrient and a coloring. Synthetic zeaxanthin is produced from raw materials that are often used in the production of other carotenoids. No long-term studies of toxicity or carcinogenity have yet been available to the JECFA (see).

ZEDOARY • A bark extract from the East Indies, Curcuma zedoaria, used as a bitters and ginger ale flavoring for beverages. There is reported use of the chemical, but it has not yet been assigned for toxicology literature. GRAS. ASP

ZEIN • It is the principal protein in corn. Contains seventeen amino acids. A byproduct of corn processing, it is used to coat food and in label varnishes and microencapsulation fibers. Also used in face masks, nail polishes, and as a plasti-cizer. Obtained as a yellowish powder by extracting corn gluten with an alcohol; also used to make textile fibers, plastics, printing inks, varnishes, and other coatings and adhesives. There was reported use of the chemical; it was not assigned for toxicology literature in 1999. GRAS.

ZEIN POWDER • A water-insoluble protein gluten, manufactured initially as a concentrated powder. It has the ability to form odorless, tasteless, clear, hard, and almost invisible edible films. Since zein films are safe to ingest, it is a coating for foods and pharmaceutical ingredients. Zein is extracted from gluten by physical rather than chemical means and is natural. Zein is resistant to bacterial attack, which frequently decomposes other proteins. GRAS. ASP

ZERANOL • Zearalanol. A hormone used to increase growth in animals. The FDA allows zero residues in uncooked edible tissues of sheep; 150 ppb in uncooked edible muscle tissue of cattle; 300 ppb as residue in uncooked kidney of cattle; 450 ppb as residues in uncooked fat of cattle; 600 ppb as an implant.

ZINC • Acetate. Carbonate. Chloride. Oxide. Sulfate. A white brittle metal insoluble in water and soluble in acids or hot solutions of alkalies. It is a mineral source and added as a nutrient to food. Widely used as an astringent for mouthwashes and as a reducing additive (see) and readditive (see). Ingestion of the salts can cause nausea and vomiting. It can cause contact dermatitis. The FDA says some studies appeared to show zinc supplements improved immunity to disease in older people. But the studies were flawed. In larger, well-designed studies, the FDA says, in which older patients received either zinc or placebos in addition to multivitamins and mineral preparations, the greatest immune function improvements were among those taking placebos. Zinc supplementation, the FDA says, not only did not improve immune system function in the elderly at 100 mg or more a day, it actually suppressed immunity. See Zinc Chloride. GRAS

ZINC ACETATE • The zinc salt of acetic acid (see) used in medicine as a dietary supplement and as a cross-linking additive for polymers (see). For toxicity, see Zinc. GRAS. NIL. E

ZINC BACITRACIN • Used in animal feed. See Bacitracin.

ZINC BORATE • The inorganic salt of zinc oxide and boric oxide, it is used as a fungistat and mildew inhibitor. See Zinc.

ZINC CARBONATE • A cosmetic coloring additive, it is a crystalline salt of zinc occurring in nature as smithsonite. See Zinc for toxicity. GRAS. NUL

ZINC-CARNOSINE • A crystalline amino-mineral complex of L-carnosine and zinc (see both), marketed for stomach health. According to the companies, zinc-carnosine has been used in Japan since 1994 for stomach disorders such heartburn, indigestion, stomach irritation, and ulcers. The ingredient combines L-carnosine—a naturally occurring dipeptide found in muscle and brain tissue—with elemental zinc for an antioxidant, tissue-healing, and mucosal-supportive complex.

ZINC CHLORIDE • Butter of Zinc. A zinc salt used as an antiseptic and astringent in shaving creams, dentifrices, and mouthwashes. Odorless and water absorbing; also a deodorant and disinfectant. Can cause contact dermatitis and is mildly irritating to the skin. Can be absorbed through the skin. GRAS. ASP

ZINC GLUCONATE • A dietary supplement. See Zinc. GRAS. ASP

ZINC GLUTAMATE • The zinc salt of glutamic acid (see).

