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CSPI ranks the safety of food additives—from acetic acid to yellow prussiate of soda—in this definitive glossary of the chemicals used to flavor and preserve our foods.

Deciding what foods to buy was simpler when most food came from farms. Now, factory-made foods have made chemical additives a significant part of our diet.

In general, it's best to avoid the following ingredients.

- Artificial sweeteners: Aspartame, Acesulfame K, Saccharin, Sucralose
- Food dyes
- Partially hydrogenated oils (trans fat)

And don't forget to cut back on sugar and salt, which cause more harm than all the other additives combined.

See our [Overview of Food Additives Infographic \(https://www.cspinet.org/reports/FoodAdditives_Infographic.pdf\)](https://www.cspinet.org/reports/FoodAdditives_Infographic.pdf) to learn more.

Note: Some substances added to the food supply are deemed "generally recognized as safe" (GRAS) without so much as a quick review by the Food and Drug Administration. [Learn more here. \(https://cspinet.org/resource/food-additive-safety-infographic\)](https://cspinet.org/resource/food-additive-safety-infographic)

Can't Find What You are Looking For?

- Check out our listing of [Banned Additives](#).
- Sometimes an additive may appear on the label multiple ways. If the additive you're interested in has two names, check our listing under both the first and last names. For example:
 - We list "Xanthan Gum" under "Gums"
 - We list "Disodium Inosinate" under "Inosine Monophosphate (IMP, Disodium Inosinate)"
 - We list "Potassium Sorbate" under "Sorbic Acid, Potassium Sorbate"
- Learn more about food additive regulation at [More Loophole Than Law: The Food Additives Testing and Approval Process](#).
- [Cancer Testing](#) explains more about safety testing.
- Interested in the definition of emulsifier or acidulant? Consult our [Glossary](#).
- Still can't find it? While Chemical Cuisine lists the most commonly used additives, it does not list all of the thousands used in the food supply. Let us know what additive you want to know about, and in what food you found it. We add additional additives as resources allow.

Safety Ratings Key



Safe

The additive appears to be safe.



Caution

May pose a risk and needs to be better tested. Try to avoid.



Cut Back

Not toxic, but large amounts may be unsafe or promote bad nutrition.



Certain People Should Avoid

May trigger an acute, allergic reaction, intolerance, or other problems.



Avoid

Unsafe in amounts consumed or is very poorly tested and not worth any risk.

Summary of the Safety of All Additives

Safe	
ACETIC ACID	MONO- and DIGLYCERIDES
ADIPIC ACID	NATAMYCIN (PIMARCIN)
ADVANTAME	NEOTAME
AIR	NIACIN (VITAMIN B3)
ALGINATE	NISIN

ALPHA TOCOPHEROL (Vitamin E)	NITROUS OXIDE	
AMMONIUM COMPOUNDS	OAT FIBER, WHEAT FIBER	
AMYLASE	OLIGOFRUCTOSE	
ASCORBIC ACID (Vitamin C)	PANTOTHENIC ACID (AND SODIUM PANTOTHENATE)	
ASCORBYL PALMITATE	PAPAIN	
BETA-CAROTENE	PECTIN (AND SODIUM PECTINATE)	
CALCIUM PROPIONATE	PHYTOSTEROLS and PHYTOSTANOLS	
CALCIUM STEAROYL FUMARATE (http://cspinet.org/reports/chemcuisine.htm#calciumstearoyl)	POLYGLYCEROL POLYRICINOLEATE(PGPR)	SHARE THIS
CALCIUM STEAROYL LACTYLATE	POTASSIUM CHLORIDE	
CARBON DIOXIDE (CARBONATED WATER)	POTASSIUM SORBATE	
CASTOREUM	PYRIDOXINE (VITAMIN B6)	
CELLULOSE	RIBOFLAVIN (VITAMIN B2)	
CITRIC ACID	SILICON DIOXIDE, SILICA, CALCIUM SILICATE	
CYSTEINE	SODIUM ASCORBATE	
DATEM	SODIUM DIACETATE	
DEXTRIN	SODIUM ERYTHORBATE, ERYTHORBIC ACID, SODIUM ISOASCORBATE	
DIACYLGLYCEROL	SODIUM PECTINATE	
EDTA	SODIUM STEAROYL FUMERATE (http://cspinet.org/reports/chemcuisine.htm#sodiumstearoyl)	
ERYTHORBIC ACID	SODIUM STEAROYL LACTYLATE	
ERYTHRITOL	SORBIC ACID	
FERROUS GLUCONATE	SORBITAN MONOSTEARATE	
FOOD-STARCH, MODIFIED	STARCH and MODIFIED STARCH	
FUMARIC ACID	STEARIC ACID	
GELATIN	STEVIA LEAF EXTRACT (REBIANA)	
GINSENG	SUCROSE ACETATE ISOBUTYRATE	
GLUCONIC ACID, GLUCONO DELTA-LACTONE, MAGNESIUM GLUCONATE, SODIUM GLUCONATE, ZINC GLUCONATE	TARTARIC ACID, POTASSIUM ACID TARTRATE, SODIUM POTASSIUM TARTRATE, SODIUM TARTRATE	
GLYCERIN (Glycerol)	TAURINE	
GUANOSINE MONOPHOSPHATE (GMP, DISODIUM GUANYLATE)	THAUMATIN	

HELIUM	THIAMIN MONONITRATE (VITAMIN B1)
INOSINE MONOPHOSPHATE (IMP, DISODIUM INOSINATE)	TORULA YEAST
INTER-ESTERIFIED OIL	TRIACETIN (GLYCEROL TRIACETATE)
INULIN	VANILLIN, ETHYL VANILLIN
ISOLATED SOY PROTEIN, TEXTURED VEGETABLE PROTEIN	VEGETABLE OIL STEROLS
LACTIC ACID	VITAMIN B2 (RIBOFLAVIN)
LECITHIN	VITAMIN B6 (PYRIDOXINE)
MAGNESIUM COMPOUNDS	VITAMIN D (D3)
MALIC ACID	VITAMIN E (ALPHA TOCOPHEROL)
MALTODEXTRIN	YELLOW PRUSSIAN OF SODA
MALTOTAME	



CORN SYRUP	PHOSPHORIC ACID; PHOSPHATES
DEXTROSE (CORN SUGAR, GLUCOSE)	POLYDEXTROSE
FRUCTOSE	SALATRIM
HIGH-FRUCTOSE CORN SYRUP	SALT
HIGH-MALTOSE CORN SYRUP	SEA SALT
HYDROGENATED STARCH HYDROLYSATE (HSH)	SORBITOL
INVERT SUGAR	SUCROSE
ISOMALT	SUGAR
LACTITOL	TAGATOSE
MALTITOL	XYLITOL
MANNITOL	



BRAZZEIN (Not yet used in U.S.)	MONATIN (Not yet used in U.S.)
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BUTYLATED HYDROXYTOLUENE (BHT)	MONK FRUIT EXTRACT
CARBOXYMETHYL CELLULOSE (CMC, CELLULOSE GUM), SODIUM CARBOXYMETHYL CELLULOSE	POLYSORBATE 60, 65, AND 80
CARRAGEENAN	SODIUM CARBOXYMETHYL CELLULOSE (CMC)
DIACETYL	TRANSGLUTAMINASE ("MEAT GLUE")



ANNATTO	MSG (MONOSODIUM GLUTAMATE)
ARTIFICIAL AND NATURAL FLAVORING	MYCOPROTEIN
AUTOLYZED YEAST EXTRACT	PROPYLENE GLYCOL
BENZOIC ACID	QUININE
CAFFEINE	QUORN
CARMINE/COCHINEAL	SODIUM BENZOATE
CASEIN	SODIUM BISULFITE
GUARANA	SODIUM CASEINATE
GUMS: Arabic, Furcelleran, Gellan, Ghatti, Guar, Karaya, Locust Bean, Tragacanth, Xanthan	SULFITES
HVP (HYDROLYZED VEGETABLE PROTEIN)	SULFUR DIOXIDE
LACTOSE	



ACESULFAME POTASSIUM	POTASSIUM BROMATE
ALOE VERA	POTASSIUM IODATE
ARTIFICIAL COLORINGS (SYNTHETIC FOOD DYES): BLUE 1, BLUE 2, CITRUS RED 2, GREEN 3, ORANGE B, RED 3, RED 40, YELLOW 5, YELLOW 6	PROPYL GALLATE
ASPARTAME (NutraSweet)	SACCHARIN
AZODICARBONAMIDE	SODIUM NITRATE
BROMINATED VEGETABLE OIL (BVO)	SODIUM NITRITE
BUTYLATED HYDROXYANISOLE (BHA)	SUCRALOSE
CARAMEL COLORING	TBHQ (tert-butylhydroquinone)
CYCLAMATE (not legal in U.S.)	TRANS FAT

GINKGO BILOBA	Also See: ARTIFICIAL COLORINGS
OLESTRA (Olean)	ARTIFICIAL SWEETENERS
PARTIALLY HYDROGENATED VEGETABLE OIL (TRANS FAT)	

Additives

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#)
https://cspinet.org/eating-healthy/chemical-cuisine#letter_Y | [Z](#)

A

ACESULFAME POTASSIUM

Artificial sweetener: "Diet," "no sugar added," "sugar-free," and other products, including soft drinks, drink mixes, baked goods, gelatin desserts, frozen desserts, yogurt, candy, chewing gum, packaged (tabletop) sweeteners.

This artificial sweetener is widely used around the world. It is about 200 times sweeter than sugar. In the United States, for several years acesulfame K (also called ace-K; the K is the chemical symbol for potassium) was permitted only in foods like sugar-free baked goods, chewing gum, and gelatin desserts. In July 1998, the FDA allowed this chemical in soft drinks, thereby greatly increasing its use and consumer exposure. It is often used together with sucralose or aspartame.

The safety tests of ace-K were conducted in the 1970s and were of mediocre quality. Key rat tests used animals afflicted by disease; a mouse study was several months too brief and did not expose animals during gestation. Two rat studies suggested that the additive might cause cancer. It was for those reasons that in 1996 the Center for Science in the Public Interest urged the FDA to require better testing before permitting ace-K in soft drinks. In addition, large doses of acetoacetamide, a breakdown product of ace-K, have been shown to affect the thyroid in rats, rabbits, and dogs.

A small study of 20 lactating women, 14 of whom reported using artificial sweeteners generally, and nine of whom reported using acesulfame K, found that ace-K was the most commonly found artificial sweetener in breast milk. The breast milk of 13 of the women—including some who reported no intake of artificial sweeteners--contained acesulfame K. Pregnant and nursing women may want to make a special effort to avoid ace-K and other artificial sweeteners.

FDA should require manufacturers to conduct high-quality, modern-day studies of acesulfame potassium or withdraw its approval of it.

ACETIC ACID

Preservative, flavoring, or acidulant.

Acetic acid is the chemical that gives vinegar its sharp taste and odor.

✓ ADIPIC ACID

Acid, flavoring agent, antioxidant: soft drinks, fruit-flavored drinks, edible oils, gelatin desserts.

Adipic acid is sometimes used as the acid in bottled drinks and throat lozenges. Because it has little tendency to pick up moisture, adipic acid may be used to supply tartness, and it may account for the je ne sais quoi taste of highly manufactured powdered products, such as gelatin desserts and fruit flavored drinks. It is occasionally added to edible oils to prevent them from going rancid. Rats, and presumably humans, metabolize adipic acid without any difficulty.

✓ ADVANTAME

Artificial sweetener: "Diet," "no sugar added," "sugar-free," and other products.

Advantame is the newest and sweetest artificial sweetener. An incredible 20,000 times sweeter than sucrose, it was approved by the U.S. Food and Drug Administration in May 2014. It is permitted to be used in soft drinks, baked goods, chewing gum, confections and frostings, frozen desserts, gelatins and puddings, jams and jellies, processed fruits and fruit juices, toppings, and syrups. It is made from aspartame and vanillin, but appears to be processed by the body differently from aspartame.

Two key safety studies on advantame were flawed. Nevertheless, because the additive is so incredibly sweet, the amounts that will be added to foods are so minuscule that any possible cancer risk would be negligible. For example, in the cancer study in mice, the number of animals that survived to the end of the study was below FDA's own recommendations. An FDA statistician concluded that the low survival rate "probably masked the occurrence of late developing tumors." As for the cancer study in rats, some FDA scientists "strongly objected" to certain aspects because they "may have compromised and confounded the outcome of the results." [CSPI criticized](http://www.cspinet.org/new/pdf/advantame-comments.pdf) (<http://www.cspinet.org/new/pdf/advantame-comments.pdf>) the FDA's failure to abide by its own published standards and its dismissal of concerns raised by some of its own scientists.

✓ AIR

Snack foods, ice cream, breakfast cereals

Air is by far the cheapest food additive, and perfectly safe. Extruded snack foods such as Cheetos, breakfast cereals like Kix, and inexpensive ice creams are fluffed out with air. In the ice cream world, the amount of air whipped into the final product is called overrun. Ben & Jerry's and Häagen-Dazs vanilla ice creams weigh more than 100 grams per half cup (120 grams), so they contain roughly 20% air. Breyers vanilla ice cream weighs 67 grams per half cup, with about 45% of the volume being air. That's one reason why the premium ice creams are higher in calories—they contain more actual ice cream per serving—and why the cheaper (and lower-calorie) ice creams are, well, cheaper.

✓ ALGINATE, PROPYLENE GLYCOL ALGINATE

Thickening agents, foam stabilizer: Ice cream, cheese, candy, yogurt, beer.

Alginate, an apparently safe derivative of seaweed (kelp), maintains the desired texture in dairy products, canned frosting, and other factory-made foods. Propylene glycol alginate, a chemically-modified algin, thickens acidic foods (soda pop, salad dressing) and can stabilize the foam in beer.

ALOE VERA

Beverages, yogurt, desserts, flavoring.

Aloe vera, which comes from a succulent plant, is sold as a juice and is added to various other foods and supplements. It is also marketed in various skin care products, for example to treat wounds and burns. Companies make diverse health claims, but scientific evidence is scarce. The National Center for Complementary and Alternative Medicine of the National Institutes of Health concluded that Aloe vera "may" help heal burns and abrasions (when used topically), but there is not enough evidence to support other claims. Aloe vera taken orally can cause diarrhea and cramps and is recognized by FDA as a laxative. However, in 2002 FDA banned it from over-the-counter laxatives due to a lack of safety information.

Carefully conducted studies by the U.S. government concluded that there was "clear" evidence that aloe vera extracts caused intestinal cancers in male and female rats, but not mice. The form tested, called non-decolorized whole-leaf extract of aloe vera, contains more of the components that are suspected of being cancer-causing—aloin and other anthraquinones—than do some aloe vera products on the market. (The outer leaf pulp of aloe leaves, known as the latex, contains anthraquinones). However, it is not known for sure what components of Aloe vera are responsible for the tumors.

The National Center for Complementary and Alternative Medicine also notes several other possible concerns: (1) people with diabetes who use glucose-lowering medication should be cautious about taking Aloe vera by mouth since preliminary studies suggest it may lower blood glucose levels; (2) there have been a few case reports of acute hepatitis following oral Aloe vera use, but a cause-effect relationship has not been established; and (3) the diarrhea caused by the laxative effect of oral Aloe vera can decrease the absorption of many drugs.

