FREE ADDITIVES HEALTH REPORT

6 Common Conditions and the Additives You Should Avoid

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This booklet features excerpts from the published book, An A-Z Guide to Food Additives by Deanna Minich, PhD.

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Introduction

“If you can’t pronounce it, don’t buy it.” --Elson M. Haas, MD, author of Staying Healthy with Nutrition

“Don’t eat anything your great grandmother wouldn’t recognize as food.” --Michael Pollan, author of In Defense of Food

Our modern society has birthed a new language: Food Additive-ese. Unless you’re a nutritionist, food technologist, or chemist, chances are you don’t understand much of the new jargon, but you’re immersed in it every time you go to a grocery store. Store shelves are laden with thousands of words waiting to be deciphered, and hundreds of new ones are piled on every year. This language, spoken on volumes of food labels, is speckled with infamous “unpronounceables”—long, polysyllabic, knotty, chemical-ized names of additives that have made their way into our everyday eating. Trying to speak this language is like talking with a mouthful of marbles—your speech becomes garbled and you end up spitting the word out with a winced face, accompanied by a shot of embarrassment and slight giggle.

To make life easier, food additives are now disguised with “code” names. Instead of tongue-tripping over their chemical names, you can now spout out their perky, friendly acronyms or brand names—like BHA rather than “butylated hydroxyanisole” and aspartame in place of “aspartyl-phenylalanine-1-methyl-ester.” The complexity of the language and the hoops you need to jump through to translate its vocabulary make knowing what you are truly eating a tenuous venture.

Although food additives are often used in small amounts, these minute amounts add up over time. The average American consumes about 150 pounds of food additives a year, the bulk of it being sugar and sweeteners, followed by salt, vitamins, flavors, colorings, and preservatives, representing almost 10 percent of the food we eat each year.

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While in the trenches at the supermarket, have you ever stopped mid-aisle to question how the food supply came to be complicated and convoluted to the point that you need an expert to tell you what to eat? Why should you need a report like this just to understand your every bite?

If we observe from a distance, we uncover a possible answer in our everyday frenzy. Day-to-day routines have become just a bit crazier, packed with extended working hours and overflowing with responsibilities. Our eyes and ears are bombarded with continuous, mind-numbing sound-bytes delivered by E-mail, radio, and TV. Technological advances are multiplying, renewing the flow of information every couple of hours. The only way to survive and succeed is to simplify. Nowadays, if we can’t say something in six words or eat something in six bites, we may not be able to give it our
undivided attention. One of the ways we have achieved our quest for convenience is at the expense of our nourishment. Packaged, ready-to-eat foods allow us to squeeze it all in—to be nothing less than “superhuman.” In return for handy prepackaged edibles, we now need to learn “labelese” to make sense of it all. Ironic isn’t it? We try our best to save time with convenient foods, but then spend extra time just learning what we are eating.

Thanks to food additives, packaged items can now sit on the shelves for years and be ready to eat whenever you are, if you have the patience to break through the casings of cardboard, Styrofoam, metal, and plastic. Additives give foods an internal “makeover” by improving their flavor and appearance and replacing nutrients lost in processing. Technically, they are defined by the Federal Food, Drug, and Cosmetic Act set forth by the U.S. Food and Drug Administration (FDA) as any substance which becomes a part of the food matrix as a result of “producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food; and including any source of radiation intended for any such use.”

With the average food traveling 1500 miles or more to your dinner table, you can only imagine the mosaic of food additives that have become a part of what you are eating.

Unless you grow your own foods, what you eat is beyond your immediate control. Consumers are at the whim of farmers, food industries, ingredient manufacturers, and supermarket buyers. Is there anyone looking out for you? The FDA has the job of overseeing food safety. Fortunately, with the advent of the Internet and accessible information, we are becoming more knowledgeable about what we are putting into our bodies. But, it is not always clear to whom we should listen and who is providing unbiased information. This report is intended to be as objective and as current as possible by slicing through the mass of information available to you. At the same time, it aims to be comprehensive enough to give you a good sense of what you are getting before you eat or buy food.

Of course, as a nutritionist, people often ask me what they should eat. Since their ears are primed to receive only a sound-byte of truth, I often reply with this simple rule of thumb: If an item was in existence more than 100 years ago, it’s probably safe. Otherwise, you may have to do some detective work to dissect your meal constituents. Since the advent of industrialization a bit more than 100 years ago, we have witnessed the proliferation of processed foods. Human-designed packaged food items cannot exist without their additive friends—the two go hand in hand. Over the years, we have gone from a sprinkling of salt to preserve and a bit of sugar to sweeten to an entire constellation of chemicals that pollute every bite. As you’ll find out, many of these can have questionable effects on your health, while others may even be helpful.

The best rule of thumb is to keep your foods simple—whole, unprocessed foods in their natural state are ideal and highly recommended (see Table 1). These foods are what I like to call “naked”—sold without the dressing of plastic, metal, cardboard, or
Styrofoam. Next are products with uncomplicated ingredient lists that contain actual food constituents rather than synthetic additives. Finally, if there are some “unpronounceables” in the list, ensure that they are minimal and not artificial anything—artificial colors, preservatives, flavors, or sweeteners.
Additives and Your Health: The Effects on 6 Common Conditions

This section contains information that can help you avoid potentially troublesome additives, depending on your food sensitivities, allergies, or other health conditions. I have rated them for their impact on your health according to the following scale:

A+ = Safe to eat; may be nutritious
A = Safe to eat
B = Most likely safe, but cut back
C = Reasonably safe, but limit quantities
D = Safety questionable, try to avoid
F = Do not eat foods with this additive
Potential Cancer-Causing Food Additives

- Acesulfame-potassium (Sunett®, Sweet One®)
- Artificial colorings
- Aspartame (NutraSweet®, Equal®)
- Butylated hydroxyanisole (BHA)
- Butylated hydroxytoluene (BHT)
- Caramel color
- Carrageenan*
- Diacetyl
- Potassium bromate
- Propyl gallate
- Saccharin (Sweet ‘N Low®)
- Sodium benzoate**
- Tert-butylhydroquinone (THBQ)
**Acesulfame-potassium (Sunett®, Sweet One®)**

Artificial sweetener. White, crystalline sweetener discovered in 1967, used in foods in the United States since 1988. 130–200 times sweeter than sugar; often blended with other artificial sweeteners to give a more true sugar taste. Heat stable and contributes no calories. According to FDA guidelines, it is a general-purpose sweetener to be added to all foods except meats. Found in thousands of foods, typically in soft drinks and other beverages, instant coffee and tea, gelatin and pudding desserts, syrups, baked goods, chewing gum. Acceptable daily intake set at 15 milligrams per kilogram body weight. Limited animal studies from more than two decades ago indicate it may cause cancer, although there is no definitive evidence to suggest that it is a carcinogen in humans. The Center for Science in the Public Interest (CSPI) has criticized the FDA for their lack of long-term animal studies using higher levels of the sweetener. CSPI has a Web site dedicated to quotes from cancer experts on its testing: http://www.cspinet.org/reports/asekquot.html. **Rating: F**


Food coloring. Added to food to change its color. Usually found in low-nutrition foods; however, may also be added to “natural” foods like salmon to provide a more consistent tone in case of natural color variability. Recent studies suggest that artificial colorings cause hyperactivity and/or attention deficit disorder (ADD) in children. Some of these chemicals have led to formation of tumors in animals, but no proof exists that they do the same in humans. Hives and asthma have been reported in a small number of individuals who are particularly sensitive to FD&C Yellow No. 5. Allergic reactions are commonly associated with artificial colorings. Researchers at the National College of Technology in Japan tested the toxicity of thirty-nine currently used food additives in eight mouse organs. They reported that dyes were most toxic, causing DNA damage in the stomach, colon, urinary bladder, and gut. Damage to the colon was with low doses of the dyes, in amounts comparable to the guidelines for acceptable intake. There are nine certified colorings approved for used in the United States by the FDA. Seven are permitted for use in foods: FD&C Blue No.1 (Brilliant Blue FCF), FD&C Blue No.2 (Indigotine), FD&C Green No.3 (Fast Green FCF), FD&C Red No.3 (Erythrosine), FD&C Red No.40 (Allura Red AC), FD&C Yellow No.5 (Tartrazine), FD&C Yellow No.6 (Sunset Yellow) **Rating: F**