ZINC ION and MANEB • A pesticide used on raisins, flours of barley, oats, rye, and wheat. Maneb is a fungicide. FDA residue tolerances: 28 ppm in raisins; 1 ppm in flours of barley, oats, rye, and wheat; 20 ppm in bran of barley, oats, rye, and wheat as well as milled feed fractions of those grains.

ZINC METHIONINE SULFATE • A nutrient. See Zinc and Methionine. ASP

ZINC OXIDE • A nutrient supplement. See Zinc. GRAS. ASP

ZINC RESÍNATE • The zinc salt of rosin (see).

ZINC RICINOLEATE • The zinc salt of ricinoleate (see). Used as a fungicide, emulsifier, and stabilizer.

ZINC ROSINATE • The zinc salt of rosin (see).

ZINC STEARATE • Nutrient. Should be free from chick edema factor. See Zinc. GRAS. ASP

ZINC SULFATE • White Vitriol. The reaction of sulfuric acid with zinc. Mild crystalline zinc salt used as a nutrient. Migrates to food from

ZINC SULFATE • White vitriol. The reaction of sulfuric acid with zinc. Mild crystalline zinc salt used as a nutrient. Migrates to food from paperboard products. Used medicinally as an emetic. Irritating to the skin and mucous membranes. May cause an allergic reaction. Injection under the skin of 2.5 milligrams per kilogram of body weight caused tumors in rabbits. See Zinc. GRAS. ASP

ZINGERONE • A synthetic flavoring occurring naturally in ginger. Used in fruit, root beer, sarsaparilla, spice, ginger ale, wintergreen, and birch beer flavorings for beverages, ice cream, ices, candy, baked goods, and chewing gum. ASP

ZINGIBER OFFICINALE • See Ginger.

ZINGIBER ONE • See Zingerone.

ZIRAM • An agricultural fungicide registered to control fungal diseases on a wide range of crops, including stone fruits, pome fruits, nut crops, vegetables and commercially grown ornamentals. In addition, it is formulated as a rabbit repellent for outdoor foliar applications to ornamentals and as an additive in industrial adhesives, caulking, and latex paints. The total annual domestic use of ziram is approximately 1.9 million pounds of active ingredient. Ziram was first registered in the United States in 1960 as a broad-spectrum-use fungicide to control the scab in apples and pears, leaf curl in peaches, and anthracnose and early blight in tomatoes. In 1981, additional uses were added to the label for controlling leaf blight and scab in almonds, shot-hole in apricots, brown rot and leaf spot in cherries, scab and anthracnose in pecans, and leaf spot, rust, and powdery mildew in ornamentals. Other registered uses of ziram include homeowner application on residential ornamentals as a rabbit repellent and industrial application as a preservative in exterior latex paint, caulking, sealants, and wall boards. The mechanism of toxicity for ziram has not been fully investigated; however, the primary target organs appear to be the nervous system, liver, and thyroid. Ziram has moderate acute toxicity but is classified as “suggestive of carcinogenicity” to humans. EPA has assessed dietary risk by estimating exposure to ziram residues from consumption of food and drinking water. Both chronic and acute food risks, as measured by the population adjusted doses (PADs) are below the agency's level of concern. Since ziram residues are primarily found on the surface of the fruit and are not systemic in nature, applying a washing reduction factor (0.15) to the acute residues was a practical way to refine the residues in fruits. When a washing reduction factor of 0.15 was applied to the residues of all commodities (except nuts and berries) the maximum acute dietary estimates were below the agency's level of concern for all population subgroups. The chronic (noncancer) food exposures, even without applying the washing reduction factor were below the level of concern for all population subgroups. To mitigate ecological risks, application rates on apples, cherries grown east of the Rockies, pears, nectarines, and peaches grown west of the Rockies were reduced as well as the maximum numbers of applications to apricots, cherries, nectarines, peaches, and pecans.