Given the possible risks and unsubstantiated benefits, people should not consume Aloe vera. People who choose to consume it should at least look for products made with a charcoal filtration process to decolorize and remove anthraquinones, and monitored to ensure than aloin levels are low (e.g., 1 part per million or less). Some solid or semi-solid products have much higher levels of aloin. However, low levels of aloin do not guarantee safety, since it is not known for sure exactly which components of Aloe vera triggered cancers in rats.

ALPHA TOCOPHEROL (Vitamin E)

Antioxidant, nutrient: Vegetable oils, breakfast cereals, beverages.

Vitamin E is abundant in whole wheat, rice germ, and vegetable oils. It is destroyed by the refining and bleaching of flour. Vitamin E prevents oils from going rancid. Large amounts of vitamin E, such as from vitamin supplements, do not appear to provide any health benefit.

AMMONIUM COMPOUNDS

Bicarbonate, Carbonate, Chloride, Hydroxide, Phosphate, Sulfate: Decrease acidity, yeast food, leavening agents.

Ammonium compounds are sources of ammonia, which is used in the body to synthesize nitrogen-containing compounds and to adjust the acidity of bodily fluids, with an excess converted to urea and excreted in the urine. Ammonia is widely available in natural forms.

AMYLASE

✓ **Amylases are enzymes that convert starch to sugar.**

They occur naturally in plants, saliva, pancreatic juice, and microorganisms. Bakers add amylase to bread dough to supplement the small amount found naturally in wheat flour. The sugar that the amylases produce serves as food for the fermenting yeast and also makes for better-tasting, better-toasting bread. Amylases also improve the dough's consistency and the bread's keeping quality.

▲ **ANNATTO**

Natural coloring: butter, cheese, other foods.

Annatto is a widely used food coloring obtained from the seeds of a tropical shrub. Its hue is yellow to orange. Unfortunately, natural does not always mean perfectly safe. Annatto causes hives in some people. In fact, allergic reactions to annatto appear to be more common than reactions to commonly used synthetic food dyes.

ARTIFICIAL COLORINGS (<http://www.cspinet.org/fooddyes/>) (SYNTHETIC FOOD DYES) (<http://cspinet.org/fooddyes>)

Most artificially colored foods are colored with synthetic petroleum-based chemicals—called dyes—that do not occur in nature. Because food dyes are used almost solely in foods of low nutritional value (candy, soft drinks, gelatin desserts, etc.), a good rule of thumb is simply avoid all dyed foods. (You may also see the term “lake” on the label—avoid those too. That is the technical term for the water-insoluble form of a dye, often used in fatty foods and low-moisture foods.) In addition to problems mentioned below, synthetic food dyes cause hyperactivity in some sensitive children. You can report adverse reactions to food dyes to www.cspi.net/fooddyes.

Some foods are artificially colored with natural substances, such as beta-carotene or carmine. Just because they are natural does not mean that they are entirely safe. Carmine, for example, can cause severe allergic reactions. Please see their entries in the alphabetical listing.

The use of colorings, be they natural or synthetic, usually indicates that a natural ingredient is not used.

✗ **BLUE 1**

Artificial Coloring: Beverages, candy, baked goods.

One (unpublished) animal test suggested a small cancer risk, and a test-tube study indicated the dye might affect neurons. It also causes occasional allergic reactions. Blue 1 might be safe for people who are not allergic, but it should be better tested.

✗ **BLUE 2**

Artificial Coloring: Pet food, beverages, candy.

Animal studies found some—but not conclusive—evidence that Blue 2 causes brain cancer in male rats, but the Food and Drug Administration concluded that there is "reasonable certainty of no harm."

✗ **CITRUS RED 2**

Artificial Coloring: Skin of some Florida oranges only.

The amounts of this rarely used dye that one might consume, even from eating marmalade, are so small that the risk is not worth worrying about.

✗ **GREEN 3**

Artificial Coloring: Candy, beverages.

A 1981 industry-sponsored study gave hints of bladder and testes tumors in male rats, but FDA re-analyzed the data using other statistical tests and concluded that the dye was safe. Fortunately, this possibly carcinogenic dye is not widely used.

X ORANGE B**Artificial Coloring: Sausage.**

Approved for use only in sausage casings, high doses of this dye are harmful to the liver and bile duct. However, that is not worrisome because Orange B has not been used for many years.

X RED 3**Artificial Coloring: Candy, baked goods.**

The evidence that this dye caused thyroid tumors in rats is "convincing," according to a 1983 review committee report requested by FDA. FDA's recommendation that the dye be banned was overruled by pressure from the cherry industry and the U.S. Department of Agriculture. Red 3 used to color maraschino cherries, but it has been replaced there by the less controversial Red 40 dye. It is still used in a smattering of foods ranging from cake icing to fruit roll-ups to chewing gum.

X RED 40**Artificial Coloring: Soda pop, candy, gelatin desserts, pastries, pet food, sausage.**

The most widely used food dye. While this is one of the most-tested food dyes, the key mouse tests were flawed and inconclusive. An FDA review committee acknowledged problems, but said evidence of harm was not "consistent" or "substantial." Red 40 can cause allergy-like reactions. Like other dyes, Red 40 is used mainly in junk foods.

X YELLOW 5**Artificial Coloring: Gelatin dessert, candy, pet food, baked goods.**

The second-most-widely used coloring causes allergy-like hypersensitivity reactions, primarily in aspirin-sensitive persons, and triggers hyperactivity in some children. It may be contaminated with such cancer-causing substances as benzidine and 4-aminobiphenyl (or chemicals that the body converts to those substances).

X YELLOW 6**Artificial Coloring: Beverages, candy, baked goods.**

Industry-sponsored animal tests indicated that this dye, the third-most-widely-used, causes tumors of the adrenal gland and kidney. In addition, small amounts of several carcinogens, such as 4-aminobiphenyl and benzidine (or chemicals that the body converts to those substances), contaminate Yellow 6. However, the FDA reviewed those data and found reasons to conclude that Yellow 6 does not pose a significant cancer risk to humans. Yellow 6 may cause occasional, but sometimes-severe, hypersensitivity reactions.

A ARTIFICIAL AND NATURAL FLAVORING**Flavoring: soft drinks, candy, breakfast cereals, gelatin desserts, and many other foods.**

Hundreds of chemicals are used to mimic natural flavors; many may be used in a single flavoring, such as for cherry soda. Most flavoring chemicals also occur in nature and are probably safe, but FDA does not review their safety, and a few have been shown to cause cancer in animals and should not be permitted. In 2018 (<https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm>), after CSPI and other organizations petitioned (<https://cspinet.org/sites/default/files/attachment/food-additive-petition-2015.pdf>) FDA, the Agency banned (<https://cspinet.org/eating-healthy/chemical-cuisine#banned>) seven synthetic carcinogenic flavors, based primarily on evidence

from government-sponsored studies in animals. Flavors are used almost exclusively in junk foods. Their use indicates that the real thing (often fruit) has been left out. Companies keep the identity of artificial (and natural) flavorings a deep secret and are not required to list them on food labels. That secrecy is unfortunate, because some people may be allergic or sensitive to certain flavoring ingredients, such as sesame, or MSG or HVP, and vegetarians and others may not want to consume flavors that are derived from animals.

ARTIFICIAL SWEETENERS and other SUGAR-FREE SWEETENERS

See also: [Acesulfame potassium](#), [Aspartame](#), [Brazzein](#), [Cyclamate](#), [Monatin](#), [Monk Fruit Extract](#), [Neotame](#), [Saccharin](#), [Stevia Leaf Extract \(Rebiana\)](#), [Sucralose](#), [Sugar Alcohols \(Erythritol, Hydrogenated Starch Hydrolysate, Isomalt, Lactitol, Maltitol, Mannitol, Sorbitol, Xylitol\)](#), [Thaumatococcus](#) ([file:///C:/Users/arianas/Documents/CSPI Dev Server/reports/Thaumatococcus](file:///C:/Users/arianas/Documents/CSPI%20Dev%20Server/reports/Thaumatococcus))

Artificial sweeteners and other sugar substitutes are used in a wide range of foods to provide sweetness without or with fewer calories. The question is: are they safe? Controversies have swirled around most of the artificial sweeteners. Acesulfame potassium, aspartame, saccharin, and sucralose may pose a slight risk of cancer. The artificial sweetener neotame and the natural "high-potency" sweeteners rebiana and thaumatococcus appear to be safe. But research on all of them is relatively limited. For instance, a 2010 study found that artificially sweetened drinks probably caused preterm deliveries; the researchers suspected that aspartame was the culprit. Synthetic high-potency sweeteners were the rule until about 2009 when rebiana, which is purified out of stevia leaves, became marketed widely in the United States. Rebiana, which has "taste challenges," allowed companies to claim "all natural" on their artificially sweetened (with a "natural ingredient," that is) products.

Sugar alcohols are sugar-free (and alcohol-free) sweeteners. Some occur in plants, but are typically manufactured. Most have about half as many calories as sugar, though erythritol has one-twentieth as many. They appear to be safe, except that large amounts of most of them may have a laxative effect (erythritol does not cause diarrhea, but may cause nausea).

Companies advertise their artificially sweetened foods as being almost magical weight-loss potions. The fact is, though, that losing weight is difficult, and people need to make a real concerted effort to eat fewer calories and exercise more. Artificial sweeteners and other sugar substitutes can make the struggle a little more pleasant.

ASCORBIC ACID (Vitamin C)

Antioxidant, nutrient, color stabilizer: Cereals, fruit drinks, cured meats.

Ascorbic acid—or vitamin C—helps maintain the red color of cured meat and prevents the formation of nitrosamines, which promote cancer (see [SODIUM NITRITE](#)). Vitamin C is also used to pump up the vitamin content of foods like "fruit" drinks and breakfast cereals. It also helps prevent loss of color and flavor in foods by reacting with unwanted oxygen. Though heroic amounts of ascorbic acid were recommended by Dr. Linus Pauling as a cure for common cold, subsequent research found only that it might slightly reduce the severity of colds.

Sodium ascorbate, also safe, is a more soluble form of ascorbic acid.

See also [ERYTHORBIC ACID](#) (or [SODIUM ERYTHORBATE](#)).

ASCORBYL PALMITATE

Antioxidant, nutrient.

Ascorbyl palmitate is a fat-soluble antioxidant formed by combining ascorbic acid (vitamin C) with palmitic acid (derived from fat). Studies indicate that ascorbyl palmitate is completely metabolized, the ascorbic acid becoming available as vitamin C, and the palmitate portion is converted to energy or fat. Though palmitate from palm and other vegetable oils can increase blood cholesterol levels, the amount derived from this additive is trivial.

X ASPARTAME (/new/200706251.html)

Artificial sweetener: "Diet," "no sugar added," "sugar-free," and other products, including soft drinks, drink mixes, gelatin desserts, frozen desserts, jams and fruit spreads, yogurt, breakfast cereal, candy, chewing gum, condiments, packaged (tabletop) sweeteners.

Aspartame (sometimes marketed under the brand names Equal, NutraSweet, or AminoSweet) is a chemical combination of two amino acids and methanol. Questions of cancer and neurological problems, such as dizziness or hallucinations, have swirled around aspartame for decades. A key 1970s industry-sponsored study initially sparked concerns that aspartame caused brain tumors in rats, but the FDA convinced an independent review panel to reverse its conclusion that aspartame was unsafe. The agency then approved its use in 1981 for use as a tabletop (packaged) sweetener and in breakfast cereals, powdered beverage mixes, and other dry packaged foods. Two years later FDA approved aspartame for use in soft drinks, by far the biggest and most lucrative market. Aspartame dominates the diet soft drink market, and the overall market for artificial sweetener, although its use is declining.

The California Environmental Protection Agency and others have urged that independent scientists conduct new animal studies to resolve the cancer question. In 2005, researchers at the Ramazzini Foundation in Bologna, Italy, conducted the first such study (<http://www.cspinet.org/reports/aspartame-Soffritti-EHP-2006.pdf#aspartame>). The study found that rats exposed to aspartame starting at eight weeks of age and continuing through their entire lifetimes developed lymphomas, leukemias, and other tumors, including kidney tumors, which are extremely rare in the strain of rat used. In 2007, the same researchers published a follow-up study that exposed rats to aspartame beginning in the womb and continuing through their entire lifetimes (<http://www.cspinet.org/reports/aspartame-Soffritti-second-rat-2007.pdf#aspartame>). That study, too, found that aspartame caused leukemias/lymphomas, as well as mammary (breast) cancer. Then in 2010, they published a study that exposed mice to aspartame (<http://www.ncbi.nlm.nih.gov/pubmed/20886530>), starting in the womb and continuing throughout their entire lifetimes. That third study found that aspartame caused liver and lung cancer in male mice.

Those new studies may have found problems that earlier company-sponsored studies did not because the newer studies used far more animals and thus were more capable of detecting adverse effects. Also, the Italian researchers monitored the animals for their entire lifetimes: as long as three years for the rats and two and one-half years for the mice, instead of just two years in the company-sponsored studies (Most chemicals are tested for just two years.) Two-year-old rats are roughly equivalent to 65-year-old people. The many tumors that occurred after two years would never have been seen in industry's studies. Furthermore, two of the new studies included exposure before birth, which increased their ability to detect cancer (only one of the industry studies did).

The food industry, FDA, and the European Food Safety Authority (<http://www.efsa.europa.eu/en/faqs/faqaspartame.htm>) contest the Italian findings, pointing to what they consider serious flaws in the design and conduct of the study and evaluation of the results. However, scientists at the Center for Science in the Public Interest and elsewhere

<http://www.efsa.europa.eu/sites/default/files/event/documentset/130409-p06.pdf>), citing evaluations sponsored by the U.S. National Toxicology Program and the Environmental Protection Agency, found industry's and EFSA's allegations to have little merit.

As one defense of aspartame, industry and FDA point to a 2006 human study by U.S. National Cancer Institute researchers. That study involved a large number of adults 50 to 71 years of age over a five-year period. The study did not find any evidence that aspartame posed a risk. However, the NCI study had three major limitations: It did not involve truly elderly people (the Italian studies monitored rodents until they died a natural death), the subjects had not consumed very much aspartame or for very long, and it was not a well-controlled study (the subjects provided only a rough estimate of their aspartame consumption, and people who consumed aspartame might have had other dietary or lifestyle differences that obscured the chemical's effects).

Meanwhile, the most careful long-term study of aspartame in humans (http://www.cspinet.org/new/pdf/aspartame_Schernhammer_2012.pdf), conducted by researchers at the Harvard School of Public Health, found the first human evidence that aspartame poses a slightly increased cancer risk to men, but not women. The researchers speculated that that might be due to the fact that men have higher levels of an enzyme that converts methanol (a breakdown product of aspartame) to formaldehyde, a human carcinogen. The Harvard study couldn't prove that aspartame was a carcinogen, but it certainly added to the safety concerns, especially since the cancers observed in the human study (multiple myeloma and non-Hodgkin's lymphoma) were similar to the cancers observed in two of the three animal studies (leukemias and lymphomas). Another study (<http://jn.nutrition.org/content/early/2014/10/22/jn.114.197475>) by researchers with the American Cancer Society, not quite as large as the Harvard study, did not find any link.