**Aspartame (NutraSweet®, Tropicana Slim, Equal®, Canderel, aspartyl-phenylalanine-1-methyl-ester)**

Artificial sweetener. Found in thousands of consumer food products. Commonly found in soft drinks, in individual packets as a condiment, or even in chewable vitamins. Not suitable for baked products because it breaks down in heat. Composed of methanol (10 percent) and two amino acids, L-aspartic acid (40 percent) and phenylalanine (50 percent). Therefore, individuals with the inherited metabolic disorder that prevents them from metabolizing the amino acid phenylalanine (called phenylketonuria or PKU) must avoid this sweetener. Methanol breaks down in the body to a number of toxic
metabolites such as formaldehyde. Formaldehyde production may be linked to incidence of migraines in aspartame users.

Animal studies have indicated that aspartame may cause negative health effects such as cancer. People have reported that it causes headaches, hallucinations, seizures, insomnia, and dizziness. Researchers Huff and LaDou from the National Institute of Environmental Health Sciences pointed out in 2007 that “the U.S. FDA should reevaluate its position on aspartame as being safe under all conditions.”

Artificial sweeteners like aspartame are often used by Type-2 diabetics; however, Canadian researchers from Université Laval questioned the safety of use in this population due to their findings that a breakfast that contains aspartame led to the same rise in blood glucose and insulin as did a breakfast containing table sugar. This area of research needs further investigation. **Rating: F**

**Butylated hydroxyanisole (BHA)**

Antioxidant. Functions to protect fats from rancidity. Widely used in fat-containing products like meats (sausage, lunch meats), butter, lard, cereals, and baked goods. May have estrogen-like effects. A report from the National Institute of Health states that BHA is “reasonably anticipated to be a human carcinogen” since studies have demonstrated it causes cancer in rats, mice, and hamsters. There is, however, no scientific evidence that it causes cancer in humans. **Rating: F**

**Butylated hydroxytoluene (BHT)**

Antioxidant. Functions to protect fats from rancidity; unknown whether it causes cancer due to mixed findings from animal studies. Acute, high doses (0.5 to 1.0 grams per kilogram—much higher than levels found in foods) have led to kidney and liver damage in male rats. Rats fed BHT at lower doses over a longer period of time developed enlarged livers and reduced liver enzyme activity. Has been linked to DNA damage in mouse gut. Has also been shown to prevent cancer in some experimental models. **Rating: F**

**Caramel color**

Food coloring. Brown-colored substance made by heating sugar of any type (for example, corn syrup). Can be processed with ammonia and sulfur to intensify color. Used to intensify brown color in foods like beer, bread, buns, chocolate, cookies, coatings, desserts, gravy, pancakes, sauces, soft drinks (especially colas), and alcoholic beverages. There exists debate about its carcinogenicity. For caramel color without ammonia (types I and II), there is no limit on intake; however, for caramel color with ammonia (types III and IV), the acceptable daily intake is 0–200 milligrams per kilogram body weight. Researchers at the TNO Research Institute in The Netherlands demonstrated lowered immune function in rats fed caramel color III, especially in those with low levels of dietary vitamin B6. However, no changes in immune function of elderly men with low vitamin B6 status was noted when they were given this additive at 200 milligrams per kilogram body weight for 7 days. Avoid if sensitive to corn. **Rating: D**
Carrageenan (ammonium carrageenan, calcium carrageenan, potassium carrageenan, sodium carrageenan)

Stabilizer, thickener. Long, non-digestible carbohydrates extracted from red seaweed (Irish moss, Chondrus crispus). May be used in ammonium, calcium, potassium, or sodium salt form. Small amounts of this seaweed-derived ingredient are used to stabilize and thicken processed foods like milk, ice cream, custards, dressings, and jellies. Not advocated for use in infant formulas in Europe due to unknown reactions with infant immature gut. When carrageenan is degraded with high heat and acid (called poligeenan) and fed to animals in large amounts, it has caused gastrointestinal ulcers and cancer. At the FAO/WHO Expert Committee on Food Additives meeting in June 2007, it was concluded that the inclusion of carrageenan in food products may need to be reevaluated. Rating: B

Diacetyl

Flavoring agent. A clear yellow-green liquid with a buttery odor that naturally occurs in products like alcoholic beverages, coffee, cheese, cocoa, and berries, but can also be made through fermentation of glucose. Used in a number of products to carry flavors—particularly microwave popcorn, margarines, and oils—to impart the aroma of butter. The U.S. National Institute for Occupational Safety and Health has determined that, when used as an artificial butter flavoring, it can be a respiratory hazard when heated to high temperatures and inhaled, such as in a factory setting. Most likely due to the number of lawsuits and publicity this additive has received in the past five to seven years, various food manufacturers have decided to omit its use in products. Diacetyl compounds may be potential carcinogens. Rating: F

Potassium bromate

Dough conditioner. White crystals or powder used to improve the function of flour in products like bread, rolls, and buns. Also used for making fermented malt beverages or distilled spirits. Potassium bromate has been shown to cause cancer in animals and be toxic in human cells. Banned in Europe, Canada, China, Sri Lanka, Nigeria, Brazil, and Peru. Not banned in the U.S. If used in a product in California, label must carry a cancer warning. Some companies have removed potassium bromate from their manufacturing process. Present in a product if “bromated flour” is listed in the ingredients. Rating: F

Propyl gallate (propyl 3,4,5-trihydroxybenzoate)

Antioxidant, preservative. White to cream-colored, slightly bitter crystalline solid additive chemically synthesized from gallic acid and propyl alcohol. Used in oils, meat products, chicken soup base, butter, margarine, breakfast cereals, desserts, and chewing gum. Prevents rancidity of fats. Commonly used in conjunction with BHA (see Butylated hydroxyanisole) and BHT (see Butylated hydroxytoluene). As of 2007, 167 cosmetic products were reported as using it up to its maximum dose. At high amounts (2.3 percent of the diet), short-term studies with rats led to death in 40 percent of the animals during the first month. Surviving animals showed retarded growth and renal...
damage at death. May be cancer-causing. Acceptable daily intake set at 0 to 0.2 milligrams per kilogram body weight. Rating: F

**Saccharin (Sweet ‘N Low®)**

Artificial sweetener. Saccharin, or 1,2-benzisothiazolin-3-one-1,1-dioxide, is 300 times sweeter than table sugar. It is the “oldest” artificial sweetener, having been used in foods for more than 100 years. Often blended with other sweeteners, since it may taste bitter or metallic at high concentrations. Added to beverages (fruit juices and drink mixes) in levels not to exceed 12 milligrams per fluid ounce. Used as a sugar substitute in individual packets. Processed foods may only have 30 milligrams of saccharin per serving. Causes bladder cancer in rats. There has been some debate about its cancer-causing potential in humans. Rating: F

**Sodium benzoate**

Preservative. Sodium benzoate is a chemically synthesized preservative used in soft drinks, fruit juices and preserves, jams, and margarine. Benzoic acid can occur in foods (plant and animal products) naturally, and at levels that are lower than typically needed in food for preservative action (40 milligrams per kilogram food versus 2000 milligrams of benzoic acid or sodium benzoate added to foods for their preservative quality). In animal studies, high amounts caused damage to the nervous system and brain. Sensitive individuals may develop hives or other allergic reactions. May encourage hyperactivity or decreased intellect in susceptible children. The Joint FAO/WHO Expert Committee on Food Additives (JECFA) has set an Acceptable Daily Intake (ADI) for humans at 0 to 5 milligrams per kilogram body weight. Sodium benzoate plus ascorbic acid can react under the right heat and light conditions to form benzene, a cancer-causing agent. Due to all the press generated on benzene’s risks, soft drink companies are looking at substitutes to sodium benzoate. Rating: D

**Tert-butylhydroquinone (THBQ)**

Antioxidant, preservative. Antioxidant used to prevent rancidity in oils and fats. Found in a variety of products, including butter, bread, confections, ice cream, margarines, pasta, and sauces. Often used in combination with other preservatives like BHA at levels of 100 to 400 milligrams per kilogram, depending on the food. Shown to be cancer-causing in animals. Rating: F

*When degraded in presence of high heat and fed in high amounts

**In combination with ascorbic acid, may react under specific conditions to form benzene, a carcinogen

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Additives that May Provoke Allergic Reactions

These additives may provoke allergic reactions like asthma, breathing difficulties, fatigue, headaches, increased heart rate, migraines, and skin reactions.