ZOALENE • Dinitolmide. Used in chicken and turkey feed to combat parasites. FDA tolerance residue is 2 ppm in uncooked fat of chickens; 3 ppm in uncooked muscle meat of chickens; 3 ppm in uncooked muscle meat and liver of turkeys; 6 ppm in uncooked liver and kidneys of chickens.

ZSWEET • A blend of erythritol and natural fruit extracts. Erythritol naturally occurs at low levels in many fruits and at higher levels in fermented foods such as soy sauce, cheese, wine, and beer. It contains a variety of benefits, including low-calorie content, low blood sugar effect, and a low laxative effect. Introduced in Ireland and Britain in 2008.

APPENDIX A
WHAT COUNTS AS A SERVING?

Americans have gotten fatter. The National Institutes of Health reported for the first time in history in 2003 that the majority of us—an estimated 55 percent—are clinically overweight, while one in every four is severely overweight. The USDA statistics show that our daily caloric intake has risen from 1,854 kcal to 2,002 kcal over the last twenty years. Many believe this is in part due to the steady increase in U.S. portion sizes over the past few decades. A European muffin, for example, is about an ounce and a half while ours is as much as eight ounces. Table-service restaurants have increased the plate size from a ten-inch to a twelve-inch size since our parents dined out. If you have been on a diet—and most of us have—portion size is almost always emphasized. One of the problems that occurs with the amount of ingredients listed on package labels is what makes a serving. For instance, one low-sodium soy sauce appears to be lower in sodium than a second but when you check the bottles, the serving size of the first is smaller, accounting for the decrease in sodium listed on the label. The second may actually contain less salt although the serving size is larger. So you have to check the serving size as well as the ingredients. The following are common serving sizes:

Grain Products Group (bread, cereal, rice, and pasta)

1 slice of bread

1 ounce of ready-to-eat cereal

1/2 cup of cooked cereal, rice, or pasta

Vegetable Group

1 cup of raw leafy vegetables

1/2 cup of other vegetables—cooked or chopped raw

3/4 cup of vegetable juice

Fruit Group

1 medium apple, banana, orange

1/2 cup of chopped, cooked, or canned fruit

3/4 cup of fruit juice

Milk Group (milk, yogurt, and cheese)

1 cup of milk or yogurt 1 1/2 ounces of natural cheese

2 ounces of processed cheese

Meat and Beans Group

(meat, poultry, fish, dry beans, eggs, and nuts)

2 to 3 ounces of cooked lean meat, poultry, or fish

1/2 cup of cooked dry beans or 1 egg counts as 1 ounce of lean meat

2 tablespoons of peanut butter or 1/3 cup of nuts count as 1 ounce of meat

APPENDIX B
MAKING SURE YOUR FOOD HASN'T EXPIRED

A large percentage of food additives are preservatives to extend shelf life but even “embalmed” foods may spoil or become less appetizing.

Want a date? You can use the dates that are given on food packaging if the manufacturer is using “open dating.” On the other hand, “code dating” is not useful to the consumer. In open dating, dates are stated alphanumerically, such as Oct. 15, or numerically, such as 10–15 or 1015. In code dating, the information is coded in letters, numbers, and symbols so that usually only the manufacturer can translate it.

Open dating may be used for:

Pull date. This is the last day that the manufacturer recommends that the product remain for sale. This date takes into consideration additional time for storage and use at home. If the food is bought on the pull date, it still can be eaten at a later date. How long the product should be offered for sale and how much home storage is allowed are determined by the manufacturer, based on knowledge of the product and the product's shelf life.

Quality assurance or freshness date. This date shows how long the manufacturer thinks a food will be of optimal quality. On the label, it often appears as: “Best if used by March 2, 2009.” This doesn't mean, however, that the product can't be used after the suggested date.

Pack date. This is the date the food was packaged or processed. It may enable you to determine how old a product really is.

Expiration date. This is the last day on which a product should be eaten. State governments regulate these dates for perishable items, such as milk and eggs. The FDA regulates only the expiration dates of infant formula.