A recent review of all of the evidence by the scientists who conducted the three positive animal studies urges governments to re-examine their positions on aspartame, and recommends that pregnant women and children not consume aspartame.
(<https://cspinet.org/sites/default/files/attachment/aspartame%20Soffritti%20analysis%201-14%20clean%20copy.pdf>)

The bottom line is that three independent studies have found that consumption of aspartame causes cancer in rodents, and one epidemiology study found evidence that aspartame increases the risk of cancer in men. That should be reason enough for the FDA and other governments to eliminate aspartame from the food supply. Meanwhile, consumers should read labels carefully and avoid this artificial sweetener).

Another concern about aspartame emerged in 2010, when Danish researchers linked the consumption of artificially sweetened soft drinks, but not sugar-sweetened soft drinks, to preterm delivery of babies. In 2012 another study, this time conducted in Norway, corroborated that finding. However, it also found a link between sugar-sweetened beverages and preterm delivery. Though the studies couldn't distinguish between the various artificial sweeteners, aspartame and acesulfame potassium (<http://cspinet.org/reports/chemcuisine.htm#acesulfamek>) were the most widely used ones in those countries. The fact that two large, independent studies found a link between artificially sweetened beverages and preterm delivery is troubling. Pregnant women should make a special effort to avoid or at least cut back on aspartame and acesulfame K, as well as moderating their consumption of added sugars.

Since aspartame was first used, some people have contended that it causes headaches or dizziness. Some small studies have documented that finding, while others did not. Anyone experiencing such problems should simply avoid aspartame.

AUTOLYZED YEAST EXTRACT

Flavoring: ready made meals, snack foods, meat products, gravies and sauces, soups, broths, and soup mixes.

Autolyzed yeast extract is a flavoring agent made from yeast, usually the same kind used to make bread rise or ferment beer. Generally, the yeast is heated or otherwise killed in a way that allows enzymes inside the cells break down the yeast, including the proteins. (Other types of yeast extracts are made by adding enzymes, rather than using the enzymes already present inside the yeast cell.)

Some people who have allergic reactions to inhaling molds also react to ingesting yeast or yeast extracts.

All proteins are made up of amino acids, and one amino acid of interest—glutamic acid—is present in autolyzed yeast extract, as well as in many other foods and in our bodies. Glutamate is a form of glutamic acid and is responsible for “umami,” the savory taste associated with foods like meat and mushrooms. The sodium salt of glutamate is called sodium glutamate, better known as MONOSODIUM GLUTAMATE or MSG. A small number of people experience headache, numbness, flushing, tingling, or other short-term symptoms when consuming large amounts of MSG. Autolyzed yeast extract is sometimes used to substitute for MSG, but has much lower levels of glutamate so adverse reactions are unlikely.

Foods such as Parmesan cheese, seaweed, dried shitake mushrooms, and dried tomatoes naturally contain relatively high levels of glutamate, and so could also potentially be a problem for individuals sensitive to MSG, although that does not seem to be the case. FDA does not allow foods that contain autolyzed yeast extract (or yeast extract, hydrolyzed yeast, soy extracts, hydrolyzed vegetable protein, or protein isolate) to say “No MSG” or “No added MSG” on their packaging. Although autolyzed yeast extract affects the flavor of foods, FDA requires that it be identified on the label; it cannot be hidden under the term “natural or artificial flavoring.”

See also MONOSODIUM GLUTAMATE (MSG)

X AZODICARBONAMIDE (<https://www.cspinet.org/new/201402041.html>)**Flour improver and bleaching agent: Flour, bread and rolls.**

Azodicarbonamide (ADC) has long been used by commercial bakers to strengthen dough, but has been poorly tested. A 1999 review published by several United Nations agencies concluded that “There are no adequate data relating to carcinogenic, reproductive, or developmental effects, hence it is not possible to evaluate the risk to human health for these endpoints.”

Most of the concern about ADC relates to two suspicious chemicals that form when bread is baked. The first chemical is semicarbazide (SEM), which caused cancers of the lung and blood vessels in mice. It did not cause cancer in rats. In 1976 the International Agency for Research on Cancer considered SEM to be a carcinogen in mice, but in 1987 concluded that the animal data were “limited” and that SEM was “not classifiable” as to its carcinogenicity to humans.

A second breakdown product, urethane, is a recognized carcinogen. ADC used at its maximum allowable level (45 ppm in bread) leads to levels of urethane in bread that pose a small risk to humans. Toasting that bread increases the amount of urethane. However, when used at 20 ppm, which may be the amount used by some commercial bakeries, a 1997 FDA study found “only a slight increase” in urethane. (Some urethane forms in bread not made with azodicarbonamide.)

Considering that many breads don’t contain azodicarbonamide and that its use slightly increases exposure to a carcinogen, this is hardly a chemical that we need in our food supply. It appears that the Delaney amendment, which bars the use of additives that cause cancer in humans or animals, would require FDA to bar its use. At the very least, FDA should reduce the amount allowed to be used.

B** BENZOIC ACID**

See [SODIUM BENZOATE](#)

 BETA-CAROTENE

Coloring, nutrient: Margarine, shortening, non-dairy whiteners, beverages, breakfast cereals, supplements.

Beta-carotene is used as an artificial coloring and a nutrient supplement. The body converts it to Vitamin A, which is part of the light-detection mechanism of the eye and which helps maintain the normal condition of mucous membranes. Large amounts of beta-carotene in the form of dietary supplements increased the risk of lung cancer in smokers and did not reduce the risk in non-smokers. Smokers should certainly not take beta-carotene supplements, but the small amounts used as food additives are safe.

 BRAZZEIN

Natural high-potency sweetener

Brazzein has not yet been approved as a food additive, but some food manufacturers see it as a better-tasting alternative to stevia-derived rebiana. Brazzein is a small (54 amino acids) protein molecule that occurs naturally in the berries of a climbing vine found in West Africa, where it has been consumed by people and animals. It is about 1,000 times sweeter than sugar, but, as far as we can determine, it has not been tested for safety. Because it is a protein, it might cause food allergies. One company is planning to market the sweetener under the name Cweet.

 BROMINATED VEGETABLE OIL (BVO)

Emulsifier, clouding agent: soft drinks.

BVO keeps flavor oils in suspension, giving a cloudy appearance to citrus-flavored soft drinks such as Mountain Dew and Fanta Orange. After some public pressure, PepsiCo agreed in 2013 to remove BVO from Gatorade, then in 2014 Coca-Cola and PepsiCo announced they would remove BVO from all their beverages, but as of mid-2016, BVO is still in at least one PepsiCo product, Mountain Dew.

Safety questions have been hanging over BVO since 1970, when the FDA removed BVO from its “Generally Recognized as Safe” list. In 1970, FDA permitted its use only on an “interim” basis pending additional study—one of only four such interim-allowed additives. Decades later, BVO is still poorly tested and remains on the interim list. Health concerns start with the finding that eating BVO leaves residues in body fat and the fat in brain, liver, and other organs. Animal studies indicate that BVO is transferred from mother’s milk to the nursing infant and also can cause heart lesions, fatty changes in the liver, and impaired growth and behavioral development. Those studies suggest that BVO might be harmful to people who drink large amounts of soft drinks that contain BVO. Indeed, doctors have

identified bromine toxicity in two people who drank extremely large amounts of such sodas. Sensitive, modern studies are urgently needed to better understand the risk, especially at the lower levels typically consumed by large numbers of children. Meanwhile, BVO should not be used (it is not permitted in Europe).

BUTYLATED HYDROXYANISOLE (BHA)

Antioxidant: Cereals, chewing gum, potato chips, vegetable oil.

BHA retards rancidity in fats, oils, and oil-containing foods. While some studies indicate it is safe, other studies demonstrate that it causes cancer in rats, mice, and hamsters. Those cancers are controversial because they occur in the forestomach, an organ that humans do not have. However, a chemical that causes cancer in at least one organ in three different species indicates that it might be carcinogenic in humans. That is why the U.S. Department of Health and Human Services considers BHA to be "reasonably anticipated to be a human carcinogen." Nevertheless, the Food and Drug Administration still permits BHA to be used in foods. This synthetic chemical can be replaced by safer chemicals (e.g., vitamin E), safer processes (e.g., packing foods under nitrogen instead of air), or can simply be left out (many brands of oily foods, such as potato chips, don't use any antioxidant).

BUTYLATED HYDROXYTOLUENE (BHT)

Antioxidant: Cereals, chewing gum, potato chips, oils, etc.

BHT retards rancidity in oils. It either increased or decreased the risk of cancer in various animal studies. Residues of BHT occur in human fat. BHT is unnecessary or is easily replaced by safe substitutes (see discussion of BHA). Avoid it when possible.

C

CAFFEINE

Stimulant: Naturally occurring in coffee, tea, cocoa, coffee-flavored yogurt and frozen desserts. Additive in soft drinks, energy drinks, chewing gum, and waters.

Caffeine is one of only two drugs that are present naturally or added to widely consumed foods (quinine is the other drug used in foods). It is mildly addictive, one possible reason that makers of soft drinks add it to their products. Many coffee drinkers experience withdrawal symptoms, such as headaches, irritability, sleepiness, and lethargy, when they stop drinking coffee.

Because caffeine appears to increase the risk of adverse pregnancy outcomes, including miscarriages, preterm delivery, stillbirth, and childhood leukemia (and possibly birth defects) and inhibits fetal growth, women who are pregnant or may become pregnant should avoid caffeine. Caffeine also may make it harder to get pregnant. The less those women consume, the lower the risk.

Caffeine also keeps many people from sleeping, causes jitteriness, and affects calcium metabolism. However, on the positive side, drinking a couple of mugs cups per day of regular (but not decaf) coffee appears to reduce the risk of Parkinson's disease, Alzheimer's disease, gallstones, and even suicide. It also can relieve headache pain, increase endurance, such as on a treadmill, and improve alertness.

The [caffeine](http://www.cspinet.org/reports/caffeine.pdf) (<http://www.cspinet.org/reports/caffeine.pdf>) in a standard cup or two of coffee is harmless to most people. But be aware that a middle-size (16 oz.) cup of regular coffee at popular coffeehouses contains 300 or more milligrams of caffeine. That is equivalent to three old-fashioned 5-ounce-cups' worth of caffeine. A 12-oz. can of Coca-Cola or most other caffeinated soft drinks contains about 35 to 40 milligrams; energy drinks typically contain much more. [Click here](http://www.cspinet.org/new/cafchart.htm#table_energy_drinks) (http://www.cspinet.org/new/cafchart.htm#table_energy_drinks) for a list of the caffeine content of beverages and foods. If you drink more than a couple of cups of coffee or several cans of caffeine-containing soda per day and experience insomnia or jitters, are at risk of osteoporosis, or are pregnant, you should rethink your habit.

✓ **CALCIUM (or SODIUM) PROPIONATE**

Preservative: Bread, rolls, pies, cakes.

Calcium propionate prevents mold growth on bread and rolls. The calcium is a beneficial mineral; the propionate is safe. Sodium propionate is used in pies and cakes, because calcium alters the action of chemical leavening agents.

✓ **CALCIUM (or SODIUM) STEAROYL LACTYLATE, CALCIUM (or SODIUM) STEAROYL FUMARATE**

Dough conditioner, whipping agent: Bread dough, cake fillings, artificial whipped cream, processed egg whites.

These additives strengthen bread dough so it can be used in commercial bread-making machinery and help produce a more uniform grain and greater volume. They act as whipping agents in dried, liquid, or frozen egg whites and artificial whipped cream.

✗ **CARAMEL COLORING (<http://www.cspinet.org/new/201102161.html>)**

Coloring: Colas, baked goods, pre-cooked meats, soy and Worcestershire sauces, chocolate-flavored products, beer.

Caramel coloring is made by heating a sugar compound (usually high-dextrose corn syrup), often together with ammonium compounds, acids, or alkalis. It is the most widely used (by weight) coloring added to foods and beverages, with hues ranging from tannish-yellow to black, depending on the concentration and the food. Caramel coloring may be used to simulate the appearance of cocoa in baked goods, make meats and gravies look more attractive, and darken soft drinks and beer.

Caramel coloring, when produced with ammonia, contains contaminants, [2-methylimidazole](http://cspinet.org/new/pdf/2-methylimidazole.pdf) (<http://cspinet.org/new/pdf/2-methylimidazole.pdf>) and [4-methylimidazole](http://cspinet.org/new/pdf/4-methylimidazole.pdf) (<http://cspinet.org/new/pdf/4-methylimidazole.pdf>). In 2007, [studies by the U.S. National Toxicology Program](http://cspinet.org/new/pdf/2007-caramel-coloring.pdf) (<http://cspinet.org/new/pdf/2007-caramel-coloring.pdf>) found that those two contaminants cause cancer in male and female mice and possibly in female rats. In 2011, the International Agency for Research on Cancer, a division of the World Health Organization, concluded that 2- and 4-methylimidazole are "possibly carcinogenic to humans." Then, the State of California's Environmental Protection Agency listed ammonia-caramel coloring as a carcinogen under the state's Proposition 65. The state lists chemicals when they pose a lifetime risk of at least 1 cancer per 100,000 people. California warned that as of January 7, 2012, widely consumed products, such as soft drinks, that contained more than 29 micrograms of 4-methylimidazole per serving would have to bear a warning notice. In March 2012, when CSPI published the results of a study that found levels up to 150 micrograms per can of Coca-Cola and Pepsi-Cola purchased in Washington, DC, the soft-drink giants announced that they had reduced the contaminant to below California's threshold for action in products distributed in California. They said they would market the less-contaminated products throughout the country, which Coca-Cola did in 2013 and PepsiCo did by 2015.

The FDA has a limit that is 10 times as strict as California's for regulating chemicals that are contaminated with cancer-causing chemicals. CSPI's analysis of a Coca-Cola purchased in 2012 in California found just 4 micrograms of 4-MI per 12 ounces. Even that much lower level might exceed the FDA's threshold for action of 1 cancer per million consumers.

It would be worth avoiding or drinking less colas and other ammonia-caramel-colored beverages not only because of risk from the 4-methylimidazole, but, of course, because the products contain about 10 teaspoons of sugar per 12 ounces and promote obesity and tooth decay. Soy sauces, baked goods, and other foods that contain ammoniated caramel coloring are much less of a problem, because the amounts consumed are small.

CARBOXYMETHYL CELLULOSE (CMC, CELLULOSE GUM), SODIUM CARBOXYMETHYL CELLULOSE

Improve texture, stabilize foam (beer), prevent fruit from settling, prevent sugar from crystallizing (cake icings), bind water: Ice cream, beer, pie fillings and jellies, cake icings, diet foods.

Carboxymethylcellulose (CMC) is a thickening agent that is made by reacting CELLULOSE (wood pulp, cotton lint) with a derivative of acetic acid (the acid in vinegar). It is also called cellulose gum.

CMC has long been considered safe, but a 2015 study funded by the National Institutes of Health raised some doubts. It found that both CMC and another emulsifier (polysorbate 80) affected gut bacteria and triggered inflammatory bowel disease symptoms and other changes in the gut, as well as obesity and a set of obesity-related disease risk factors known as metabolic syndrome. In mice that were predisposed to colitis, the emulsifiers promoted the disease. It is possible that polysorbates, CMC, and other emulsifiers act like detergents to disrupt the mucous layer that lines the gut, and that the results of the study may apply to other emulsifiers as well. Research is needed to determine long-term effects of these and other emulsifiers at levels that people consume.