- Agar
- Alginate (alginic acid, algin, sodium alginate, Pacific kelp)
- Annatto extract
- Artificial colorings
- Aspartame (NutraSweet®, Equal®)
- Bromate (calcium bromate, potassium bromate)
- Caffeine
- Calcium propionate
- Carmine
- Cochineal extract
- Gums (acacia, Arabic, furcellaran, guar, locust bean, tragacanth, xanthan)
- Hydrolyzed vegetable protein (HVP, TVP, hydrolyzed soy protein, hydrolyzed wheat protein, hydrolyzed whey protein, hydrolyzed casein, texturized vegetable protein)
- Inulin
- Isoamyl acetate
- Monosodium glutamate (MSG)
- Neotame
- Quinine
- Sodium benzoate (benzoic acid)
- Sodium hexametaphosphate
- Sucralose (Splenda®)
- Sulfites (potassium bisulfate, potassium metabisulfite, sodium metabisulfite, sodium sulfate, sulfur dioxide, sodium bisulfite)
**Agar**

Bulking agent, emulsifier, fiber, stabilizer, thickener. Mucilaginous substance from various seaweed sources used to thicken and stabilize desserts, soups, baked goods, frostings, and canned jellied meats. Used extensively in Asian foods and medicinally as a treatment for constipation. May have a laxative effect. Since it swells with water, may promote a feeling of fullness when eaten. May cause allergic reactions in sensitive individuals. Avoid if allergic. **Rating: A+**

**Alginate (alginic acid, algin, sodium alginate, Pacific kelp)**

Bulking agent, emulsifier, fiber, stabilizer, thickener. Brown seaweed-derived ingredient that can stabilize foam and act as a thickener in products like jellies, salad dressings, beverages, custards, ice cream, soups, and cheese. Sodium alginate is the sodium salt form. Theoretically, it may have cholesterol-lowering effects due to its ability to trap dietary cholesterol in its gel-like structure. Limited studies suggest it may create fullness or satiety, although this concept needs further testing. May cause allergic reactions in sensitive individuals. Avoid if allergic. **Rating: A+**

**Annatto extract**


See information under Potential Cancer-causing Additives.

**Aspartame (NutraSweet®, Tropicana Slim, Equal®, Canderel, aspartyl-phenylalanine-1-methyl-ester)**

See information under Potential Cancer-causing Additives

**Bromate (calcium bromate, potassium bromate)**

Dough conditioner. White crystals or powder used to improve the function of flour in products like bread, rolls, and buns. Also used for making fermented malt beverages or distilled spirits. Potassium bromate has been shown to cause cancer in animals and be toxic in human cells. Banned in Europe, Canada, China, Sri Lanka, Nigeria, Brazil, and Peru. Not banned in the U.S. If used in a product in California, label must carry a cancer warning. Some companies have removed potassium bromate from their manufacturing process. Present in a product if “bromated flour” is listed in the ingredients. **Rating: F**

**Caffeine**

Flavoring agent. Naturally occurring substance in many plants and found in foods/drinks like coffee, cocoa, and tea. Added to cola-like beverages and “energy” drinks.
Stimulant effects, mildly addictive. May cause heart palpitations and insomnia in sensitive individuals. Avoid in pregnancy, since caffeine crosses the placenta. Avoid if sensitive or pregnant. **Rating: C**

**Calcium propionate**

Preservative. White or colorless crystalline solid that prevents bacteria and mold growth on products like bread, rolls, dairy products, processed sweet baked goods; also used to prevent fungal growth on growing produce. Unlike other preservatives, does not need an acidic environment to work. Can be found naturally (small amounts) in foods like cheese. Propionic acid is produced in the human body through metabolic processes. The calcium form of propionate is preferred from a functional perspective, since the alpha-amylase enzyme needs calcium to make the starch available to the yeast, allowing for better bread structure. Use of this additive in all forms is relatively widespread. There is debate about whether this additive is safe. Researchers have tested children’s reactions to calcium propionate in bread against bread without calcium propionate. They found irritability, restlessness, inattention, and sleep disturbance in some children and advised minimizing concentrations added to processed foods. Sodium-sensitive individuals should limit or reduce their intake of sodium propionate. Sodium-sensitive individuals to limit or reduce intake of sodium propionate. **Rating: C**

**Carmine/Cochineal extract**

Artificial coloring. Red food coloring made from the eggs of the cochineal beetle. Used to give foods like confections, meat, and spices a red, pink, or purple coloring. Carmine refers to the purified form of cochineal. It is not always clearly labeled on food products, and is often listed as a “natural” additive. Potential for both to provoke (severe) allergic reactions. Avoid if allergic. **Rating: F**

**Gums (acacia, Arabic, furcellaran, guar, locust bean, tragacanth, xanthan)**

Stabilizers, thickeners. Collectively, these are fibers from plant (seed, bean trees, seaweed) or bacterial sources. Acacia and arabic gums are the same ingredient—an extract from a tree source. Furcellaran is from red algae; guar and tragacanth gums are from legumes; karaya is from senna trees; locust bean gum is from carob seeds; xanthan gum is a bacterial fermentation product of sugars. Gums thicken candies, dressings, jellies, frostings, and cheeses, and stabilize beverages. May help delay the normal rise in blood sugar with eating, and may even contribute to satiety. Some gums are found in powdered laxatives. Since they swell with water, eating large amounts in laxative or fiber products without adequate fluid can lead to throat closure and difficulty breathing. Some individuals who may be allergic to the source of the gum should avoid it. **Rating: A+**

**Hydrolyzed vegetable protein (HVP, hydrolyzed protein, hydrolyzed soy protein, hydrolyzed wheat protein, hydrolyzed whey protein, hydrolyzed casein, TVP, texturized vegetable protein)**

Flavor enhancer. Plant protein (often soy-based, but can be wheat- or corn-based—the source should be specified on the label) that has been broken down into amino
acids. Incorporated into instant soups, meats, sauces, and beef stew because of its savory (“umami”) meat flavor. Contains 10–30 percent MSG. Classified on some food labels as a “natural flavoring.” May cause reactions like headache. Gluten-sensitive individuals should avoid if the source is wheat. Individuals with soy, wheat, or milk allergies should avoid proteins from these sources. Also avoid if allergic to MSG. **Rating: F**

Inulin

Bulking agent, (natural) fat substitute, fiber, nutrient, sweetener. Naturally occurring, slightly sweet fiber found in chicory root, garlic, leek, and Jerusalem artichokes. May be found in a variety of foods, from processed baked goods to more healthy fiber supplements. Considered to be healthy since it acts as a “prebiotic,” or food for healthy gut bacteria, and also helps enhance calcium absorption. Has minimal effect on blood sugar; thought to be safe for diabetics. May cause allergic reaction in sensitive individuals, who should avoid it. **Rating: A+**