Code date. This date is of considerably less use to you. A common type of code dating is the product code. This code enables the manufacturer to convey a relatively large amount of information with a few small letters, numbers, and symbols. It tells when and where a product was packaged. In the case of a recall, this makes it easier for the grocer and manufacturer to quickly identify and track down the product and take it off the market. FDA encourages manufacturers to put product codes on packaging, especially for products with a long shelf life.

Food processors are often masters at making codes inconspicuous. On frozen-food packages, the dates are usually indented on the wrapper or the carton. These colorless indentations are most often found at one end of the package. Another method of dating frozen food involves putting a small letter or number on the food wrapper. It is not stamped but is part of the printing on the wrapper. Cans have the code numbers embossed on one end of the can, usually the bottom or now digitally printed on the end. Boxes have either stamped or indented codes on one end of the package.

It is impractical to give all the codes here, but most supermarkets keep a thick book of master codes in their offices. If you have no success in breaking the code of a particular product, ask the store manager to see the codebook.

APPENDIX C

FOOD STORAGE INFORMATION*

Supermarkets today have an amazing array of fresh, frozen, and prepared foods. Your store maintains rigid quality assurance and sanitation standards to make sure you always receive fresh, wholesome and safe food products.

After selecting food items, though, it's up to you to take care of them properly. The Food Keeper contains valuable food safety and storage advice to help you maintain the freshness and quality of foods that you purchase.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Apples	1 to 3 weeks			Do not wash. Store in crisper or moisture-resistant wrap. Wash individual apples before eating.
Asparagus	1 to 2 days		8 months	Keep in crisper.
Bacon (opened)	5 to 7 days			Keep wrapped. Store in coldest part of refrigerator or in meat keeper.
Bacon (unopened)	2 weeks		If frozen, 1 month	Keep wrapped. Store in coldest part of the refrigerator or in meat keeper.
Bananas	Only when fully ripe			

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Dried beans	12 months			Keep in crisper or moisture-proof wrap.
Green or wax beans	1 to 2 days		8 months	Keep in crisper or moisture-proof wrap
Lima beans (unshelled)	3 to 5 days		8 months	Keep in crisper or moisture-proof wrap.
Beef casseroles			3 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Beef chops	2 to 3 days		6 to 9 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Corned beef	5 to 7 days			Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Dried beef	10 to 12 days			Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Ground beef	1 to 2 days		2 to 3 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Roast beef	2 to 4 days		6 to 12 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Beef sausage	2 to 3 days		1 to 2 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Beef steaks	2 to 3 days		1 to 2 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Beef stew meat	1 to 2 days		6 to 9 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
TV dinners with beef			6 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Varieties of beef (heart, liver, etc.)			1 to 2 months	Freeze 2 weeks in original wrapper. Use suitable wrap for longer periods.
Beets	1 to 2 weeks			Remove leafy tops. Keep in crisper.
Berries	1 to 2 days		12 months	Store opened.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Biscuit mix		9 months		Keep cool and dry.
Bread, commercial			2 to 3 months	
Quick baked bread			3 to 6 months	
Yeast bread (baked)			1 month	
Yeast bread (unbaked)	Check expiration date on label.			
Broth (leftover)	2 days		1 month	
Brownie mix		9 months		Keep cool and dry.
Butter	1 to 2 weeks		6 to 9 months	
Buttermilk	10 to 30 days			
Cabbage	1 to 2 weeks			
Cakes, purchased		1 to 2 days		If butter cream, whipped cream, cream or custard frosting filling, refrigerate.
Angel food cake			2 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Chiffon sponge cake			2 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.
Cheese cake			2 to 3 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.
Chocolate cake			4 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.
Fruit cake			12 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.
Yellow pound cake			6 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.
Cakes, frosted			8 to 12 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.
Home frozen cake			3 months	If butter cream, whipped cream, cream or custard frosting filling, refrigerate.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Canned food all types (unopened)				Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned food (opened)				Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned baby foods	2 to 3 days			Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned fish and shellfish	2 days			Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned fruit	1 week			Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned meats	2 days			Transfer all opened canned foods to plastic or glass containers before refrigerating.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Canned pickles	1 to 2 months			Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned poultry	2 days			Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned sauce (tomato)	5 days			Transfer all opened canned foods to plastic or glass containers before refrigerating.
Canned vegetables	3 days			Transfer all opened canned foods to plastic or glass containers before refrigerating.
Carrots	1 to 2 weeks		8 months	
Catsup		12 months		Refrigeration recommended.
Chili or cocktail sauce (unopened)		12 months		Refrigeration recommended after opening.
Celery	1 to 2 weeks			Keep in crisper or moisture-proof wrapper.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Ready-to-eat cereals (unopened)		6 to 12 months		
Ready-to-eat cereals (opened)		2 to 3 months		Refold package liner tightly.
Hot cereals (require cooking)		6 months		
Cottage cheese	10 to 30 days			Keep all cheese tightly packaged in moisture-proof wrap.
Cream cheese (opened)	2 weeks			Keep all cheese tightly packaged in moisture-proof wrap.
Neufchatel (opened)	2 weeks			Keep all cheese tightly packaged in moisture-proof wrap.
Hard and wax coated (unopened)	3 to 6 months			Moisture-proof wrap. If outside gets somewhat moldy, trim off ½ inch. The cheese may become crumbly after freezing.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Hard and wax coated (opened)	3 to 4 weeks			Moisture-proof wrap. If outside gets somewhat moldy, trim off ½ inch. The cheese may become crumbly after freezing.
Hard and wax coated (sliced)	2 weeks			Moisture-proof wrap. If outside gets somewhat moldy, trim off ½ inch. The cheese may become crumbly after freezing.
Parmesan, Romano cheese (opened)		2 months		If it picks up moisture, it will develop mold.
Parmesan, Romano cheese (unopened)		2 months	10 months	If it picks up moisture, it will develop mold.
Ricotta cheese	5 days			
Processed cheese products	3 to 4 weeks		4 months	Refrigerate after opening. Keep tightly closed.
Cherries	1 to 2 days		12 months	Do not wash. Store in crisper or moisture-resistant wrap. Wash before eating.
Chicken	2 to 3 days		12 months	
Chicken livers	1 to 2 days		3 months	