CMC is not absorbed or digested, so the FDA allows it to be included with "dietary fiber" on food labels. CMC isn't as healthful as fiber that comes from natural foods.

CARBON DIOXIDE (CARBONATED WATER)

Carbon dioxide, a harmless gas, is responsible for the bubbles in beer, soda pop, mineral water, and the like.

CARMINE; COCHINEAL EXTRACT (/new/200901055.html)

Artificial coloring.

Cochineal extract is a coloring obtained from the cochineal insect, which lives on cactus plants in Peru, the Canary Islands, and elsewhere. Carmine is a more purified coloring made from cochineal, but in both cases, carminic acid actually provides the color. These colorings, which are extremely stable, are used in some red, pink or purple candy, yogurt, ice cream, beverages, and other foods, as well as in drugs and cosmetics. They appear to be safe, except that a small percentage of consumers suffer allergic reactions ranging from hives to life-threatening anaphylactic shock. Carmine and cochineal have long been listed on labels simply as "artificial coloring" or "color added." In 2009, in response to a petition (/new/pdf/carmine_letter.pdf) by the [Center for Science in the Public Interest](#) (<http://cspinet.org/new/200605011.html>), the U.S. Food and Drug Administration gave the food industry until January 1, 2011, to clearly

identify the colorings as carmine or cochineal extract on food labels to help consumers identify the cause of their allergic reaction and avoid the colorings in the future. Unfortunately, sensitive individuals must endure any number of allergic reactions before identifying the cause. The FDA rejected CSPI's request for labels to disclose that carmine is extracted from insects so vegetarians and others who want to avoid animal products could do so.

CARRAGEENAN

Thickening, gelling, and stabilizing agent: Dairy and non-dairy products, including ice cream, sorbet, frozen desserts, chocolate milk, soy milk, almond milk, yogurt, cottage cheese, whipping cream; jelly, infant formula, salad dressings, deli meat, frozen dinners.

Carrageenan is a family of indigestible large molecules obtained from certain seaweeds. It is used as a thickening or texturing agent in a wide variety of foods and beverages.

Large amounts of carrageenan have harmed test animals' colons. The amounts in food are too small to be a concern for most people, but an independent committee of the World Health Organization (WHO) concluded that it is unclear whether people with episodes of gastrointestinal disease might absorb some carrageenan, which presumably could cause gastrointestinal or immune system problems. Some people have reported that eliminating carrageenan from their diet diminished or eliminated their gastrointestinal discomfort.

Carrageenan—at least in its natural, undegraded form—does not cause cancer in animals. In animal studies, high doses of carrageenan increase the potency of chemicals that cause cancer, and there has been controversy over whether it could do so at the low levels that people consume. The FDA and the WHO committee have concluded that food-grade carrageenan does not pose either a direct or an indirect cancer risk.

Food-grade carrageenan contains small amounts of “degraded” carrageenan, and a bit more probably forms in the acidic conditions of the stomach. The International Agency for Research on Cancer, another unit of the WHO, considers degraded carrageenan to be “possibly carcinogenic in humans.” While any possible cancer risk would be quite small, some people may wish to err on the side of caution and avoid carrageenan.

Some experts have been concerned about the safety of carrageenan for infants, given that the GI tract of the infant is still developing. In 2014, however, the WHO committee reviewed new animal studies and concluded that infant formula made with carrageenan is safe.

CASEIN, SODIUM CASEINATE

Thickening and whitening agent: Ice cream, ice milk, sherbet, coffee creamers.

Casein, the principal protein in milk, is a nutritious protein containing adequate amounts of all the essential amino acids. People who are allergic to casein should read food labels carefully, because the additive is used in some “non-dairy” and “vegetarian” foods.

CASTOREUM

Natural flavoring: vanilla-flavored and other foods

This substance is occasionally used as a natural flavoring. Only about 1,000 pounds of the product are used annually, so it really isn't a significant part of the food supply, nor should it pose any risk. The FDA considers it to be "generally recognized as safe." But because it is extracted from the anal castor sacs of beavers, it has been publicly lampooned in recent years.

Beavers mix castoreum with urine to mark their territories and make their fur and tail more water-resistant. The food industry finds it strong, tar-like, musky odor to be useful in flavorings. Of course, you'll never see "castoreum from anal sacs of beavers" on food labels; instead, it is just included in the broad term "natural flavorings."

CELLULOSE

Prevents caking and clumping, binds water (used in diet foods), improves texture, thickens, emulsifies, used as a filler: Grated cheese, breads, diet foods, frozen dinners, sauces, salad dressings.

Cellulose is a safe and inexpensive carbohydrate that comprises the woody parts and cell walls of plants. It is a type of dietary fiber found naturally in fruits, vegetables, and cereals. The cellulose added to processed foods usually comes from wood pulp (saw dust) or cotton lint. It can prevent caking, such as in grated parmesan cheese, but some companies fraudulently use it as a cheap filler in their "100%" grated parmesan cheese. It is also a cheap way to boost the fiber content on food labels, but it isn't as healthful as fiber that comes from natural foods.

CITRIC ACID, SODIUM CITRATE

Acid, flavoring, chelating agent: Ice cream, sherbet, fruit drink, candy, carbonated beverages, instant potatoes.

Citric acid is versatile, widely used, cheap, and safe. It is an important metabolite in virtually all living organisms and is especially abundant naturally in citrus fruits and berries. It is used as a strong acid, a tart flavoring, and an antioxidant. Sodium citrate, also safe, is a buffer that controls the acidity of gelatin desserts, jam, ice cream, candy, and other foods.

COCHINEAL EXTRACT

See [CARMINE](#)

CORN SYRUP

Sweetener, thickener: Candy, marshmallows, syrups, snack foods, imitation dairy foods.

Corn syrup, which consists mostly of dextrose, is a sweet, thick liquid made by treating cornstarch with acids or enzymes. It may be dried and used as corn syrup solids in coffee whiteners and other dry products. Corn syrup contains no nutritional value other than calories, promotes tooth decay, and is used mainly in foods with little intrinsic nutritional value.

CYCLAMATE

Artificial sweetener: Banned in the United States. Allowed as a packaged (tabletop) sweetener in Canada, and also in diet soft drinks and foods in some other countries.

This controversial high-potency sweetener was used in the United States in diet foods until 1970, at which time it was banned because animal studies suggested that it caused cancer. (It is still permitted in Canada, Europe, and some other countries.) Now, based on animal studies, cyclamate (or a byproduct) is believed not to cause cancer directly, but to increase the potency of other carcinogens and to harm the testes.

CYSTEINE

Antioxidant: flour.

Cysteine, an amino acid, is a natural constituent of protein-containing foods. It is added to foods to prevent oxygen from destroying vitamin C. Bakers use cysteine to reduce the mixing time for dough.

D

DATEM (Diacetyl tartaric acid ester of monoglycerides)

Emulsifier: Bread, biscuits.

This safe emulsifier is used to build a strong gluten network to improve bread volume and keep dough from getting sticky or collapsing.

DEXTRIN

Emulsifier: Prevents sugar from crystallizing, encapsulates flavor oils, thickening agent: Candy, powdered mixes.

Dextrin is the mixture of fragments that results from treating starch with acid, alkali, or enzymes. It is as safe as starch.

DEXTROSE (Glucose, Corn sugar)

Sweetener: Bread, caramel, soda pop, cookies, many other foods.

Dextrose is an important chemical in every living organism. A sugar, it is a source of sweetness in fruits and honey. Added to foods as a sweetener, it represents empty calories and contributes to tooth decay. Dextrose turns brown when heated and contributes to the color of bread crust and toast. Dextrose contributes a modest 2% of the 76 pounds of refined sugars that the average American consumes annually.

DIACETYL

Butter flavoring.

Diacetyl is one of the many chemicals that give butter its characteristic flavor. Low levels are present in butter (including unsalted butter, to which extra diacetyl is added to prolong its shelf life). Much higher levels have been used in butter-flavored popcorn, margarine, and

butter-flavored cooking oils and sprays. The low levels are safe, but workers in factories that produce microwave popcorn learned the hard way that long-term exposure to diacetyl causes obstructive lung disease, which is potentially fatal. Widespread publicity around 2005 to 2007 and several lawsuits persuaded most major American food manufacturers to protect their workers (and restaurant cooks) by switching to supposedly safer ingredients. But more recent studies indicate that one substitute, 2,3-pentanedione, chemically similar to diacetyl (also called 2,3-butanedione), may be just as damaging to the respiratory tract.

✓ DIACYLGLYCEROL

Cooking oil.

This is the diglyceride part of the long-used emulsifier, mono- and diglycerides. The manufacturer claims that it can help people lose weight and reduce triglyceride levels. Don't count on this little-used ingredient providing any real benefit.

E

✓ EDTA

Chelating agent: Salad dressing, margarine, sandwich spreads, mayonnaise, processed fruits and vegetables, canned shellfish, soft drinks.

Modern food-manufacturing technology, which involves rollers, blenders, and containers made of metal, results in trace amounts of metal contamination in food. EDTA (ethylenediamine tetraacetic acid) traps metal impurities, which would otherwise promote rancidity and the breakdown of artificial colors. It is safe.

✓ ERYTHORBIC ACID, SODIUM ERYTHORBATE

Antioxidant, color stabilizer: Cured meats.

See [ASCORBIC ACID](#)

✓ ERYTHRITOL

Low calorie sugar-free sweetener: Drinks, hard candy, chocolate milk, frozen desserts, baked goods, packaged sweeteners (sometimes mixed with stevia leaf extract, monk fruit extract, or other sweeteners).

This sugar alcohol, which was first used commercially in the United States in about 2001, is about 60 to 70 percent as sweet as sugar, but provides at most only one-twentieth as many calories. Small amounts occur naturally in such fruits as pears, melons, and grapes, but virtually all of the erythritol used as a food additive is produced by fermenting glucose with various yeasts. Many companies mix it with high-potency sweeteners, such as stevia leaf extract or monk fruit extract, to keep the calories down while masking those other

sweeteners' unpleasant aftertastes. Companies also value erythritol because it provides the bulk that sugar has and which high-potency sweeteners lack, plus it adds to the "mouthfeel" of low-sugar beverages. Because it is not digested by bacteria, it does not promote tooth decay.

Other than occasional allergic reactions, the only safety concern about erythritol is that eating too much of it could cause nausea. Individual sensitivities vary greatly, but most adults can safely consume up to about 50 grams of erythritol per day. (For comparison, there are 12 grams in Blue Sky Zero Cola, 4 grams of erythritol in a 12-ounce can of Zevia soda, and 3 grams of erythritol in a packet of Truvia.) That's safer than most other sugar alcohols, such as sorbitol, mannitol, and lactitol. Erythritol's relative safety is due to its being mostly absorbed into the bloodstream and excreted unchanged in urine. Other sugar alcohols stir up trouble in the colon where they attract water (leading to laxation or diarrhea) or are digested by bacteria (causing gas).

F

FERROUS GLUCONATE

Coloring, nutrient: Black olives.

Used by the olive industry to generate a uniform jet-black color and in pills as a source of iron.

FOOD-STARCH, MODIFIED

See [STARCH, MODIFIED](#)

FRUCTOSE

Sweetener: "Health" drinks and other products.

Fructose (also called levulose) is a sugar that is a little sweeter than table sugar. Modest amounts of fructose occur naturally in fruits and vegetables, which also contain other sugars. When table sugar is digested, it breaks down into equal amounts of fructose and glucose (dextrose). Another major source of fructose in the typical diet is high-fructose corn syrup (HFCS), which typically contains about half fructose and half glucose. Fructose itself is used as a sweetener in a small number of foods whose labels often imply, deceptively, that such foods are healthier than competing products that are sweetened with sugar or HFCS.

The fructose that occurs in fruits and vegetables is certainly safe. However, the large amounts that come from added fructose, sucrose (ordinary table sugar), and high-fructose corn syrup increase triglyceride (fat) and small, dense LDL ("bad") cholesterol levels in blood and may thereby increase the risk of heart disease. Also, recent studies show that consuming 25 percent of one's calories from fructose or high-fructose corn syrup (which is about half fructose) leads to more visceral (deep belly) fat or liver fat. Those changes may increase the risk of diabetes and heart disease. Finally, large amounts consumed on a regular basis also may affect levels of such hormones as leptin and ghrelin, which help regulate appetite, thereby contributing to weight gain and obesity.

The Dietary Guidelines for Americans (America's basic nutrition policy), American Heart Association, and other health authorities recommend that people consume no more than about 3 to 8 percent of calories in the form of refined sugars. That's far less than the current average of 14 percent of calories. The bottom line: the less added sugars—fructose, dextrose, sucrose, or HFCS—one consumes the better (though, again, small amounts are safe).

FUMARIC ACID

Tartness agent: Powdered drinks, pudding, pie fillings, gelatin desserts.

A solid at room temperature, inexpensive, and highly acidic, fumaric acid is the ideal source of tartness and acidity in dry food products. However, it dissolves slowly in cold water, a drawback cured by adding DIOCTYL SODIUM SULFOSUCCINATE (DSS), a detergent-like additive that appears to be safe.

G

GELATIN

Thickening and gelling agent: Powdered dessert mixes, marshmallows, yogurt, ice cream, cheese spreads, beverages.

Gelatin is a protein obtained from animal hides and bones. It has little nutritional value, because it contains little or none of several essential amino acids.

GINKGO BILOBA

Pretend benefits: Beverages.

Companies add small amounts of Ginkgo biloba to beverages because it supposedly boosts memory and thinking, but most studies in healthy people show little or no benefit at levels greater than what's added to foods and beverages. Since Ginkgo appears to interfere with blood clotting, it should not be consumed before or after surgery, during labor and delivery, or by those with bleeding problems such as hemophilia. Importantly, in 2013, the [U.S. Government's National Toxicology Program published the first study](http://ntp.niehs.nih.gov/ntp/htdocs/LT_rpts/TR578_508.pdf) (http://ntp.niehs.nih.gov/ntp/htdocs/LT_rpts/TR578_508.pdf) that could evaluate Ginkgo's ability to cause cancer. The study found "clear evidence" that Ginkgo biloba caused liver cancer in male and female mice and "some evidence" that Ginkgo caused thyroid cancer in rats.

GINSENG

Pretend benefits: Energy drinks.

Companies add small amounts to foods because of ginseng's reputation for boosting energy, sexual stamina, and mental effort, but there's little evidence for those claims even at much higher levels than what is found in foods. The amount in foods and beverages is not likely to pose a safety risk.

✓ **GLUCONIC ACID, GLUCONO DELTA-LACTONE, MAGNESIUM GLUCONATE, SODIUM GLUCONATE, ZINC GLUCONATE**

Sequestrant, acidifier, leavening agent, curing agent: Nonalcoholic beverages, processed fruit and fruit juices, baked goods, dairy products, cured meats.

Gluconic acid is a metabolite of glucose. Glucono delta-lactone is the most widely used of this family of compounds and is used to adjust the acidity or as a leavening agent in baked goods, processed fruits, and dairy products. It is also used in some cured meats to speed the formation of the pink color.

All of these substances are safe. See also [ferrous gluconate](#).

✓ **GLYCERIN (GLYCEROL)**

Maintains water content: Candy, fudge, baked goods.

In nature, glycerin forms the backbone of fat and oil molecules. The body uses it as a source of energy or as a starting material in making more-complex molecules.