Isoamyl acetate

Flavoring agent (artificial). Fruity flavoring that occurs naturally in bananas and pears, but is usually synthesized and used in beverages, ice cream, candy, baked goods, and flavored fruit sodas. Exposure to high amounts has resulted in headache, fatigue, increased pulse, and irritation of nose and throat. **Rating: F**

Monosodium glutamate (MSG)

Flavor enhancer. Sodium complexed to the amino acid, glutamic acid. Used to enhance savory (“umami”) flavor in meats, sauces, spices, instant meals, and bouillon cubes. Some people are sensitive to MSG and may experience nerve-toxic effects like headaches, mood changes, numbness, nausea, weakness, and a burning sensation in the upper body. People who are sensitive to MSG may also encounter similar effects with aspartame/neotame. Natural flavorings, gelatin, hydrolyzed yeast, yeast extract, soy extracts, and hydrolyzed vegetable protein all contain glutamate. **Rating: F**

Neotame

Artificial sweetener. Similar in structure to aspartame. Contains aspartic acid and phenylalanine, like aspartame, but differs in that it contains a methyl ester. However, unlike aspartame, appears to be safe for individuals with phenylketonuria (PKU), since it does not metabolize to phenylalanine. Approved for use in foods, except meat and poultry, since 2002. Several thousand times (7,000–13,000) sweeter than table sugar and about 40 times sweeter than aspartame. In the past, not frequently used, but with concern about high-fructose corn syrup (HFCS, see High fructose corn syrup), it is becoming a more popular choice. Found in soft drinks, bars, powdered drink mixes, juices, chewing gum, bread, frozen desserts, baked goods, and candies. **Rating: F**

Quinine

Flavoring agent. Extract of the bark of South American cinchona tree used to flavor carbonated beverages (tonic water, bitter lemon) and alcoholic drinks (vermouth) in...
concentrations of up to 83 parts per million (83 milligrams per kilogram). Used as a pharmaceutical to treat malaria until the 1940’s. Can also be used to treat leg cramps. Per FDA mandate, its inclusion in food and beverages requires prominent display on the label. May cause reactions in sensitive individuals. Some indications exist that it may not be safe for pregnant women. Avoid if pregnant or sensitive to quinine. **Rating: D**

**Sodium benzoate (benzoic acid)**

Preservative. Sodium benzoate is a chemically synthesized preservative used in soft drinks, fruit juices and preserves, jams, and margarine. Benzoic acid can occur in foods (plant and animal products) naturally, and at levels that are lower than typically needed in food for preservative action (40 milligrams per kilogram food versus 2000 milligrams of benzoic acid or sodium benzoate added to foods for their preservative quality). In animal studies, high amounts caused damage to the nervous system and brain. Sensitive individuals may develop hives or other allergic reactions. May encourage hyperactivity or decreased intellect in susceptible children. The Joint FAO/WHO Expert Committee on Food Additives (JECFA) has set an Acceptable Daily Intake (ADI) for humans at 0 to 5 milligrams per kilogram body weight. Sodium benzoate plus ascorbic acid can react under the right heat and light conditions to form benzene, a cancer-causing agent. Due to all the press generated on benzene’s risks, soft drink companies are looking at substitutes to sodium benzoate. **Rating: D**

**Sodium hexametaphosphate**

Emulsifier, sequestrant, texturizer. Sodium salt with high phosphate content. Note that high phosphate intake may lead to imbalance between other minerals in the body, such as calcium and magnesium. In 1975, animal studies on this additive indicated toxicity at doses up to 370 milligrams per kilogram body weight in mice and 240 milligrams per kilogram body weight in rats. Added to breakfast cereals, cake, fish, ice cream, beverages, puddings, and jellies. Used in water treatment—may be found in bottled water. May cause allergic reaction. Sodium- and phosphate-sensitive individuals should limit intake. **Rating: C**

**Sucralose (Splenda®)**

Artificial sweetener. Sucralose has many names: 1,6-dichloro-1,6-dideoxy-β-D-fructofuranosyl-4-chloro-4-deoxy-α-D-galactopyranoside, 1',4,6'-trichlorogalactosucrose, trichlorosucrose, and Splenda®. Sucralose is chlorinated sucrose (3 chlorine atoms attached to table sugar) and is referred to as a “chlorinated sugar.” Discovered in 1976, but not approved for use in the U.S. until 1998. Splenda® is prepared with added corn-derived fillers (maltodextrin and dextrose). These fillers are not always needed when added directly to food products like candy, desserts, and diet soft drinks. Used in several food items. More than 100 studies have been done on sucralose in the twenty years since its discovery that indicate it is non-toxic and doesn’t cause tooth cavities. A human study concluded its safety in humans at amounts of 5 milligrams per kilogram per day when given for thirteen weeks. However, since it is a relatively new synthetic sweetener, no long-term studies have been done in humans. Although a large majority of studies indicate its safety, there have been some published case reports that it may trigger migraines. Sucralose appears to have adverse effects...
on the gut tissue. Research from a Japanese university demonstrated that sucralose caused DNA damage in the gut of mice. More recently, researchers at the Duke University Medical Center showed that rats fed sucralose at an equivalent acceptable dosage for humans as determined by the U.S. FDA experienced a reduction in beneficial gut bacteria. **Rating: F**

**Sulfites (potassium bisulfate, potassium metabisulfite, sodium metabisulfite, sodium sulfite, sulfur dioxide, sodium bisulfite)**

Antioxidant, antimicrobial dough conditioner, preservative. Sulfur-containing compounds that can occur naturally in foods (for example, wine) or be added to foods (dried fruits and vegetables, dried potatoes, vinegar) as preservatives to help retain fluidity and color. Sulfites used to be added to raw vegetables, but were subsequently banned by the FDA in 1986 due to severe reactions. If added to foods at a level of 10 parts per million (or 10 milligrams per kilogram), a label declaration is required. Highly allergenic ingredient, particularly for those with asthma; can lead to migraines, hives, itching, and breathing difficulties. In particular, sulfur dioxide may be especially problematic. Avoid these if you are allergic. **Rating: F**
Additives that May Cause Gastrointestinal Effects

These additives may cause gas, bloating, cramping, or changes in bowel movements.

- Agar (agar-agar)
- Alginate (alginic acid, algin, sodium alginate, Pacific kelp)
- Carboxymethylcellulose (sodium carboxymethylcellulose)
- Gluten
- Gums (acacia, Arabic, furcellan, guar, locust bean, tragacanth, xanthan)
- Hydrogenated starch hydrolysate (hydrogenated glucose syrup, maltitol syrup, sorbitol syrup)
- Inulin
- Sugar alcohols (erythritol, lactitol, maltitol, mannitol, sorbitol (glucitol), xylitol)
- Olestra (Olean®)
- Polydextrose (Litesse®, Sta-Lite®, Trimcal)
- Salatrim (Benefat®)
- Vitamin C (high amounts have a laxative effect)
**Agar (agar-agar)**

See Additives that May Provoke an Allergic Reaction.

**Alginate (alginic acid, algin, sodium alginate, Pacific kelp)**

See Additives that May Provoke an Allergic Reaction.

**Carboxymethylcellulose (sodium carboxymethylcellulose)**

Bulking agent, emulsifier, fiber, stabilizer, thickener. Odorless, white to yellow, water-soluble plant fiber (cellulose) derivative reacted with an acid. Sodium carboxymethylcellulose is the sodium salt of carboxymethylcellulose. Added to a variety of foods like ice cream, dressings, cheeses, icings, toppings, and gelatinous desserts. Also used as a binder (excipient) in dietary supplements. Considered a fiber source, used as a laxative in over-the-counter preparations. Sodium-sensitive individuals should note sodium source coming from sodium carboxymethylcellulose. Sodium-sensitive individuals should limit or reduce intake of sodium carboxymethylcellulose. **Rating: A**

**Gluten**

Dough conditioner, nutrient, stabilizer, texturizer, thickener. Principle protein fraction from wheat (can also be found in other grains, but wheat is most commonly used). Added to foods like breads, ice cream, and condiments for a variety of functions, but mainly to give structure and texture. Individuals with celiac disease need to follow a gluten-free diet. A gluten-free diet may also be helpful for those who are gluten intolerant but do not necessarily have celiac disease. Due to the high number of individuals with gluten intolerance, it may be best to avoid this additive. **Rating: F**

**Gums (acacia, Arabic, furcellaran, guar, locust bean, tragacanth, xanthan)**

See Additives that May Provoke an Allergic Reaction.