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Chicken TV dinners			6 months	
Premelted chocolate		12 months		Keep cool.
Semi-sweet chocolate		2 years		Keep cool.
Unsweetened chocolate		18 months		Keep cool.
Chocolate syrup (unopened)		2 years		
Chocolate syrup (opened)		6 months		Cover tightly and refrigerate.
Shucked clams	1 day		3 months	
Cocoa mixes	8 months			Cover tightly.
Coffee, cans (unopened)		2 years		Refrigerate after opening. Keep tightly closed. Use dry measuring spoon.
Coffee, cans (opened)	2 weeks			Refrigerate after opening. Keep tightly closed. Use dry measuring spoon.
Coffee lightener, dry (unopened)		6 months		Keep tightly closed.
Coffee lighteners, dry (opened)		6 months		Keep tightly closed.
Cookies, homemade		2 to 3 weeks	8 to 12 months	Put in airtight container.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Cookies, packaged		2 months	8 to 12 months	Keep box tightly closed.
Corn	1 to 2 days in husks		8 months	
Cornmeal		12 months		Keep tightly closed (in refrigerator, especially in summer).
Cornstarch		18 months		Keep tightly closed.
King Crab	10 months			Keep in original wrap.
Crab, in shell	2 days			
Crackers (unopened)		8 months		Keep box tightly closed.
Cream, half & half	10 days			Cover tightly. To prevent bacteria from spreading to leftover cream, don't return unused cream to original container. Keep covered.
Light heavy cream	10 days			Cover tightly. To prevent bacteria from spreading to leftover cream, don't return unused cream to original container. Keep covered.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Cream, coffee lightener (liquid)	10 days			Cover tightly. To prevent bacteria from spreading to leftover cream, don't return unused cream to original container. Keep covered.
Sour cream	2 to 4 weeks			Cover tightly. To prevent bacteria from spreading to leftover cream, don't return unused cream to original container. Keep covered.
Whipped cream topping in aerosol can	3 months			Cover tightly. To prevent bacteria from spreading to leftover cream, don't return unused cream to original container. Keep covered.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Cream prepared from mix	3 days			Cover tightly. To prevent bacteria from spreading to leftover cream, don't return unused cream to original container. Keep covered.
Dry cream		12 months		
Frozen cream topping (after thawed)	2 weeks			Cover tightly. To prevent bacteria from spreading to leftover cream, don't return unused cream to original container. Keep covered.
Duck	2 days		6 months	
Eggs, in shell	4 to 5 weeks			
Egg whites	1 week		12 months	
Egg yolks	3 days		12 months	Yolks will thicken when frozen.
Hardcooked eggs	1 week			