✓ **GUANOSINE MONOPHOSPHATE (GMP, DISODIUM GUANYLATE)**

Flavor enhancer: Soups, sauces, seasonings.

GMP and inosine monophosphate (IMP) are used together to enhance the meaty (umami) flavor of soups and other foods. They are usually used together with monosodium glutamate (MSG), because they enhance its potency.

⚠ **GUARANA**

Stimulant: Energy drinks, teas.

Guarana is a plant that has seeds high in caffeine. Companies add guarana to beverages as a "natural" source of caffeine, but its effect is the same as the caffeine in coffee or tea. Include guarana when you're keeping track of the caffeine in your diet. Too much caffeine from any source can cause insomnia, anxiety, and other problems (see discussion of [caffeine](#)).

⚠ **GUMS**

Arabic, Furcelleran, Gellan, Ghatti, Guar, Karaya, Locust Bean, Tragacanth, Xanthan.

Thickening agents, stabilizers: Beverages, ice cream, frozen pudding, salad dressing, dough, cottage cheese, candy, drink mixes.

Gums are derived from natural sources (bushes, trees, seaweed, bacteria) and are poorly tested, though probably safe. They are not absorbed by the body. They are used to thicken foods, prevent sugar crystals from forming in candy, stabilize beer foam (arabic), form a gel in pudding (furcelleran), encapsulate flavor oils in powdered drink mixes, or keep oil and water mixed together in salad dressings. Gums are often used to replace fat in low-fat ice cream, baked goods, and salad dressings. Tragacanth has caused occasional severe allergic reactions. The FDA warns against giving a product called SimplyThick, which contains xanthan gum, to infants, since it may cause a life-threatening condition called necrotizing enterocolitis. It is not clear whether the gum itself, bacterial contamination of the gum, or some other cause is to blame.

H

HELIUM

Inert, safe gas: Balloons or pressurized containers.

Helium is an inert, safe gas that is used to float balloons or sometimes to force foods out of pressurized containers.

HIGH-FRUCTOSE CORN SYRUP (/liquidcandy/)

Sweetener: Soft drinks, other processed foods.

Our consumption of high-fructose corn syrup (HFCS) has soared since around 1980. That's because this sweet syrupy liquid is cheaper and easier for some companies to use than sugar. HFCS has been blamed by some for the obesity epidemic, because rates of obesity have climbed right along with HFCS consumption. But that's an urban myth. HFCS and sugar are equally harmful. We're consuming far too much of both.

HFCS starts out as cornstarch. Companies use enzymes or acids to break down most of the starch into its glucose subunits. Then other enzymes convert different proportions of the glucose to fructose. The resulting syrups contain as much as 90 percent fructose, but most HFCS is 42 percent or 55 percent fructose. In 2013, about 59 pounds of corn sweeteners, mostly HFCS, and 68 pounds of cane and beet sugar were produced per capita in the United States. A total of 128 pounds of all caloric sweeteners, down 15 percent from the 1999 high of 152 pounds, was produced per person. And, because of all the criticism (not fully deserved) of HFCS in recent years, HFCS consumption declined by about 32 percent between 1999 and 2013. Much of that decline resulted from declining soft drink consumption (thanks to increased health consciousness and to the popularity of bottled water), while the rest reflects food manufacturers switching back to ordinary sugar. Actual consumption (as opposed to production) of caloric sweeteners, according to the U.S. Department of Agriculture, was 76 pounds per person in 2013.

Some people think that HFCS is mostly fructose, which does probably play a significant role in obesity. However, HFCS, on average, is about half fructose and half glucose—the same as ordinary table sugar (sucrose) when it is metabolized by the body. When sugar is used in soft drinks, much of it is broken down to glucose and fructose right in the bottle. If the big soda companies weren't using HFCS, they'd be using regular sugar, and the extra cost would only be a couple of cents per can, a difference that would have little effect on consumption.

Modest amounts of HFCS are safe. However, large amounts promote tooth decay, as well as increase triglyceride (fat) levels in blood, thereby increasing the risk of heart disease. Also, recent studies show that consuming 25 percent of calories from HFCS or fructose leads to more visceral (deep belly) fat or liver fat. Those changes may increase the risk of diabetes or heart disease. Finally, large amounts of fructose from HFCS or sugar consumed on a regular basis also may affect levels of such hormones as insulin, leptin, and ghrelin that regulate appetite, thereby contributing to weight gain and obesity. The HFCS 55 that is used in most soft drinks contains about 10 percent more fructose than sucrose. That makes most soft drinks a bit more harmful than if they were made with sugar.

The Dietary Guidelines for Americans (America's basic nutrition policy) recommends that people consume no more than about 10 percent of calories (12 teaspoons in a 2,000-calorie diet) in the form of refined sugars. The American Heart Association has a stricter recommendation: six teaspoons of refined sugars per day for women and nine teaspoons for men. That's far less than the current average of 13 percent of calories. The bottom line: the less added sugars—fructose, dextrose, sucrose, or HFCS—one consumes the better.

See also [SUGAR \(SUCROSE\)](#) and [HIGH MALTOSE CORN SYRUP](#).

HIGH-MALTOSE CORN SYRUP

Sweetener, improves shelf life, inhibits bacterial growth, fermentation, other purposes: Candy, baked goods, beer.

Acids or enzymes are used to break down cornstarch into a syrup rich in the sugar maltose (35 percent or more). Maltose is composed of two units of glucose. High-maltose corn syrup, corn syrup solids, and maltodextrin are similar, in that each contain glucose but not fructose, and each is produced in a wide variety of formulations for different applications. Since high-maltose corn syrup doesn't contain any fructose, it is probably safer than table sugar or high fructose corn syrup, but still, the less added sugars one consumes, the better (though small amounts are safe). Fortunately, not much is used in foods.

See also [MALTODEXTRIN](#) and [HIGH FRUCTOSE CORN SYRUP](#).

HYDROGENATED STARCH HYDROLYSATE (HSH)

Sugar-free sweetener: Candy, chocolates, chewing gum, baked goods.

HSH, like sorbitol and other sugar alcohols, is slightly sweet and poorly absorbed by the body. As with most sugar alcohols, eating significant amounts of HSH may cause intestinal gas and diarrhea. It has more calories than most other sugar alcohols—three calories per gram, compared to about 4 for sugar and about 2 for most other sugar alcohols.

HYDROLYZED VEGETABLE PROTEIN (HVP)

Flavor enhancer: Instant soups, frankfurters, sauce mixes, beef stew.

HVP consists of vegetable (usually soybean) protein that has been chemically broken down to the amino acids of which it is composed. HVP is used to bring out the natural flavor of food (and, perhaps, to enable companies to use less real food). It contains MSG and may cause adverse reactions in sensitive individuals.

I

INOSINE MONOPHOSPHATE (IMP, DISODIUM INOSINATE)

Flavor enhancer: Soups, sauces, seasonings.

IMP and guanosine monophosphate (GMP) are used together to enhance the meaty (umami) flavor of soups and other foods. They are often used together with monosodium glutamate (MSG), because they enhance its potency. These safe 5'-ribonucleotides are produced together.

 **INTER-ESTERIFIED OIL****Shortening**

With trans fat now recognized as being the most harmful type of fatty acid of all, companies have sought to find safe substitutes for PARTIALLY HYDROGENATED VEGETABLE OIL, the source of artificial trans fat. One such substitute is inter-esterified oil. The oil is produced by chemically combining a polyunsaturated oil like soybean oil with fully hydrogenated soybean oil. Fully hydrogenated oils do not contain trans fat, but consist largely of saturated fatty acids. That particular type of saturated fat, stearic acid, is relatively innocuous compared to the other common types of saturated fat. By varying the proportions of normal and fully hydrogenated oil, companies can obtain oils that have the desired consistency. Inter-esterified oils are good substitutes for such saturated fats as palm oil, which increases the "bad" cholesterol.

 **INULIN****Fiber and fat substitute: Margarine, baked goods, fillings, dairy foods, frozen desserts, salad dressing.**

It's a naturally occurring soluble fiber. Inulin doesn't raise blood sugar levels, so it may help people with diabetes. It also stimulates the growth of friendly bacteria in the large intestine. However, because it is a purified fiber, it doesn't come with the various vitamins and minerals that accompany the dietary fiber that one gets from whole foods.

 **INVERT SUGAR (/liquidcandy/)****Sweetener: Candy, soft drinks, many other foods.**

Invert sugar, a 50-50 mixture of two sugars, dextrose and fructose, is sweeter and more soluble than sucrose (table sugar). Invert sugar forms when sucrose is split in two by an enzyme or acid. It provides "empty calories," contributes to tooth decay, and should be avoided.

 **ISOLATED SOY PROTEIN, TEXTURED VEGETABLE PROTEIN****Nutrient.**

Isolated soy protein is simply protein purified from soybeans. Textured vegetable protein is soy protein that has been combined with chemical additives and processed into granules, chunks, or strips that resemble meat. These proteins are used in some imitation meat products, which are generally healthful, but may contain flavor enhancers, thickening agents, emulsifiers, and artificial colorings.

 **ISOMALT**

Sugar-free sweetener: Hard candies, chocolates, chewing gum, baked goods.

This slightly sweet ingredient is manufactured from sugar and does not promote tooth decay. It is often mixed with artificial sweeteners, such as sucralose, to provide more sweetening power. Isomalt is poorly absorbed by the body, and thus has only about half the calories of sugar. Chemically, it is a disaccharide sugar-alcohol consisting of glucose and mannitol or sorbitol sub-units. Like many other sugar alcohols, large amounts can cause diarrhea.

L**✓ LACTIC ACID**

Controls acidity: Spanish olives, cheese, frozen desserts, carbonated beverages.

This safe acid occurs in almost all living organisms. It inhibits spoilage in Spanish-type olives, balances the acidity in cheese-making, and adds tartness to frozen desserts, carbonated fruit-flavored drinks, and other foods.

✂ LACTITOL

Sugar-free sweetener: Candy, chocolates, baked goods, ice cream, other sugar-free foods.

Lactitol is a sugar alcohol. It is made from lactose (milk sugar). Like most other sugar alcohols, lactitol is not absorbed well by the body (which means it has only about half the calories of sugar), and it does not promote tooth decay. However, large amounts (above 20 to 30 grams) may cause loose stools or diarrhea.

⚠ LACTOSE

Nutrient, sweetener: Whipped topping mix, fortified breakfast pastry.

Lactose, a carbohydrate that is found only in milk, is nature's way of delivering calories to infant mammals. One-sixth as sweet as sugar, it is used as a slightly sweet source of carbohydrate. The intestine secretes an enzyme that splits lactose into its two principal sugars: glucose and galactose. Children suffering from galactosemia, a rare genetic disease, can suffer serious harm by consuming lactose. Far more common is 'lactose intolerance', where undigested lactose is metabolized by bacteria, producing gas, bloating, and flatulence. Most Asians and people of black African heritage cannot tolerate as much lactose as Caucasians after early childhood. Some people are acutely lactose intolerant, but most people with lactose intolerance can safely eat smaller amounts of dairy products or foods with added lactose.

✓ LECITHIN

Emulsifier, antioxidant: Baked goods, margarine, chocolate, ice cream.

A common constituent of animal and plant tissues, lecithin is a source of the nutrient choline. It keeps oil and water from separating out, retards rancidity, reduces spattering in a frying pan, and leads to fluffier cakes. Major natural sources are egg yolk and soybeans.

M

✓ MAGNESIUM COMPOUNDS

Carbonate, Chloride, Hydroxide, Phosphate, Stearate, Sulfate: Anticaking agent, alkali, nutrient, water corrective.

Magnesium is a mineral that is a crucial component of many enzymes in the human body and plays a unique role in muscle contraction. We get about half our magnesium from nuts, beans, whole grains, fruits, and vegetables, but it's also in many other foods. About half of the body's magnesium is stored in bone.

✓ MALIC ACID

Acidulant, flavoring: Fruit-flavored drinks, candy, lemon-flavored ice-tea mix, ice cream, preserves.

L-Malic acid is an important metabolite present in all living cells and is abundant in apples. It is sometimes called "apple acid." The food industry uses malic acid as an acidulant and flavoring agent in fruit-flavored drinks, candy, lemon-flavored ice-tea mix, ice cream, and preserves.

While adults can probably utilize D-malic acid (the unnatural form), infants may not, so synthetic DL-malic acid should not be added to baby food.

✂ MALTITOL

Sugar-free sweetener: Candy, chocolates, jams, and other sugar-free foods.

Maltitol, a sugar alcohol, is made by hydrogenating maltose, which is obtained from corn syrup. (Unlike hydrogenated oils, no trans fat forms when maltose is hydrogenated.) Like other sugar alcohols, maltitol is not absorbed well by the body (which means it has only about half as many calories as sugar), and it does not promote tooth decay. However, large amounts (above 20 to 30 grams) may have a laxative effect.

✓ MALTODEXTRIN

Texturizer in processed foods.

This ingredient is made from starch and consists of short chains of glucose molecules. Normal maltodextrins are easily digested and absorbed by the body. But companies also use "resistant maltodextrin" to simulate dietary fiber. That form of maltodextrin is made by treating starch with enzymes, heat, or acids and cannot be broken down by digestive enzymes. That makes the additive an "isolated fiber." Resistant maltodextrins may help lower blood sugar levels, but don't help prevent constipation.

Maltodextrin is usually made from starch from corn, potato, or rice, but is sometimes made from wheat starch. If maltodextrin is made from wheat, food labels will indicate that fact to protect people who are allergic to wheat.

MALTOTAME

Artificial Sweetener: Diet drinks, snacks.

A blend of neotame and maltodextrin that one company calls maltotame. Some food manufacturers illegally state maltotame in the ingredient lists on their products instead of identifying the actual additives. (CSPI rates maltodextrin, an ingredient made from corn starch, as safe).

See also [NEOTAME](#) and [MALTODEXTRIN](#).

MANNITOL (/new/sorbitol_pr.html)

Sugar-free sweetener: "Dust" on chewing gum, other sugar-free foods.

Mannitol, like most other sugar alcohols, is not as sweet as sugar, not absorbed well by the body (which means it provides only less than half as many calories per gram as table sugar), and does not promote tooth decay. However, large amounts may have a laxative effect and may even cause diarrhea. The FDA requires foods "whose reasonably foreseeable consumption may result in a daily ingestion of 20 grams of mannitol" to bear this warning: "Excess consumption may have a laxative effect."

MONATIN

Natural high-potency sweetener

Monatin is not yet used as a food additive, but Cargill, PepsiCo, and other companies see that as a possibility in the future. Like stevia-derived rebiana, monatin was first identified in a plant—in this case the root bark of a shrub that grows in South Africa, where the plant has been consumed by people. The substance, which can be synthesized more efficiently in a factory, is about 3,000 times sweeter than sugar and supposedly does not have the unpleasant aftertaste that most current stevia extracts have. Monatin has undergone only rudimentary safety testing.

MONK FRUIT EXTRACT

Natural high-potency sweetener: Frozen desserts, soft drinks, packaged sweeteners, other sugar-free foods. Also called monk fruit, Swingle fruit extracts (SGFE), Luo Han Guo, Lo Han Kuo.