**Hydrogenated starch hydrolysate (hydrogenated glucose syrup, maltitol syrup, sorbitol syrup)**

Humectant, sweetener. Sweeteners derived from corn, wheat, or potato starch by breaking down these substances into smaller fragments, followed by the process of hydrogenation (applying hydrogen gas under high pressure) to create a mixture of various sugar alcohols (see Sugar alcohols). Found in diabetic foods. As with other sugar alcohols, high amounts (10 grams or more daily) can have a laxative effect. **Rating: C**

**Inulin**

See Additives that May Provoke an Allergic Reaction.
Sugar alcohols (erythritol, lactitol, maltitol, mannitol, sorbitol (glucitol), xylitol)

Bulking agents, humectants, sweeteners. White, odorless, sweet powders that occur naturally in fruits, vegetables, grains, and fermented foods. They are not as sweet as sucrose, yet they are desirable because they are lower in calories. Since they are not well-absorbed, they have about 33-50 percent of the calories of sugar. Foods labeled as “sugar free” commonly contain sugar alcohols. For foods that contain relatively high amounts, additional food labeling stating that “Excess consumption may have a laxative effect” is required. Eating large amounts (above ten grams per day) may have a laxative effect. Unlike sugar, sugar alcohols do not cause tooth decay. In fact, studies show that xylitol may be helpful in preventing cavities. When concentrated, some sugar alcohols produce a cooling sensation in the mouth (e.g., as in chewing gum). Some concern has been raised about ingestion of sugar alcohols and their effects on worsening irritable bowel syndrome (IBS). Small amounts in foods (less than ten grams eaten per day) may be without effect for some individuals, but others may be sensitive to lesser amounts. Rating: C

Olestra (Olean®)

Fat substitute. Produced by Procter & Gamble; formed by the mixture of fatty acids and sucrose (called a “sucrose polyester”). It has fat-like properties, thus is used as a fat substitute. Approved as a food additive in 1996. Products containing olestra had to carry an FDA-mandated warning about side effects (abdominal cramping and loose stools) and had to contain additional levels of fat-soluble vitamins (A, D, E, K) due to their malabsorption. Studies have indicated that blood levels of dietary carotenoids (plant compounds like beta-carotene) are lower in people eating products with olestra. Subsequent evaluation of customer complaints resulted in the withdrawal of the initial labeling requirement on olestra in 2003 by the FDA. The Center for Science in the Public Interest opposes the use of olestra and accepts consumer complaints at http://www.cspinet.org/olestraform/index.htm. May be used in savory/salty ready-to-eat snacks (potato chips, tortilla chips, cheese puffs, crackers), tortillas, and ready-to-heat un-popped popcorn kernels. Does not get absorbed, so it has no calories. Long-term studies in humans are ongoing. It has been suggested that its consumption may worsen symptoms of irritable bowel syndrome (IBS). Rating: F

Polydextrose (Litesse®, Sta-Lite®, Trimcal)

Bulking agent, humectant, sweetener. Ingredient formed by combining dextrose (from corn) with a sugar alcohol (sorbitol). Contains a small amount (1 percent) citric acid or (0.1 percent) phosphoric acid. Classified as a soluble fiber, it can replace calories, fat, and sugar in foods like baked goods, baking mixes, frostings, salad dressings, frozen desserts, sauces, and toppings. Tastes slightly sweet and is not fully absorbed. Laxation may be experienced when taking high amounts, similar to the effects of a sugar alcohol. A label warning must be included on a food product if a serving contains more than 15 grams of polydextrose. Rating: B
Salatrim ( Benefat®)

Fat substitute. “Salatrim” stands for “short and long chain acyl triglyceride molecules.” Modified fat developed from canola, cottonseed, soybean or sunflower oils by Nabisco made of short fatty acids and a long fatty acid (stearic acid). Added to foods as a low-calorie fat substitute since 1994 (five calories per gram instead of the typical nine calories you get from fat). Does not get completely absorbed in the intestine like other fats. A recent study in twenty-two healthy, young men by researchers at the University of Copenhagen showed that, compared with traditional fat, salatrim modestly suppresses appetite to a greater extent. It did not change gut appetite hormones. Can be found in select reduced-fat cookies and chocolate chips. In large amounts (30 grams per day), may cause cramps and nausea. **Rating: F**

Vitamin C (high amounts have a laxative effect) (Ascorbic acid, Ascorbate, Ascorbyl Palmitate, Calcium Ascorbate, L-Ascorbic Acid, Sodium Ascorbate)

Acid, antioxidant, nutrient. Water-soluble vitamin naturally occurring in citrus fruits, and can also be chemically synthesized. Biologically necessary for humans for healthy teeth, bones, and blood vessels. Used as an antioxidant to preserve color of fresh and cured meats, vegetables, fruits, juices, etc. Can inhibit the formation of cancer compounds (see Sodium nitrites). Has been used since the 1930s to improve volume and texture of dough. Sodium ascorbate is a common form in drinks due to its ability to dissolve easily. Recommended daily allowance (RDA) for men nineteen years and older is 95 milligrams, and 75 milligrams for women the same age. Considered to be a safe compound at levels below 2000 mg daily. **Rating: A+**
Additives Lactose-Intolerant Individuals Should Avoid

- All milk-containing products
- Calcium (or Sodium) stearoyl lactylate
- Lactitol
- Lactose
**Calcium (or Sodium) stearoyl lactylate**

Dough conditioner, emulsifier, whipping agent. Slightly sweet white powder made from the combination of lactic acid and the fatty acid, stearic acid, followed by treating it with either calcium hydroxide or sodium hydroxide to make the calcium or sodium salt, respectively. When fumaric acid (see Fumaric acid) is used in place of lactic acid, the final result is called sodium stearoyl fumarate. All forms of this additive toughen bread dough so that it can be processed with machinery. They create increased bread volume by making the gluten structure stronger and can assist as a whipping agent in egg and dairy products. Since this additive contains a fat, high amounts fed to rats caused fat to build up in the body. This effect was reversed by changing their diets. Although somewhat rare, lactose-intolerant persons may be sensitive to the lactylate forms, since lactic acid (made from fermenting lactose) is a starting ingredient. Avoid if lactose-intolerant; sodium-sensitive individuals should limit the sodium form of this additive. **Rating: A**

**Lactitol**

Bulking agent, humectant, sweetener. Sugar alcohol made from lactose (milk sugar). Lactose-sensitive individuals should avoid. Found in low-calorie and diabetic foods. Like other sugar alcohols (see Sugar alcohols), bloating and diarrhea can result when ingesting high amounts (more than 10 grams daily). Avoid if lactose intolerant. **Rating: C**

**Lactose**

Sweetener. Sugar from the whey portion of milk. Called “milk sugar.” Used as a material for bacteria to ferment in the souring of milk. Included in cultured milk, dry powdered milks, eggnog, cream, and yogurt. Found in infant formula as a nutrient. Not as sweet as table sugar. Some people, especially Asians and African Americans, have a decreased ability to break down lactose—they are considered to be “lactose intolerant.” They should avoid lactose to prevent gas, bloating, and diarrhea. **Rating: A**
Additives Gluten-Intolerant Individuals Should Avoid