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Breaded fish			3 months	Keep purchased frozen fish in original wrap, thaw, and follow cooking directions on package.
Fatty fish	1 to 2 days		2 to 3 months	Freeze in original wrap for up to 2 weeks. For longer periods wrap with suitable freezer wrap.
Lean fish	1 to 2 days		6 months	Freeze in original wrap for up to 2 weeks. For longer periods wrap with suitable freezer wrap.
White flour		6 to 8 months		Keep in airtight container.
Whole-wheat flour		6 to 8 months		Keep in airtight container.
Frosting, canned		3 months		Store leftover in refrigerator.
Frosting, mix		8 months		Store leftover in refrigerator.
Citrus fruit	1 week			
Citrus fruit (dried)			6 months	Keep cool in airtight container.
Citrus fruit (sections)			6 months	

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Gelatin (all types)		18 months		
Gravy (left over)	2 days		1 month	
Greens	1 to 2 days			
Canned ham (unopened)	6 months			Freezing cured meat not recommended.
Whole ham	1 week			Freezing cured meat not recommended.
Ham TV dinner			3 months	
Honey		12 months		If crystals form, heat in pan of water.
Hot roll mix		18 months		
Ice cream, ice milk			2 to 4 months	
Jellies (unopened)		12 months		Cover tightly. Storage life lengthened if refrigerated after opening.
Canned juices		9 months		
Citrus juices	6 days		6 months	
Concentrated juices	6 days		12 months	
Ground lamb	1 to 2 days		2 to 3 months	
Lamb steak and chops	2 to 3 days		3 to 4 months	