This high potency sweetener is about 200 times sweeter than sugar. Like artificial sweeteners and stevia leaf extracts (rebiana), monk fruit extract can be used to replace some or all of the added sugars in a wide range of foods and beverages. This product has not been well tested in animals. It is derived from a fruit that has been consumed in China for at least several hundred years and used as an herbal medicine for the past several decades, so it may well be safe, although any chronic adverse effects might easily have escaped detection.

Monk fruit extract contains several intensely sweet substances called mogrosides. One company's purest product contains more than 50 percent mogroside V. Labels may call the ingredient monk fruit, but don't think you're getting any whole fruit; manufacturers use a multi-step process to extract just the sweet mogrosides.

MONO-and DIGLYCERIDES

Emulsifier: Baked goods, margarine, candy, peanut butter.

Makes bread softer and prevents staling, improves the stability of margarine, makes caramels less sticky, and prevents the oil in peanut butter from separating out. Mono- and diglycerides are safe, though most foods they are used in are high in refined flour, sugar, or fat.

 MONOSODIUM GLUTAMATE (MSG)**Flavor enhancer: Soup, salad dressing, chips, frozen entrees, restaurant foods.**

This amino acid brings out the flavor in many foods. While that may sound like a treat for taste buds, the use of MSG allows companies to reduce the amount of real ingredients in their foods, such as chicken in chicken soup. In the 1960s, it was discovered that large amounts of MSG fed to infant mice destroyed nerve cells in the brain. After that research was publicized, public pressure forced baby-food companies to stop adding MSG to their products (it was used to make the foods taste better to parents).

Careful studies have shown that some people are sensitive to large amounts of MSG. Reactions include headache, nausea, weakness, and burning sensation in the back of neck and forearms. Some people complain of wheezing, changes in heart rate, and difficulty breathing. Some people claim to be sensitive to very small amounts of MSG, but no good studies have been done to determine just how little MSG can cause a reaction in the most-sensitive people. To protect the public's health, manufacturers and restaurateurs should use less or no MSG and the amounts of MSG should be listed on labels of foods that contain significant amounts. People who believe they are sensitive to MSG should be aware that other ingredients, such as natural flavoring, Torula yeast, and hydrolyzed vegetable protein, also contain glutamate. Also, foods such as Parmesan cheese and tomatoes contain glutamate that occurs naturally, but no reactions have been reported to those foods.

 MYCOPROTEIN (/quorn/)**Meat substitute: Quorn brand foods.**

Mycoprotein, the novel ingredient in Quorn-brand frozen meat substitutes, is made from processed mold (*Fusarium venenatum*) and can cause serious reactions in some people. Until recently, manufacturer Marlow Foods' advertising and labeling implied that the product is "mushroom protein" or "mushroom in origin," although the mold (or fungus) from which it is made does not produce mushrooms. Rather, the mold is grown in liquid solution in large tanks. Quorn foods have been sold in the United Kingdom since the 1990s and also in continental Europe. Quorn foods have been marketed in the United States since 2002 and in Scandinavia, Australia, and New Zealand more recently. The chunks of imitation meat are nutritious, but the prepared foods in which they are used may be high in fat or salt.

Typical adverse reactions to Quorn products are vomiting, nausea, and diarrhea. Hives, breathing difficulties, and potentially fatal anaphylactic reactions are less common. Many people have gone to emergency rooms for treatment of Quorn-related reactions. In 2013, an 11-year-old boy who had asthma died after eating a Quorn Turk'y Burger.

The British and American governments acknowledge that people are allergic or intolerant to Quorn foods, but so far have rejected CSPI's recommendations to require Quorn foods to bear a label warning of possible severe adverse reactions. (In fact, when Quorn-containing "vegetarian" products are served at restaurants, cafeterias, and other foodservice locations, there may not even be a label to inform consumers that they are eating Quorn foods.)

However, in 2017, because of an objection that CSPI filed in response to a proposed settlement of a class action case accusing Quorn's manufacturer of deceptive marketing, the manufacturer agreed to modify its labeling. Labels for all Quorn products sold in the United States now must state "Mycoprotein is a mold [member of the fungi family]. There have been rare cases of allergic reactions to products that contain mycoprotein."

Consumers who believe they have been sickened by Quorn foods are encouraged to [file an adverse-reaction report](http://www.cspinet.org/cgi-bin/quorn/quorn.cgi) (<http://www.cspinet.org/cgi-bin/quorn/quorn.cgi>) with the Center for Science in the Public Interest and with the Food and Drug Administration's [Medwatch](https://www.accessdata.fda.gov/scripts/medwatch/index.cfm?action=reporting.home) (<https://www.accessdata.fda.gov/scripts/medwatch/index.cfm?action=reporting.home>) program. In 2018, CSPI published an analysis ([https://www.annallergy.org/article/S1081-1206\(18\)30218-7/fulltext](https://www.annallergy.org/article/S1081-1206(18)30218-7/fulltext)) of over 2,000 reports to CSPI. It concluded that more people suffered from sometimes severe GI reactions (nausea, vomiting, diarrhea, abdominal cramps) than allergic reactions (hives, itchy skin, swelling of the throat or mouth area, breathing difficulties), and that some people experienced both.

N

✓ **NATAMYCIN (PIMARCIN)**

Antimicrobial: Cheese.

This antimicrobial agent is produced by bacteria and used to prevent mold growth in cheese.

✓ **NEOTAME**

Artificial sweetener: "Diet," "no-sugar added," "sugar-free" and other products, including soft drinks, dairy products, frozen desserts, and baked goods.

Neotame (brand name Newtame), produced by NutraSweet Co., is a remarkable 8,000 times sweeter than table sugar and 40 times sweeter than aspartame. Neotame is chemically related to aspartame, but the difference confers greater chemical stability, enabling the new sweetener to be used in baked foods, and it is handled differently by the body. It likely will be used mostly in low-calorie foods, but may also be used to adjust the flavor of other foods. To compensate for taste flaws, you will probably find neotame mixed with sugar or with other artificial sweeteners. It was approved by the U.S. FDA in 2002 and the European Union in 2010, but is still rarely used.

✓ **NIACIN (VITAMIN B3)**

Nutrient: Enriched flour, breakfast cereals, and other fortified foods.

Niacin, or vitamin B3, is safe. Niacin deficiency causes pellagra, which is characterized by mental disturbances and potentially death.

✓ **NISIN**

Preservative: meat and poultry products, cheese, liquid eggs, salad dressings.

Nisin is a short polypeptide (small protein molecule) that is produced by lactic acid bacteria and has anti-bacterial properties. It is unclear how widely this preservative is used.

✓ NITROUS OXIDE**Propellant.**

Nitrous oxide is often used as the propellant to drive foods out of pressurized containers. It is better known as laughing gas and is safe.

O**✓ OAT FIBER, WHEAT FIBER****Isolated fiber: Cereal, crackers, bread, muffins.**

When a food ingredient contains the word "fiber," it's code for an isolated fiber. "Wheat fiber" and "oat hull fiber" are insoluble fibers, which may help prevent constipation but don't lower blood cholesterol or blood sugar. "Oat fiber" can be either insoluble or soluble fiber. Soluble fiber may lower blood cholesterol and blood sugar but doesn't prevent constipation. Finally, isolated fibers don't contain the micronutrients and phytochemicals that foods with naturally occurring fiber contain.

✗ OLESTRA (Olean) (/olestra/)**Fat substitute: Lay's Light Chips, Pringles Light chips.**

Olestra is Procter & Gamble's synthetic fat that is not absorbed as it passes through the digestive system, so it has no calories. Procter & Gamble suggests that replacing regular fat with olestra will help people lose weight and lower the risk of heart disease. Originally envisioned as a replacement for fat in everything from cheese to ice cream, the ingredient is now only used in a couple of brands of snack chips.

Olestra can cause diarrhea and loose stools, abdominal cramps, flatulence, and other adverse effects. Those symptoms are sometimes severe.

Olestra reduces the body's ability to absorb fat-soluble carotenoids (such as alpha and beta-carotene, lycopene, lutein, and canthaxanthin) from fruits and vegetables, but an occasional serving wouldn't be a problem. Those nutrients are thought by many experts to reduce the risk of cancer and heart disease. Olestra enables manufacturers to offer greasy-feeling low-fat snacks, but consumers would be better off with baked snacks, which are safe and just as low in calories. Products made with olestra should not be called "fat free," because they contain substantial amounts of indigestible fat.

✓ OLIGOFRACTOSE**Bulking agent, emulsifier, sweetener, prebiotic: Frozen desserts, cookies, energy and granola bars.**

Oligofructose, synthesized from sucrose or extracted from chicory roots, consists of up to several dozen fructose molecules linked end to end. Like inulin and other soluble fibers, oligofructose is digested by bacteria in the large intestine, but not by human enzymes. This

slightly sweet ingredient provides less than about half as many calories per gram as fructose or other sugar. Oligofructose promotes the growth of "good" bifidus bacteria.

P

PANTOTHENIC ACID (AND SODIUM PANTOTHENATE)

Nutrient.

Pantothenic acid is one of the water-soluble B vitamins. Human deficiencies have never been observed.

PAPAIN

Meat tenderizer.

Papain is a harmless enzyme obtained from papaya that is used to break down tough muscle protein in meat.

PARTIALLY HYDROGENATED VEGETABLE OIL, HYDROGENATED VEGETABLE OIL (Trans fat) (<http://www.cspinet.org/transfat>)

Fat, oil, shortening: Stick margarine, crackers, fried restaurant foods, baked goods, icing, microwave popcorn.

Vegetable oil, usually a liquid, can be made into a semi-solid shortening by reacting it with hydrogen. Partial hydrogenation reduces the levels of polyunsaturated oils – and also creates trans fats, which promote heart disease. A committee of the U.S. Food and Drug Administration (FDA) concluded in 2004 that on a gram-for-gram basis, trans fat is even more harmful than saturated fat. That finding encouraged a few food manufacturers to begin replacing hydrogenated shortening with less-harmful ingredients. Similarly, the Institute of Medicine advised consumers to consume as little trans fat as possible, ideally less than about 2 grams a day (that much might come from naturally occurring trans fat in beef and dairy products). Harvard School of Public Health researchers estimate that trans fat had been causing about 50,000 premature heart attack deaths annually, making partially hydrogenated oil one of the most harmful ingredients in the food supply (see discussion of salt).

Beginning in 2006, Nutrition Facts labels have had to list the amount of trans fat in a serving. That spurred many more companies, including Frito-Lay, Kraft, ConAgra, and others, to replace most or all of the partially hydrogenated oil in almost all their products. The substitutes are invariably more healthful, and the total of saturated plus trans fat (which both boost the “bad” LDL cholesterol when replaced by polyunsaturated vegetable oils) is generally no higher than it was before companies switched. Confusing label reading, though, is that foods labeled “0g trans fat” are permitted to contain 0.5g of trans fat per serving, while “no trans fat” means none at all. Consumers need to read labels carefully for another reason: foods labeled “0g trans” or “no trans” may still have large amounts of saturated fat.

Restaurants, which do not provide nutrition information, were slower to change, but the pace of change has picked up. They use partially hydrogenated oil for frying chicken, potatoes, and fish, as well as in biscuits and other baked goods. By 2016, McDonald's, Wendy's, KFC, Taco Bell, Ruby Tuesday, Red Lobster, and other large chains, and most smaller restaurants, eliminated trans fat.

Denmark virtually banned partially hydrogenated oil as of January 1, 2004. Later that year, the Center for Science in the Public Interest petitioned the FDA to require restaurants to disclose when they use partially hydrogenated oil and to begin the process of eliminating partially hydrogenated oil from the entire food supply. While the FDA rejected the idea of requiring restaurants to disclose the presence of trans fat, New York City, Philadelphia, Boston, and other jurisdictions have set tight limits on the trans-fat content of restaurant foods. Meanwhile, Austria, Hungary, Iceland, Norway, and Switzerland adopted Denmark-like restrictions.

In 2013 the FDA responded to CSPI's petition to revoke the legal status of partially hydrogenated oil (the FDA considered that oil to be "generally recognized as safe," even though it and everyone else considers it to be "generally recognized as dangerous") by proposing that that oil be eliminated from the food supply. In 2015 the FDA finally concluded that partially hydrogenated oil was no longer safe and gave the food industry three years to eliminate it from its products. Already the industry has replaced about seven billion pounds of the manufactured oil, and FDA's action will spur companies to eliminate the remaining billion pounds. Still, the Grocery Manufacturers Association, the industry's largest trade association, has petitioned the FDA to approve numerous small uses of partially hydrogenated oil.

PECTIN (and SODIUM PECTINATE)

Gelling agent: Jams, jellies.

Pectin is a safe carbohydrate that strengthens cell walls in citrus fruits, apples, beets, carrots, and other fruits and vegetables. Pectin forms gels that are the basis of fruit jellies, and may be used to thicken barbeque sauce, cranberry sauce, canned frosting, and yogurt.

PHOSPHORIC ACID; PHOSPHATES

Acidulant, chelating agent, buffer, emulsifier, nutrient, discoloration inhibitor: Baked goods, cheese, powdered foods, cured meat, soda pop, breakfast cereals, dehydrated potatoes.

Phosphoric acid acidifies and flavors cola beverages; the acidity erodes tooth enamel. Calcium and iron phosphates act as mineral supplements. Sodium aluminum phosphate is a leavening agent. Calcium and ammonium phosphates serve as food for yeast in baking. Sodium acid pyrophosphate reduces levels of the carcinogen acrylamide in French fries, prevents discoloration in potatoes and sugar syrups, and prevents the formation of harmless mineral (struvite) crystals in canned seafood. Sodium phosphates help retain moisture in processed meats and prevent struvite crystals from forming in canned tuna. Most people consume far more phosphorus than they need, which may have adverse effects on kidney, bone, and cardiovascular health, especially for people suffering from kidney disease.

PHYTOSTEROLS and PHYTOSTANOLS (PLANT STEROLS or STANOLS)

Cholesterol-lowering additive: Margarine, fruit juice, bread, dietary supplements.

These substances are minor components of membranes in many nuts, seeds, vegetable oils, fruits, vegetables and other foods. They are chemically related to cholesterol. They are more easily incorporated into foods (other than fruit juices) when they are converted to ester

forms. Then, when consumed in high doses from foods or dietary supplements, the sterol or stanol esters reduce the absorption of cholesterol from food and can lower LDL (“bad”) blood cholesterol levels by 10 to 15 percent. They are not toxic, but they may reduce the body’s absorption of nutrients called carotenoids that are thought to reduce the risk of cancer and heart disease.

POLYDEXTROSE

Bulking agent: Reduced-calorie salad dressings, baked goods, candies, puddings, frozen desserts.

Polydextrose is made by combining dextrose (corn sugar) with sorbitol. The result is a slightly sweet, reduced-calorie (only one calorie per gram because it is poorly digested) bulking agent. The FDA requires that if a serving of a food would likely provide more than 15 grams of polydextrose, the label should advise consumers that “Sensitive individuals may experience a laxative effect from excessive consumption of this product.”

POLYGLYCEROL POLYRICINOLEATE (PGPR)

Emulsifier: Chocolate candy, margarine.

PGPR is one of those mysterious chemicals that manufacturers use in food production. It stabilizes low-fat, high-water margarines and helps the “flow properties” in candy production.

POLYSORBATE 60, 65, AND 80

Emulsifier: Baked goods, frozen desserts, imitation cream.