- Dextrins (wheat-derived: maltodextrin)
- Gluten
- Hydrogenated starch hydrolysate (wheat-derived: hydrogenated glucose syrup, maltitol syrup, sorbitol syrup)
- Hydrolyzed vegetable protein (wheat-derived: HVP, hydrolyzed protein, hydrolyzed wheat protein, TVP, texturized vegetable protein)
- Maltose (barley-derived: dried maltose syrup, maltose syrup, dried malt syrup)
- Modified food starch (wheat-derived)
- Mono- and Di-glycerides (wheat carrier)
**Dextrins (wheat-derived: maltodextrin)**

Stabilizer, sweetener, thickener. A water-soluble white or yellow powder consisting of short fragments of carbohydrates made from the breakdown of starch by acid and heat. Easily digested and sweet tasting because they are small chains of glucose, but some dextrins are chemically processed to be resistant to digestion. These forms of dextrins act as fiber, slowing the release of sugar into the bloodstream. Used extensively in numerous products (baked goods, beverages, gravies, pie fillings, puddings, soups) due to its safety and low cost. A common dextrin is maltodextrin, or corn-starch-derived fragments with no more than twenty glucose units. Dextrins can be made from rice, corn, potato, and tapioca. Some dextrins are derived from wheat—those avoiding gluten should avoid these as well. May cause allergic reactions if sensitive to the source from which it is derived. Avoid if allergic. **Rating: A**

**Gluten**

See Additives that May Cause Gastrointestinal Effect.

**Hydrogenated starch hydrolysate (wheat-derived: hydrogenated glucose syrup, maltitol syrup, sorbitol syrup)**

See Additives that May Cause Gastrointestinal Effect.

**Hydrolyzed vegetable protein (wheat-derived: HVP, hydrolyzed protein, hydrolyzed wheat protein, TVP, texturized vegetable protein)**

See Additives that May Provoke and Allergic Response.

**Maltose (barley-derived: dried maltose syrup, maltose syrup, dried malt syrup)**

Stabilizer, sweetener. Sugar derived from malt (barley is often the source). Made of two glucose units and only about one-third as sweet as table sugar. Can be fermented and thus is widely used in beers, cakes, and bread. Avoid if you are gluten intolerant. **Rating: A**

**Modified food starch (wheat-derived)**

Emulsifier, fat substitute, stabilizer, thickener. Starch from corn, wheat, potato, rice, or tapioca that has been treated with chemicals so that its properties are optimized for a specific food application—for example, allowing it to perform under high heat or acid conditions. It can be made more digestible so it is included in foods that are easy to digest, like baby food. They are also used as thickeners in products like cheeses, sauces, pie fillings, gravies, and baked products. Concern has been raised regarding the chemicals used to modify the starch. Those who are sensitive to the starch sources named above should be aware that they may be sensitive to processed foods containing this ingredient. **Rating: B**

**Mono- and Di-glycerides (wheat carrier)**

Dough conditioners, emulsifiers, flavoring agent, stabilizers. Type of fat that has either one (mono-) or two (di-) fatty acids attached to a glycerol molecule. These fats are
derived from animal and plant sources. May be made from oils (soybean, palm, cottonseed, sunflower) or chemically synthesized by reacting glycerin with fatty acids using an alkali agent. Works as an emulsifier in several foods (for example, peanut butter, margarine, and shortening). They give foods like margarine, breads, bagels, and baked goods a better consistency. Some but not all, may be used in conjunction with a wheat carrier and tend to occur in nutrient-poor processed foods. Gluten-intolerant individuals should probably avoid. Rating: B
Additives Sodium-Sensitive Individuals Should Limit

- All additives with “sodium” in the name
- All additives with “salt” in the name
- Aluminosilicic acid (aluminum sodium salt, aluminum sodium silicate, disodium citrate)
- Baking soda (bicarbonate of soda, sodium hydrogen carbonate, sodium bicarbonate)
- Calcium disodium EDTA
- Disodium EDTA
- Disodium guanylate
- Disodium inosinate
- Disodium tartrate (monosodium citrate)
- Monosodium glutamate (MSG)
- Monosodium tartrate
- Potassium sodium tartrate
- Sodium acid pyrophosphate
- Sodium alginate
- Sodium aluminosilicate (sodium aluminosilicate)
- Sodium aluminum phosphate
- Sodium benzoate
- Sodium bisulfite
- Sodium carbonate (washing soda, soda ash)
- Sodium carboxymethylcellulose
- Sodium caseinate
- Sodium caseinate
- Sodium chloride (salt)
- Sodium citrate
- Sodium erythorbate
- Sodium gluconate
- Sodium hexametaphosphate
- Sodium metabisulfite
- Sodium nitrite (sodium nitrate)
- Sodium polymetaphosphate
- Sodium potassium tartrate
- Sodium propionate
- Sodium silicoaluminate
- Sodium sorbate
- Sodium stearoyl lactylate
- Sodium sulfite (trisodium citrate)
**Aluminosilicic acid (aluminum sodium salt, aluminum sodium silicate, disodium citrate)**

Anti-caking agent. Fine, white crystalline solid that promotes the free flow of table salt and dried egg-yolk products at a level not to exceed 2 percent. This additive contains both sodium and aluminum. The association of aluminum with Alzheimer’s disease remains inconclusive. Avoid aluminum-containing additives, however, in case of chronic renal disease, as there can be an accumulation of aluminum. Sodium silicate and magnesium trisilicate have been shown to produce damage in dog kidneys. Sodium-sensitive individuals should limit intake. **Rating: F**

**Baking soda (bicarbonate of soda, sodium hydrogen carbonate, sodium bicarbonate)**

Anti-caking, buffer, leavening agent, stabilizer. Fine, white, alkaline powder that combines with acidic ingredients or additives (lemon juice, cream of tartar, phosphates) to produce carbon dioxide gas, causing a food product to rise. Added to “self-rising” products like self-rising flour or self-rising corn meal, and incorporated into sweet baked goods (pastries, pies, cakes), breads, beverages, vegetable-based products, and cocoa products. Contains sodium. Limit if you are sodium sensitive. **Rating: A**

**Calcium disodium EDTA (Disodium EDTA)**

Acid, chelating agent. Widely used food and cosmetic additive that binds metals such as manganese, iron, lead, and copper left in foods from processing. Sequestering metals in foods is beneficial, since non-bound metals can become reactive in oils, causing them to become rancid. Various forms of EDTA are used to promote color and flavor retention in pickled cabbage, canned foods like carbonated soft drinks, vegetables, seafood, and beans, as well as alcoholic beverages, sauces, salad dressings, and sandwich spreads. Also used therapeutically by health-care professionals for chelation therapy. Toxicity studies in animals indicate the lowest dose to cause a toxic effect is 750 milligrams per kilogram of body weight given daily. In lab animals, it has been found to be toxic to cells and genes, but not cancer causing. Acceptable daily intake (for calcium disodium EDTA) established for humans at 0–2.5 milligrams per kilogram body weight. Sodium-sensitive individuals should limit sodium forms of EDTA. **Rating: B**

**Disodium guanylate (Disodium inosinate)**

Flavoring agents. Disodium salts of guanylic and inosinic acids. Used to provide a savory (“umami”) flavor to noodles, snack foods, rice, vegetables, cured meat, and soups, often together with monosodium glutamate (see Monosodium glutamate). Individuals with gout or uric acid kidney stones should limit their intake of these purine-containing additives. Sodium-sensitive individuals should also limit intake. May cause allergic reactions. **Rating: B**

**Tartaric acid (monosodium tartrate, disodium tartrate, monopotassium tartrate, cream of tartar, dipotassium tartrate, sodium potassium tartrate, potassium sodium tartrate)**

Acid, firming agent, flavoring agent, humectant. Naturally occurring acid, found in fruits like grapes. Commercially synthesized as a byproduct of wine making. Found in its acid
and salt forms in baking powder, jams, jellies, cocoa powder, wine, citrus dessert mixes, meat, and cheese products. Potassium bitartrate is also known as cream of tartar. Sodium salts provide sodium; therefore, sodium-sensitive individuals should limit intake. High amounts (several grams per day) can lead to laxative effects. **Rating: B**

### Monosodium glutamate (MSG)

See Additives that May Provoke an Allergic Reaction.