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Lamb roasts	2 to 4 days		3 to 4 months	
Lamb stew meat	1 to 2 days		3 to 4 months	
Varieties of lamb meats	1 day		2 to 3 months	
Lettuce head (unwashed)	5 to 7 days			
Lettuce head (washed, thoroughly drained)	3 to 5 days			
Bibb lettuce	1 to 2 days			
Lobster tails	2 days in the shell		3 months	
Lunch meats	4 to 6 days			Freezing not recommended.
Margarine	2 to 3 months			Keep in airtight container.
Marshmallows		2 to 3 months		Keep in airtight container.
Marshmallow cream		3 to 4 months		Cover tightly. Refrigerate after opening to extend storage life. Use at room temperature.
Mayonnaise (unopened)		2 to 3 months		Refrigerate after opening.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Meat substitutes, textured protein products (e.g., imitation bacon bits)		4 months		Keep tightly closed. For longer storage, refrigerate.
Melon	1 week			
Metered-caloric products, instant breakfast		6 months		Keep in can, closed jars, or original packets.
Condensed or evaporated milk (unopened)		9 months		Invert can every 2 months.
Condensed or evaporated milk (opened)	4 to 5 days			
Fresh milk	5 days		1 month	
Molasses (unopened)		12 months		
Molasses (opened)		6 months		Keep tightly closed. Refrigerate to extend storage life.
Nuts in shell (unopened)		4 months		Refrigerate after opening. Freeze for longer life. Unsalted and blanched nuts keep longer than salted.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Nutmeats, packaged in vacuum can (unopened)		1 year		Refrigerate after opening. Freeze for longer life. Unsalted and blanched nuts keep longer than salted.
Nutmeats, packaged in vacuum can (opened)		3 months		Refrigerate after opening. Freeze for longer life. Unsalted and blanched nuts keep longer than salted.
Salted nuts		6 to 8 months		Package tightly in suitable freezer wrap.
Unsalted nuts		9 to 12 months		Package tightly in suitable freezer wrap.
Onions		3 to 4 weeks		Keep dry and away from sun.
Oysters	1 day		4 months	
Pancake mix		6 to 9 months		Once opened, store in airtight container.
Pasta (spaghetti, pasta, etc.)		2 years		
Peaches (ripe)	1 to 2 weeks		12 months	
Peanut butter (unopened)		6 to 9 months		
Peanut butter (opened)		2 to 3 months		Keeps longer if refrigerated.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Pears (ripe)	1 week		12 months	
Peas			8 months	
Dried peas		12 months		Store in a cool, dry place in air-tight container.
Unshelled peas	3 to 5 days			Store in a cool, dry place in air-tight container.
Pectin, liquid (opened)			1 month	Recap and refrigerate.
Pies and pastries		2 to 3 days		Refrigerate whipped cream, custard, and chiffon fillings.
Pies and pastries, baked			1 to 2 months	Refrigerate whipped cream, custard, and chiffon fillings.
Pies and pastries, unbaked			8 months	Refrigerate whipped cream, custard, and chiffon fillings.
Pineapple	1 week		12 months	
Popcorn (unpopped)		2 years		Store in airtight container.
Pork chops	2 to 3 days		2 to 3 months	Original wrap up to 2 weeks. For longer period rewrap in suitable freezer wrap.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Ground pork	1 to 2 days		1 to 2 months	Original wrap up to two weeks. For longer period rewrap in suitable freezer wrap.
Pork roast	2 to 4 days		3 to 6 months	Original wrap up to two weeks. For longer period rewrap in suitable freezer wrap.
Pork steaks	2 to 3 days		2 to 3 months	Original wrap up to two weeks. For longer period rewrap in suitable freezer wrap.
Pork TV dinners			3 months	Original wrap up to two weeks. For longer period rewrap in suitable freezer wrap.
Fresh, white potatoes		2 to 3 months		Keep dry and away from sun. For longer storage keep about 50°F. Don't refrigerate potatoes.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Instant potatoes		6 to 12 months		Keep in airtight package.
Sweet potatoes		2 to 3 weeks		Keep dry and away from sun. For longer storage keep about 50°F. Don't refrigerate potatoes.
Pudding	1 to 2 days			
Pudding mixes		12 months		Keep cool and dry.
Radishes	1 to 2 weeks			
Flavored or herb rice		6 months		Keep tightly closed, cool, and dry.
White rice		2 years		Keep tightly closed, cool, and dry.
Rice mixes		6 months		Keep tightly closed, cool, and dry.
Rolls, yeast, baked			3 to 6 months	
Rolls, partially baked	Expiration date on label		2 to 3 months	Do not store in refrigerator door; temperature fluctuation and jarring lowers quality.
Salad dressings, bottled (unopened)		10 to 12 months		