Polysorbate 60 is short for polyoxyethylene-(20)- sorbitan monostearate. It and its close relatives, polysorbate 65 and 80, work the same way as mono- and diglycerides, but smaller amounts are needed. They keep baked goods from going stale, keep dill oil dissolved in bottled dill pickles, help coffee whiteners dissolve in coffee, and prevent oil from separating out of artificial whipped cream. A 2015 study of polysorbate 80 and another emulsifier (carboxymethylcellulose) in mice found that both affected gut bacteria and triggered inflammation and other changes in the gut, as well as obesity and metabolic syndrome. In mice that were predisposed to colitis, the emulsifiers promoted the disease. It is possible that polysorbates and other emulsifiers act like detergents to disrupt the mucous layer that lines the gut, and that the results of this study may apply to other emulsifiers as well. Research needs to be done to determine long-term effects of these and other emulsifiers at levels that people consume.

POTASSIUM BROMATE (/new/bromate.html)

Flour improver: White flour, bread and rolls.

This additive has long been used to increase the volume of bread and to produce bread with a fine crumb (the not-crust part of bread) structure. Most bromate rapidly breaks down to form innocuous bromide. However, bromate itself causes cancer in animals. The tiny amounts of bromate that may remain in bread pose a small risk to consumers. Bromate has been banned virtually worldwide except in

Japan and the United States. It is rarely used in California because a cancer warning might be required on the label. In 1999, the Center for Science in the Public Interest petitioned the FDA to ban bromate. Since then, numerous millers and bakers have stopped using bromate. (Calcium bromate, which likely is toxicologically similar to potassium bromate, occasionally may be used.)

POTASSIUM CHLORIDE

Salt substitute.

Potassium chloride is used in some salt substitutes as a way to reduce sodium, a major cause of high blood pressure and heart disease and strokes. It also adds potassium to the diet, which provides an added benefit.

No-Salt salt substitute consists entirely of potassium chloride, while most “lite” salts are about half potassium chloride and half sodium chloride. The amount of potassium chloride used in foods is almost self-limiting, because most people perceive potassium chloride to taste extremely bitter. People with kidney disease and certain heart conditions need to talk to their doctors about avoiding large amounts of potassium.

POTASSIUM IODATE

Dough strengthener: Bread, rolls.

Potassium iodate is sometimes used as a dough strengthener in bread and rolls. Some bakers may switch to this ingredient when they stop using its chemical cousin potassium bromate, which poses a small cancer risk. However, potassium iodate, too, is not well tested and may also pose a slight cancer risk. It conceivably could lead to excessive iodine intake.

Potassium iodate is a source of iodine, an essential trace element, necessary for the body to make thyroid hormones. That’s the good news. But too little or too much iodine can be harmful. A committee of the World Health Organization concluded that use of potassium iodate as a flour treatment agent was unacceptable because it could result in an excessive intake of iodine. At the same time, the committee endorsed the use of potassium iodate to fortify salt, since use in salt results in a lower intake of iodine than widespread use in bread and rolls and is used to prevent iodine deficiency disorders such as goiter and mental retardation, to name a few.

In the United States, potassium iodide, not potassium iodate, is used in iodized salt, but in other countries, especially tropical countries, potassium iodate is favored because it is more stable in warm, humid conditions. Iodized salt has virtually eliminated iodine deficiency in the United States, Canada, and several other countries.

Some people, such as those with thyroid disease, are especially sensitive to iodine intake and should make a special effort to avoid potassium iodate in bread and rolls. One other possible concern is that iodate breaks down in dough and in the body to form iodide. In a study conducted by Japanese government scientists, high doses of potassium iodide caused cancer in rats, suggesting it may be a weak carcinogen. The same research found that it also increased the potency of a known carcinogen.

As a sidelight, both potassium iodate and potassium iodide can also be used to prevent damage to the thyroid in the event of an accident at a nuclear reactor, although the iodide form is generally recommended.

Bottom line: Potassium iodate is not widely used in baked goods, and any risk is small. Still, it may be worth choosing baked goods without this ill-tested additive, and bakers should stop using it.

PROPYL GALLATE

Antioxidant preservative: Vegetable oil, meat products, potato sticks, chicken soup base, chewing gum.

Propyl gallate retards the spoilage of fats and oils and is often used together with two other antioxidants, BHA and BHT, because of the synergistic effects those preservatives have with one another. The best safety studies, which were published by the U.S. government, yielded unusual results. Propyl gallate appeared to cause more cancers (in several organs) in rats treated with a low dose than with either a zero dose (the controls) or a high dose. That finding may be indicative of an "endocrine disruptor," as well as a carcinogen. This additive needs to be better studied.

PROPYLENE GLYCOL

Maintains moisture, thickener, emulsifier, antioxidant, anticaking agent: ice cream, cake mixes, creamers, frozen meals, frosting, baked goods, snacks, candy, nuts, pickles, dressings, condiments.

Propylene glycol is used in a wide range of food products, often to maintain moisture, as well as thicken, emulsify, and preserve foods. It can also lower the freezing point of water, like its more toxic chemical cousin, ethylene glycol, used in antifreeze. Some people are allergic to propylene glycol in foods, as well as in personal care products and topical cortisone creams, and should avoid it.

PYRIDOXINE (VITAMIN B6)

Nutrient: Breakfast cereals, instant breakfasts, health-food bars.

Pyridoxine, or vitamin B6, serves a variety of functions in the body and performs a central role in amino acid metabolism. Wheat germ, brown rice, and yeast are rich sources of pyridoxine. It is safe.

Q

QUININE

Flavoring: Tonic water, quinine water, bitter lemon.

This drug can cure malaria and is used as a bitter flavoring in a few soft drinks. In 1994, the U.S. Food and Drug Administration banned quinine from over-the-counter drugs used to treat leg cramps, saying it was not safe and effective for that use. Then in 2006 FDA ordered companies to stop marketing unapproved products containing quinine. And in 2010 and 2012 FDA warned against using the only

approved quinine-containing anti-malaria drug for any purpose other than to treat malaria. The higher levels used in drugs are more likely to cause adverse reactions than the low levels used in food, but to be on the safe side, pregnant women and the elderly should avoid quinine-containing beverages.

QUORN

See [MYCOPROTEIN](#)

CSPI has received well over 2,000 reports of adverse reactions, mostly from the United Kingdom and the United States. If you have experienced a reaction to [Quorn \(/eating-healthy/foods-avoid/quorn\)](#) foods, please [file a report \(http://action.cspinet.org/ea-action/action?ea.client.id=1927&ea.campaign.id=47775\)](http://action.cspinet.org/ea-action/action?ea.client.id=1927&ea.campaign.id=47775).

R

REBIANA

See [STEVIA LEAF EXTRACT \(REBIANA\) \(file:///C:/Users/arianas/Documents/CSPI Dev Server/reports/stevia\)](file:///C:/Users/arianas/Documents/CSPI%20Dev%20Server/reports/stevia)

RIBOFLAVIN (VITAMIN B2)

Nutrient: Enriched flour, breakfast cereals, and other vitamin-fortified foods.

Riboflavin is simply vitamin B2. Riboflavin plays a crucial role in activating numerous enzymes. It is safe.

S

SACCHARIN

Artificial sweetener: "Diet," "no-sugar-added," "sugar-free" soft drinks and packaged (tabletop) sweeteners.

Saccharin (one brand is Sweet 'N Low) is about 350 times sweeter than sugar and is used in diet foods and as a packaged (tabletop) sugar substitute. Saccharin is the original artificial sweetener, having been discovered accidentally in 1879 at Johns Hopkins University. Many studies on rodents have shown that saccharin can cause cancer of the urinary bladder, especially in males. In some animal studies, saccharin also caused cancer of the uterus, ovaries, skin, blood vessels, and other organs. Additional studies have shown that saccharin increases the potency of other cancer-causing chemicals. And the best epidemiology (human) study, which was conducted by the National Cancer Institute, found that the use of artificial sweeteners (saccharin and cyclamate) was associated with a higher incidence of bladder cancer. That said, other animal and human studies did not identify a cancer risk.

In 1977, the FDA proposed that saccharin be banned because of the studies showing that it causes cancer in animals. However, Congress intervened and permitted it to be used, provided that foods carried a warning notice. In 1997, the diet-food industry began pressuring the U.S. and Canadian governments and the World Health Organization to take saccharin off their lists of cancer-causing chemicals. The industry acknowledges that large amounts of saccharin cause bladder cancer in male rats, but argues that those tumors are caused by a mechanism that would not occur in humans. Some public health experts respond by stating that, even if that still-unproved mechanism was correct in male rats, saccharin could cause cancer by additional mechanisms and that, in some studies, saccharin has caused bladder cancer in mice and in female rats and other cancers in both rats and mice.

In May 2000, the U.S. Department of Health and Human Services removed saccharin from its list of cancer-causing chemicals. Later that year, Congress passed a law removing the warning notice.

Saccharin has been replaced in almost all foods by aspartame and other better-tasting sweeteners. Coca-Cola Company's Tab, one of the first diet sodas, still contains saccharin, but now also contains aspartame. In 2014, Health Canada lifted its decades-long ban on saccharin in foods, allowing it to be added to some beverages, canned fruits, frozen desserts, and other foods. Saccharin passes into the breast milk of nursing mothers.

SALATRIM (/foodsafety/additives_salatrim.htm)

Modified fat: Baked goods, candy.

This manufactured fat (developed by Nabisco) has the physical properties of regular fat, but the manufacturer claims it provides only about 5/9 as many calories. Its use can enable companies to make reduced-calorie claims on their products. Salatrim's low calorie content results from its content of stearic acid, which the manufacturer says is absorbed poorly, and short-chain fatty acids, which provide fewer calories per unit weight.

Critics have charged that it does not provide as big a calorie reduction as claimed by Nabisco. Moreover, only very limited testing has been done to determine effects on humans. Eating small amounts of salatrim is probably safe, but large amounts (30g or more per day) increase the risk of such side effects as stomach cramps and nausea. No tests have been done to determine if the various food additives (salatrim, olestra, mannitol, and sorbitol) that cause gastrointestinal symptoms can act in concert to cause greater effects.

Nabisco declared salatrim safe and has marketed it, as the law allows, without formal FDA approval. (Nabisco has since sold salatrim to another company, Cultor.) In June 1998, the Center for Science in the Public Interest urged the FDA to ban salatrim until better tests were done and demonstrated safety. The FDA rejected that recommendation, but salatrim is not widely used, if at all.

SALT (Sodium Chloride) (/salt/)

Flavoring, preservative: Most processed foods, cured meats, soup, snack chips, crackers, and others.

Salt, at the levels present in the diets of most people around the world, is probably the single most harmful substance in the food supply. Salt is used liberally in many processed foods and restaurant meals, with some meals containing far more than a day's worth of sodium. Other additives, such as monosodium glutamate and sodium benzoate, contribute additional sodium. Salt serves many purposes in foods, such as acting as a preservative, adding a salty flavor, masking bitter flavors, and fostering expected texture or other property.

A diet high in sodium increases blood pressure in most people, thereby increasing the risk of heart attack and stroke. In 2004, the director of the U.S. National Heart, Lung, and Blood Institute and two colleagues estimated that cutting the amount of sodium in packaged and restaurant foods by half would save 150,000 lives a year. Everyone should avoid salty processed foods and restaurant meals, use salt sparingly in cooking and at the table, and enjoy other seasonings.

The Food and Drug Administration considers salt to be "generally recognized as safe" (GRAS), even though it recognizes that diets high in salt are a major cause of cardiovascular disease and even though its own advisory committee in 1979 concluded that salt should not be considered GRAS. In 1978 and 2005 the Center for Science in the Public Interest [petitioned the FDA \(/new/200511081.html\)](/new/200511081.html) to revoke salt's GRAS status and take other steps to lower sodium levels in the food supply. In response, the FDA held a public hearing in November, 2007. Meanwhile, the [British government \(http://www.food.gov.uk/healthiereating/salt/\)](http://www.food.gov.uk/healthiereating/salt/) has made salt reduction one of its top health goals and has been having significant success.

Many companies defend the amounts of salt used, saying that using less would sacrifice taste or safety. However, comparisons of different brands of the same product frequently show wide differences in [sodium content \(/salt/\)](/salt/). That indicates that many companies could use less salt (or other sodium-containing ingredients) to the levels used by competitors and still have perfectly marketable products.

SEA SALT (<https://cspinet.org/eating-healthy/ingredients-concern/salt>) **Flavoring, preservative: Seasoning, soup, snack chips, crackers, and other processed foods.**

Sea salt is obtained from the evaporation of sea water, unlike most table salt, which is mined from salt deposits, and then further processed to remove impurities. Many sea salts have slightly different flavors than regular salt—due to their slightly different mineral content—but the typical variety used in processed foods does not.

Sales of sea salt and sea-salted products are booming, and marketers would have you believe sea salt is a healthier, more natural form of salt. Although a majority of people surveyed by the American Heart Association believed sea salt was a lower-sodium alternative to table salt, sea salt has just as much sodium as table salt. (You can find lower-sodium sea salt and other salts; these are made by mixing the salt (sodium chloride) with potassium chloride and other ingredients.) The trace amounts of magnesium, potassium, calcium, and other minerals in sea salt are so minor as to be insignificant to health. However, some sea salts, as well as kosher salt (which sometimes is from the sea), have larger crystal sizes with irregular shapes so they do not pack as tightly as table salt and therefore they have less sodium per teaspoon.

Most people should consume less salt (be it regular or sea salt), because diets high in sodium increase blood pressure and the risk of heart attacks, strokes, and kidney disease.

See [SALT \(Sodium Chloride\)](#) and [POTASSIUM CHLORIDE](#)

SILICON DIOXIDE, SILICA, CALCIUM SILICATE **Anti-caking agent: salt, soups, coffee creamer, and other dry, powdery foods.**

This chemical is just sand. Silicon dioxide occurs naturally in foods, especially foods derived from plants. Breathed in, silica dust can cause lung disease, even cancer. For use in food, it is finely ground and added to salt and other foods to help powders flow more easily. Aluminium calcium silicate and tricalcium silicate are also used in foods, and calcium silicate is used in some dietary supplements.

SODIUM BENZOATE, BENZOIC ACID

Preservative: Fruit juice, carbonated drinks, pickles.

Manufacturers have used sodium benzoate (and its close relative benzoic acid) for a century to prevent the growth of microorganisms in acidic foods. The substances occur naturally in many plants and animals. They appear to be safe for most people, though they cause hives, asthma, or other allergic reactions in sensitive individuals.

Another problem occurs when sodium benzoate is used in beverages that also contain ascorbic acid (vitamin C) or erythorbic acid (also known as d-ascorbic acid). The two substances, in an acidic solution, can react together to form small amounts of benzene, a chemical that causes leukemia and other cancers. Though the amounts of benzene that form are small, leading to only a very small risk of cancer, there is no need for consumers to experience any risk. In the early 1990s the FDA had urged companies not to use benzoate in products that also contain ascorbic acid, but in the 2000s companies were still using that combination. A lawsuit filed in 2006 by private attorneys ultimately forced Coca-Cola, PepsiCo, and other soft-drink makers in the U.S. to reformulate affected beverages, typically fruit-flavored products.