### Phosphates (particularly sodium aluminum phosphate, sodium acid pyrophosphate, tetrasodium phosphate)

Acid, chelating agent, color stabilizer, dough conditioner, emulsifier, firming agent, nutrient. Phosphoric acid is used as an acid and flavoring in bakery products, cheeses, beverages, candy, and dairy products. Phosphate is a nutrient and is needed in the body for kidney, intestine, and bone health, as well as for the proper functioning of the parathyroid gland (regulates Vitamin D and calcium in the body). Consuming too much, mainly by eating excessive meat and dairy products, can have adverse effects. A variety of phosphate additives are found in foods and have specific functions. Colas contain phosphoric acid as an acid. In a study by Tufts University, researchers found that women who were cola drinkers had low calcium-to-phosphorus ratio and a lower bone mineral density, suggesting that drinking large amounts of cola can lead to mineral imbalance in the body.

In addition to providing calcium as a nutrient, calcium phosphate is used in bread products, canned vegetables, and jellies. Tricalcium phosphate is often used as a supplemental source of calcium in foods like orange juice. Sodium aluminum phosphate is used in cheeses and together with sodium bicarbonate in self-rising flour. Tetrasodium phosphate suspends cocoa in milk. Ammonium phosphate is commonly found in baking powder and in bread products as a leavening agent. Sodium acid pyrophosphate provides different levels of leavening action in self-rising and prepared cakes, donuts, refrigerated dough, and other baking flours and mixes. It can be added to hot dogs and sausages to obtain a red color. **Rating: A**

### Alginate (particularly sodium alginate)

Bulking agent, emulsifier, fiber, stabilizer, thickener. Brown seaweed-derived ingredient that can stabilize foam and act as a thickener in products like jellies, salad dressings, beverages, custards, ice cream, soups, and cheese. Sodium alginate is the sodium salt form. Theoretically, it may have cholesterol-lowering effects due to its ability to trap dietary cholesterol in its gel-like structure. Limited studies suggest it may create fullness or satiety, although this concept needs further testing. May cause allergic reactions in sensitive individuals. Avoid if allergic. **Rating: A+**

### Sodium silicoaluminate (sodium aluminosilicate, aluminum sodium salt, aluminosilicic acid, aluminum sodium silicate)

Anti-caking agent. Fine, white crystalline solid that promotes the free flow of table salt and dried egg-yolk products at a level not to exceed 2 percent. This additive contains both sodium and aluminum. The association of aluminum with Alzheimer’s disease...
remains inconclusive. Avoid aluminum-containing additives, however, in case of chronic renal disease, as there can be an accumulation of aluminum. Sodium silicate and magnesium trisilicate have been shown to produce damage in dog kidneys. Sodium-sensitive individuals should limit intake. **Rating: F**

**Sodium benzoate (benzoic acid)**

Preservative. Sodium benzoate is a chemically synthesized preservative used in soft drinks, fruit juices and preserves, jams, and margarine. Benzoic acid can occur in foods (plant and animal products) naturally, and at levels that are lower than typically needed in food for preservative action (40 milligrams per kilogram food versus 2000 milligrams of benzoic acid or sodium benzoate added to foods for their preservative quality). In animal studies, high amounts caused damage to the nervous system and brain. Sensitive individuals may develop hives or other allergic reactions. May encourage hyperactivity or decreased intellect in susceptible children. The Joint FAO/WHO Expert Committee on Food Additives (JECFA) has set an Acceptable Daily Intake (ADI) for humans at 0 to 5 milligrams per kilogram body weight. Sodium benzoate plus ascorbic acid can react under the right heat and light conditions to form benzene, a cancer-causing agent. Due to all the press generated on benzene’s risks, soft drink companies are looking at substitutes to sodium benzoate. **Rating: D**

**Sulfites (sodium metabisulfite, sodium sulfite, sodium bisulfate)**

Antioxidant, antimicrobial dough conditioner, preservative. Sulfur-containing compounds that can occur naturally in foods (for example, wine) or be added to foods (dried fruits and vegetables, dried potatoes, vinegar) as preservatives to help retain fluidity and color. Sulfites used to be added to raw vegetables, but were subsequently banned by the FDA in 1986 due to severe reactions. If added to foods at a level of 10 parts per million (or 10 milligrams per kilogram), a label declaration is required. Highly allergenic ingredient, particularly for those with asthma; can lead to migraines, hives, itching, and breathing difficulties. In particular, sulfur dioxide may be especially problematic. Avoid these if you are allergic. **Rating: F**

**Sodium carbonate (washing soda, soda ash)**

Anti-caking agent, buffer, leavening agent, stabilizer. Sodium salt of carbonic acid. This white alkaline powder is added to breads, baked goods, noodles, pastas, confections, ice cream, and numerous other products. Contains sodium, so sodium-sensitive individuals should limit intake. **Rating: A**

**Sodium Carboxymethylcellulose (cellulose gum, CMC)**

Bulking agent, emulsifier, fiber, stabilizer, thickener. Odorless, white to yellow, water-soluble plant fiber (cellulose) derivative reacted with an acid. Sodium carboxymethylcellulose is the sodium salt of carboxymethylcellulose. Added to a variety of foods like ice cream, dressings, cheeses, icings, toppings, and gelatinous desserts. Also used as a binder (excipient) in dietary supplements. Considered a fiber source, used as a laxative in over-the-counter preparations. Sodium-sensitive individuals should note sodium source coming from sodium carboxymethylcellulose. Sodium-
sensitive individuals should limit or reduce intake of sodium carboxymethylcellulose. 

**Rating: A**

**Sodium caseinate**

Emulsifier, food coloring, nutrient, texturizer, thickener. Main high-quality, complete (contains all essential amino acids) protein in cow’s milk. Added to foods like cream, coffee creamers, processed meats, cheeses, and frozen desserts, serving in a number of functional roles. Imparts white color to foods. Note that it is found in “nondairy” foods like soy cheese. Milk-allergic individuals need to avoid this ingredient. May also contribute sodium if in the form of sodium caseinate. Individuals who are allergic and sodium-sensitive individuals should limit intake of sodium caseinate. **Rating: A+**

**Salt (sodium chloride, iodized salt, iodized table salt, table salt)**

Flavoring agent, preservative. Sodium chloride, or common table salt, is one of the oldest known food additives. Iodized table salt is salt with added iodide (in the form of cuprous iodide or potassium iodide, added to prevent thyroid disease) and it may also contain an anti-caking agent to promote a free-flowing property of the crystals. Too much salt in the diet can lead to high blood pressure and increased risk for heart disease in susceptible individuals. Processed foods (frozen dinners, canned vegetables, and canned juices) contain relatively high amounts of sodium. Claims such as “low sodium” indicate that the food has 140 milligrams of sodium or less per serving. “Reduced sodium” implies that sodium has been reduced by 25 percent. The American Heart Association advised eating no more than 2400 milligrams of sodium (about one teaspoon) per day. The average American eats more than this amount (some sources cite typical consumption at 3300 milligrams per day). In late 2007, the consumer interest group Center for Science in the Public Interest petitioned the FDA to have stricter regulations on food sodium content. Sea salt (see Sea salt) is an alternative to iodized table salt. **Rating: C**