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Salad dressings, bottled (opened)	3 months			Refrigerate after opening or preparing.
Salad dressings made from mix	2 weeks			
Salad oils (unopened)		6 months		
Salad oils (opened)		1 to 3 months		
Sauces and gravy mixes		6 to 12 months		Keep cool and dry.
Scallops	1 day		3 months	
Sherbet			2 months	
Shortenings, solid		8 months		
Shrimp TV dinners			3 months	
Shrimp, fresh (uncooked)	1 day			
Shrimp, frozen			12 months	
Soup mixes		12 months		Keep cool and dry
Whole spices		1 to 2 years		Spices and herbs keep longer if refrigerated or frozen. Store in airtight containers in a dry place away from sunlight and heat.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Ground spices		6 months		Spices and herbs keep longer if refrigerated or frozen. Store in airtight containers in a dry place away from sunlight and heat.
Herbs		6 months		Spices and herbs keep longer if refrigerated or frozen. Store in airtight containers in a dry place away from sunlight and heat.
Herb/spice blends		6 months		Spices and herbs keep longer if refrigerated or frozen. Store in airtight containers in a dry place away from sunlight and heat.
Paprika, red pepper			6 months	Best stored in refrigerator.
Chili powder		6 months		
Spinach	3 to 5 days		8 months	
Brown sugar		4 months		Put in airtight container.
Confectioner's sugar		18 months		Put in airtight container.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Granulated sugar		2 years		Close tightly.
Artificial Sweetener		2 years		Close tightly.
Syrup		12 months		Keep tightly closed. Refrigerate to extend life.
Tea bags		18 months		Put in airtight container.
Instant tea		3 years		Cover tightly.
Loose tea		2 years		Put in airtight container.
Toaster pastries		2 to 3 months		Keep in airtight packet.
Tomatoes	1 to 2 days			
Turkey	2 days		6 months	
Vanilla (unopened)		2 years		
Vanilla (opened)		12 months		Keep tightly closed; volatile oils escape.
Other vanilla-type extracts (opened)		12 months		Keep tightly closed; volatile oils escape.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Ground veal	1 to 2 days		2 to 3 months	Check for holes in trays and plastic wrap of fresh meat. If none, freeze in this wrap up to 2 weeks. For longer storage, wrap with suitable freezer wrap.
Veal steaks	2 to 3 days		3 to 4 months	Check for holes in trays and plastic wrap of fresh meat. If none, freeze in this wrap up to 2 weeks. For longer storage, wrap with suitable freezer wrap.
Veal chops	2 to 3 days		3 to 4 months	Check for holes in trays and plastic wrap of fresh meat. If none, freeze in this wrap up to 2 weeks. For longer storage, wrap with suitable freezer wrap.

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Veal roasts	2 to 4 days			Check for holes in trays and plastic wrap of fresh meat. If none, freeze in this wrap up to 2 weeks. For longer storage, wrap with suitable freezer wrap.
Veal stew meat	1 to 2 days			Check for holes in trays and plastic wrap of fresh meat. If none, freeze in this wrap up to 2 weeks. For longer storage, wrap with suitable freezer wrap.
Varieties of veal meat	1 day			Check for holes in trays and plastic wrap of fresh meat. If none, freeze in this wrap up to 2 weeks. For longer storage, wrap with suitable freezer wrap.
Home frozen vegetables			10 months	

Food	*Refrigerator*	*Pantry*	*Freezer*	*Special*
Purchased frozen vegetables			8 months	
Dehydrated vegetables, flakes		6 months		
Dried vegetables		1 year		If possible, refrigerate.
Venison and game birds			8 to 12 months	Check for holes in trays and plastic wrap of fresh meat. If none, freeze in this wrap up to 2 weeks. For longer storage, wrap with suitable freezer wrap.
Vinegar (unopened)		2 years		
Vinegar (opened)		12 months		Keep tightly closed. Slightly cloudy appearance doesn't affect quality. Distilled vinegar keeps longer.
Dry yeast	Expiration date on package			Keep cool and dry.
Yogurt	7 to 10 days			Check date on package.

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Ruth Winter, M.S., former science editor of the Newark Star-Ledger and syndicated columnist for the Los Angeles Times and isyndicate.com, is the author of thirty-five popular books in the health field. She has won many awards, including the American Society of Authors and Journalists Career Achievement Award for Non-Fiction, the American Medical Writers Award for Magazine Writing, and the National Association of Science Writers Service Award. Ruth and her husband, Arthur Winter, M.D., director of the New Jersey Neurological Institute's Memory Clinic in Livingston, NJ, live in Short Hills, NJ. They have three grown children and three grandchildren.

This book provides general information about food additives. If you have particular questions or concerns about any food additive and your personal health or if you believe you are reacting to a food additive, you should consult your physician.

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