**Sodium citrate (monosodium citrate, disodium citrate, trisodium citrate)**

Acid, antioxidant, emulsifier, flavoring agent. The sodium salt of citric acid in the form of colorless crystals or white powder. All forms of sodium citrate contain sodium with trisodium citrate containing the most of the three. Therefore, sodium-sensitive individuals should reduce or avoid these compounds (see Salt). Some of these compounds (especially trisodium citrate) taste both sour and salty and are sometimes used to give products flavor (for example, club soda). Citrates can be also be used to emulsify fat—in ice cream, for example. Found within a broad spectrum of foods: dairy-based drinks, condensed milk, cheeses, margarine, processed fruit, breakfast cereals, soybean products, processed meats, vinegar, sauces, soups, condiments, and alcoholic beverages. Sodium-sensitive individuals should limit intake. **Rating: C**

**Sodium erythorbate**

Antioxidant. White-yellowish, water-soluble, crystalline antioxidant derived from vegetables and produced from sucrose. Used as an antioxidant in meat, dairy products, processed fruit, dried and canned vegetables, cereals, egg products, artificial sweeteners, condiments, soups, beverages, and baked goods. Similar in
structure to, but not a substitute for, ascorbic acid (vitamin C). Eating it does not interact with vitamin C in the body, as demonstrated by University of Alabama researchers. Has been shown to promote iron absorption in humans in ways similar to vitamin C. Sodium-sensitive individuals should limit the sodium form. **Rating: A**

**Sodium gluconate**

Chelating agent. Sodium salt of gluconic acid (see Gluconic acid) [XREF] produced commercially by glucose fermentation. A fine, white crystalline powder added to dairy-based products (cheeses, margarine, frozen desserts), breakfast cereals, grain products (noodles, pastas), rice cakes, soy-based products. Contains sodium, so sodium-sensitive individuals should limit intake. **Rating: A**

**Sodium hexametaphosphate (sodium polymetaphosphate, Graham’s salt)**

Emulsifier, sequestrant, texturizer. Sodium salt with high phosphate content. Note that high phosphate intake may lead to imbalance between other minerals in the body, such as calcium and magnesium. In 1975, animal studies on this additive indicated toxicity at doses up to 370 milligrams per kilogram body weight in mice and 240 milligrams per kilogram body weight in rats. Added to breakfast cereals, cake, fish, ice cream, beverages, puddings, and jellies. Used in water treatment—may be found in bottled water. May cause allergic reaction. Sodium- and phosphate-sensitive individuals should limit intake. **Rating: C**

**Sodium nitrate, sodium nitrite**

Flavoring agent, food coloring, preservative. Sodium nitrate is the sodium salt of nitric acid, often appearing in the form of clear, colorless crystals. Similarly, sodium nitrite is the sodium salt of nitrous acid and comes as a white to yellowish powder. Both compounds are commonly used to preserve color in fish and meats, or keep them pink/red instead of brown. Sodium nitrite has replaced much of sodium nitrate use. These compounds also prevent the growth of bacteria like Clostridium botulinum, which is responsible for botulism. Sodium nitrate has been shown to be toxic in mammals. A single dose of one gram is toxic to humans; eight grams may be fatal and ingestion of thirteen to fifteen grams is generally fatal. Numerous cases of nitrate toxicity, especially in vulnerable populations like infants, have been documented due to contamination of well water with nitrate fertilizers. Nitrites and nitrates occur in vegetable sources such as root vegetables and leafy greens, especially when fertilizer is used.

In the presence of heat and amino acids (building blocks of protein), as in cooking meat or in the gastrointestinal tract, these compounds can form cancer-causing agents called N-nitrosamines. N-nitrosamines have been associated with migraines. Food companies have started to add acid (ascorbic acid or erythorbic acid) to meats to prevent nitrosamines from forming. In general, there are studies indicating that meat consumption may not be healthy. Specifically, studies demonstrating a link between colon cancer and meat consumption may suggest that sodium nitrite is involved. There is also some evidence that eating meats containing nitrates may lead to a lung disease
(COPD). Various sources recommend that children and pregnant women avoid these compounds, as nitrites can cross the placenta. **Rating: F**

**Sodium propionate**

Preservative. White or colorless crystalline solid that prevents bacteria and mold growth on products like bread, rolls, dairy products, processed sweet baked goods; also used to prevent fungal growth on growing produce. Unlike other preservatives, does not need an acidic environment to work. Can be found naturally (small amounts) in foods like cheese. Propionic acid is produced in the human body through metabolic processes. The calcium form of propionate is preferred from a functional perspective, since the alpha-amylase enzyme needs calcium to make the starch available to the yeast, allowing for better bread structure. Use of this additive in all forms is relatively widespread. There is debate about whether this additive is safe. Researchers have tested children’s reactions to calcium propionate in bread against bread without calcium propionate. They found irritability, restlessness, inattention, and sleep disturbance in some children and advised minimizing concentrations added to processed foods. Sodium-sensitive individuals should limit or reduce their intake of sodium propionate. **Rating: C**

**Sodium sorbate**

Preservative. Naturally occurring preservative, first identified in unripe berries of Sorbus aucuparia, a plant grown in the northern hemisphere. Long-term feeding of 5 percent sorbic acid to rats resulted in no negative effects. Prevents mold, yeast, and bacterial growth. Sodium, calcium, or potassium salts of sorbic acid are used for their high water solubility. Overall, sorbates are used in a wide array of food (and cosmetic) products. Sodium-sensitive individuals should limit sodium forms. **Rating: A**

**Sodium stearoyl lactylate**

Dough conditioner, emulsifier, whipping agent. Slightly sweet white powder made from the combination of lactic acid and the fatty acid, stearic acid, followed by treating it with either calcium hydroxide or sodium hydroxide to make the calcium or sodium salt, respectively. When fumaric acid (see Fumaric acid) is used in place of lactic acid, the final result is called sodium stearoyl fumarate. All forms of this additive toughen bread dough so that it can be processed with machinery. They create increased bread volume by making the gluten structure stronger and can assist as a whipping agent in egg and dairy products. Since this additive contains a fat, high amounts fed to rats caused fat to build up in the body. This effect was reversed by changing their diets. Although somewhat rare, lactose-intolerant persons may be sensitive to the lactylate forms, since lactic acid (made from fermenting lactose) is a starting ingredient. Avoid if lactose-intolerant; sodium-sensitive individuals should limit the sodium form of this additive. **Rating: A**

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Consumer Resources

Center for Science in the Public Interest (CSPI)
A consumer watchdog organization in existence since 1972: http://www.cspinet.org/

Code of Federal Regulations (CFR)

Food and Drug Administration (FDA)
Food additive database: http://vm.cfsan.fda.gov/~dms/eafus.html

Institute for Agriculture and Trade Policy
The pulse on the intersection between policy and practice for fair, sustainable food growing: http://www.iatp.org

International Programme on Chemical Safety
Chemical safety information from intergovernmental organizations: http://www.inchem.org/

National Toxicology Program, Department of Health and Human Services
Evaluates public health concern using toxicology and molecular biology: http://ntp.niehs.nih.gov/

Organic Consumers Association
For those who want more information on how to be proactive in the organic market: http://www.organicconsumers.org/

PUBMED
A free service of the National Library of Medicine providing access to over 17 million scientific citations: http://www.ncbi.nlm.nih.gov/pubmed/

U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition
Federal regulations around safety of food additives: http://www.cfsan.fda.gov/

Wageningen University, Food Science Department
Provides food allergy dictionaries in over 30 languages, comprehensive food additive listing, http://www.food-info.net/uk/
References


Department of Health and Human Services, National Toxicology Program, http://ntp.niehs.nih.gov/


Maga JA, Tu AT. Food Additive Toxicology. CRC Press, 1995.


Natural Medicines Comprehensive Database, www.naturaldatabase.com


Oregon State University, College of Health and Human Services, http://food.oregonstate.edu/

Oregon State University, Linus Pauling Institute, http://lpi.oregonstate.edu/infocenter/


Purdue University, Center for New Crops and Plant Products, http://www.hort.purdue.edu/newcrop/default.html


Wageningen University, www.food-info.net/uk


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