SODIUM CARBOXYMETHYL CELLULOSE (CMC)

See [CARBOXYMETHYL CELLULOSE](#)

SODIUM DIACETATE

Preservative, acidulant, flavor: baked goods, snack foods, fats and oils, meat products, candy, gravies and sauces, soups and soup mixes.

A salt of [ACETIC ACID](#), the main ingredient (other than water) of vinegar. It has a vinegar flavor and can prevent the growth of mold and bacteria.

SODIUM ERYTHORBATE, ERYTHORBIC ACID, SODIUM ISOASCORBATE

Antioxidant, color retainer: Processed meat, beverages, baked goods, and potato salad.

Chemically, sodium erythorbate is stereoisomer of ascorbic acid (vitamin C), but it itself has no nutritional value. It is used most commonly in processed meats, where it retards nitrosamine formation and color fading.

SODIUM NITRITE, SODIUM NITRATE

Preservative, coloring, flavoring: Bacon, ham, frankfurters, luncheon meats, smoked fish, corned beef.

Meat processors love sodium nitrite because it stabilizes the red color in cured meat (without nitrite, hot dogs and bacon would look gray) and gives a characteristic flavor. Sodium **nitrate** is used in dry cured meat, because it slowly breaks down into nitrite. Adding nitrite to food can lead to the formation of small amounts of potent cancer-causing chemicals (nitrosamines), particularly in fried bacon. Nitrite, which also occurs in saliva and forms from nitrate in several vegetables, can undergo the same chemical reaction in the stomach. Companies now add ascorbic acid or erythorbic acid to bacon to inhibit nitrosamine formation, a measure that has greatly reduced the problem. While nitrite and nitrate cause only a small risk, they are still worth avoiding.

Several studies have linked consumption of cured meat and nitrite by children, pregnant women, and adults with various types of cancer. In 2015 the International Agency for Research on Cancer, part of the World Health Organization, concluded that processed meat is carcinogenic to humans. In 2016 CSPI petitioned the USDA to require a warning label on packages of bacon, ham, hot dogs, and other processed meat products to inform consumers that eating those foods can increase the risk of colorectal cancer. All consumers, including in particular pregnant women, would be prudent to avoid those products.

The meat industry justifies its use of nitrite and nitrate by claiming that it prevents the growth of bacteria that cause botulism poisoning. That's true, but freezing and refrigeration could also do that, and the U.S. Department of Agriculture has developed a safe method using lactic-acid-producing bacteria. The use of nitrite and nitrate has decreased greatly over the decades, because of refrigeration and restrictions on the amounts used. The meat industry could do the public's health a favor by cutting back even further. Because nitrite is used primarily in fatty, salty foods, consumers have important nutritional reasons for avoiding nitrite-preserved foods.

The labels on some "natural" hot dogs and other cured meats brag about "no added nitrite." Be skeptical. While those products may not contain added sodium nitrite, they sometimes are made with celery powder or celery juice, which are naturally high in nitrite. Indeed in 2011 The New York Times revealed that the "natural" cured meats could have 10 times as much nitrite as conventional products. The bottom line: nitrite aside, those "no added nitrites" products typically are high in salt and sometimes saturated fat, so they'd be worth eating only occasionally or avoiding entirely.



SODIUM STEAROYL FUMARATE

See [CALCIUM \(or SODIUM\) STEAROYL LACTYLATE](#)



SORBIC ACID, POTASSIUM SORBATE

Prevents growth of mold: Cheese, syrup, jelly, cake, wine, dry fruits.

Sorbic acid occurs naturally in many plants. These additives are safe.



SORBITAN MONOSTEARATE

Emulsifier: Cakes, candy, frozen pudding, icing.

Like mono- and diglycerides and polysorbates, this additive keeps oil and water mixed together. In chocolate candy, it prevents the discoloration that normally occurs when the candy is warmed up and then cooled down.

SORBITOL (/new/sorbitol_pr.html)

Sugar-free sweetener, thickening agent, maintains moisture: Frozen desserts, candy, shredded coconut, chewing gum, other sugar-free foods.

Sorbitol, a sugar alcohol and close relative of sugar, occurs naturally in fruits and berries. It is sweet, but only half as sweet as sugar. It is non-cariogenic (does not cause tooth decay) and is used in chewing gum. Some diabetics use sorbitol-sweetened foods because it is absorbed slowly and does not cause blood sugar to increase rapidly. Moderate amounts of sorbitol are safe, but large amounts may have a strong laxative effect and even cause diarrhea. The FDA requires foods "whose reasonably foreseeable consumption may result in a daily ingestion of 50 grams of sorbitol" to bear the label statement: "Excess consumption may have a laxative effect."

STARCH

Thickening agent: Soup, gravy, frozen foods.

Starch, the major component of flour, potatoes, and corn, is used in many foods as a thickening agent. However, starch does not dissolve in cold water. Chemists have solved this problem by reacting starch with various chemicals to create MODIFIED STARCHES (see next entry).

Starch made from breeds of high-amylose corn is relatively resistant to digestion. That "resistant starch" has some of the same benefits of naturally occurring dietary fiber.

Starch is made up of two large carbohydrate molecules. Amylose is insoluble carbohydrate made up of long chains of glucose molecules. Amylopectin is a large, water-soluble, branched-chain polysaccharide that constitutes the other part of starch.

STARCH, MODIFIED

Thickening agent: Soup, gravy, frozen foods.

Modified starches are used in processed foods to improve their consistency and keep the solids suspended. Starch and modified starches used to be used in baby foods to replace large percentages of more nutritious ingredients, such as fruit. The starches were eliminated when the Center for Science in the Public Interest charged that some baby foods contained only about 30 percent food (such as strained bananas), with the rest being water, modified starch, and sugar

STEARIC ACID

Antioxidant, chewing gum base, Flavoring, anti-caking agent (calcium stearate).

Stearic acid is a fatty acid that occurs in virtually all fats. Though it is a saturated fat, it does not appear to affect blood cholesterol levels. However, it might increase the risk of heart disease by raising fibrinogen levels and causing blood clots. The trivial amounts used as an additive are harmless.

STEVIA LEAF EXTRACT (REBIANA)

"Natural" high-potency sweetener: "Diet," "no-sugar," "sugar-free" and other products, including beverages, packaged sweeteners, and various foods. Also called rebiana, stevioside, rebaudioside A, rebaudioside D, etc.; sold under such brand names as Truvia, Pure Via, and Sweet Leaf.

Stevia (http://cspinet.org/new/pdf/stevia_update.pdf) rebaudiana is a shrub (yerba dulce) that traditionally grew in Brazil, Paraguay, and even parts of Arizona. It is now grown commercially in California, China, southeast Asia, and elsewhere. Stevia leaves are about 30 times as sweet as sugar, and contain sweet substances called steviol glycosides that are 200–300 times sweeter than sugar. Among the sweetest ones are rebaudioside A, also called reb A or rebiana, and stevioside. Companies are racing to market better-tasting extracts that have been dubbed rebaudioside D, M, X, and others.

The food industry and many consumers who are trying to avoid sugar and artificial sweeteners have high hopes for stevia leaf extracts. Crude stevia leaf extracts have long been used in Japan and several other countries. One flaw though, is that many people perceive stevia leaf and its sweet derivatives to have an unpleasant aftertaste, which companies are trying feverishly to overcome.

In the 1990s, the FDA (and Canada and the European Union) rejected whole-leaf stevia and crude stevia extracts for use as a food ingredient. High dosages fed to rats reduced sperm production and increased cell proliferation in their testicles, which, at least at those dosages, could cause infertility or other problems. Pregnant hamsters that had been fed large amounts of a metabolite of stevioside called steviol had fewer and smaller offspring. In the laboratory, steviol can be converted into a mutagenic compound, which may promote cancer by causing mutations in the cells' DNA. FDA also was concerned that stevia might interfere with the absorption of carbohydrates and the conversion of food into energy within cells, as well as with effects on cardiovascular and renal systems.

In the early 2000s, Cargill and Merisant (a marketer of sugar substitutes) developed highly purified extracts of stevia that are 95 percent pure rebaudioside A and 200 times as sweet as sugar. Since then, other companies have also developed highly purified extracts of stevia, some containing rebaudioside A and some containing stevioside. Truvia and Pure Via are the brand names for packaged or tabletop sweeteners containing mostly rebaudioside A, also called rebiana, and SweetLeaf is the brand name for packaged sweeteners containing both rebiana and stevioside. Like other packaged sugar substitutes, packets of those products contain only a very small amount of the actual high-intensity sweetener (rebiana and/or stevioside in this case), since the tiny bits of powder would get lost in the packets if a carrier were not added. Thus, Truvia packets are mostly erythritol, PureVia mostly dextrose and cellulose powder, and SweetLeaf mostly inulin.

The one nagging concern (other than taste) about stevia leaf extracts is that they have not been adequately tested for cancer. Several (but not all) genetic tests found that rebiana-related substances caused mutations (</new/200808281.html>) and other forms of genotoxicity. Because such findings may indicate a cancer risk, that should have spurred the FDA to require additional animal feeding studies.

Nevertheless, in late 2008 the FDA did not object to rebaudioside A as "generally recognized as safe" (GRAS) and since then has raised no objections to other steviol glycosides such as stevioside as GRAS. Companies quickly marketed a wide range of lower-calorie products sweetened with stevia leaf extracts, replacing some or all of the sugar or other high-potency sweeteners.

Some food and beverage companies are trying to mask the aftertaste of rebiana with various ingredients, including ERYTHRITOL or modest amounts of sugar. Meanwhile, companies are developing other natural sweeteners, such as MONK FRUIT EXTRACT, MONATIN, and others. Ultimately, those substances might play an important role in reducing the harm caused by the huge amounts of SUGAR and HIGH-FRUCTOSE CORN SYRUP that so many people are consuming.

SUCRALOSE

Artificial sweetener: "No sugar added," "sugar-free," "diet" and other products, including baked goods, kettle corn, frozen desserts, ice cream, soft drinks, prepared meals, packaged (tabletop) sweeteners (Splenda).

Approved in the United States in 1998, sucralose—sometimes marketed as Splenda—is used in soft drinks, baked goods, ice cream, and other products, including ones you might not expect, such as frozen dinners and English muffins. It is widely used around the world. Unlike aspartame, sucralose does not break down at high temperatures and so can be used in baked goods.

In 2016 an independent Italian laboratory published a large study on mice. The study found that sucralose caused leukemia and related blood cancers in male mice that were exposed to it throughout their lives starting from before birth. The study is superior to previous industry-sponsored studies that did not find a link with cancer, since those tested fewer animals, started exposing the animals much later, and terminated the study earlier. In addition, treated animals in the industry-sponsored studies had significantly decreased body weight compared to controls, which can decrease cancer rates. This Italian lab is the same one that several years earlier published studies that found that aspartame caused cancers in rats and mice.

When sucralose was first being considered for approval by the FDA, CSPI objected. A study in rats had indicated that the additive might cause premature shrinkage of the thymus gland, which is part of the immune system. However, a subsequent study did not find any problem. Likewise, studies designed to detect whether sucralose could cause cancer in lab animals did not find any problems.

Several researchers contend that sucralose negatively impacts the gut, including changes in the microbiome and enzymes. That could have a range of consequences, including effects on blood sugar, regulation of body weight, inflammatory bowel disease, and how drugs and other chemicals are absorbed and metabolized by the body. For example, a 2008 study (funded by the sugar industry) reported that Splenda significantly reduced beneficial bacteria and had other effects in the gastrointestinal tract of rats that could affect the bioavailability of drugs. Unfortunately, the study was small and had other significant shortcomings. A 2012 study found a close correlation between the use of sucralose and saccharin and changes in the incidence of inflammatory bowel disease (IBD) in different regions around the world. However, finding a correlation is a long way from demonstrating a cause-effect relationship. Meanwhile, people experiencing IBD or other GI symptoms could see if avoiding sucralose provides any relief.

Even setting aside these concerns, young children could exceed the FDA's "acceptable daily intake" for sucralose (5 mg/kg), especially given sucralose's popularity (more products containing sugar substitutes use sucralose than any other sweetener). For example, a 6-year old child weighing 45 pounds would exceed the FDA limit by drinking two or three 12-ounce sodas containing the typical 40-60 mg of sucralose per can. In addition, sucralose passes into breast milk at levels high enough to make the milk sweeter.

A final point: McNeil Nutritionals long advertised Splenda as being "made from sugar, so it tastes like sugar." That statement may be literally true, but is misleading, as the Sugar Association charged in a lawsuit. In fact, the sweetener is a synthetic chemical made by chemically reacting sugar (sucrose) with chlorine. (The mere fact that sucralose is synthetic does not make it unsafe.) The lawsuit was settled without any announcement of the terms, but McNeil has dropped that "made from sugar" slogan.

SUCROSE ACETATE ISOBUTYRATE

Emulsifier: Citrus-flavored beverages, including "energy," "sport," and "electrolyte" drinks, as well as such alcoholic beverages as wine coolers, malt beverage coolers, and premixed cocktail products.

Sucrose acetate isobutyrate (SAIB), like brominated vegetable oil, is used primarily in citrus-flavored drinks to keep the flavor oils in suspension, giving them a cloudy appearance. In January 2013 it was announced as a replacement for brominated vegetable oil (BVO) in Gatorade, following widespread consumer protest over BVO.

FDA has approved its use in non-alcoholic and alcoholic beverages up to 300 ppm. SAIB has been subjected to short- and long-term studies in laboratory animals and people, at high doses, with little, if any, evidence of harm. It is also approved for use in Europe.

SUGAR (SUCROSE) (/liquidcandy/)

Sweetener: Table sugar, sweetened foods.

Sucrose, ordinary table sugar, occurs naturally in fruit, sugar cane, and sugar beets. Industry produced 68 pounds of sugar per person in 2013. That figure was down from 102 pounds per year in 1970, but the decrease has been more than made up for by increased use of high-fructose corn syrup and dextrose. In 2013, industry produced a total of about 128 pounds of total refined sugars per person, though because of waste and spoilage the average American actually consumed only about 76 pounds of all refined sugars (about 1.5 pounds per week). That represents a 15-percent reduction from the 1999 high of 89 pounds. That historic decline resulted largely from declining soft drink consumption (due partly to increased health concerns and to the popularity of bottled water).

Sugar and sweetened foods may taste good and supply energy, but most people eat too much of them. Sugar, corn syrup, and other refined sweeteners make up 13 percent of the average diet, but provide no vitamins, minerals, or protein. That means a person would have to get 100 percent of his or her nutrients from only 87 percent of his or her food. And, of course, some people, especially teen-aged boys, consume as much as 25 percent of their calories from refined sugars.

When sugar is digested, it breaks down into one fructose and one glucose (dextrose) molecule. Small amounts of fructose and glucose from fruits, vegetables, sugar, HFCS, or other sources are safe. However, large amounts of refined sugars promote tooth decay and displace nutrient-rich foods with empty calories. Furthermore, large amounts of glucose boost blood sugar levels and large amounts of fructose increase triglyceride (fat) levels and small, dense LDL ("bad") cholesterol levels in blood, and may thereby increase the risk of heart disease. Also, recent studies show that consuming 25 percent of calories from fructose or HFCS (which is about half fructose) leads to more visceral (deep belly) fat or liver fat. Those changes may increase the risk of diabetes and heart disease. Finally, preliminary research suggests that large amounts of fructose may upset levels of such hormones as leptin and ghrelin, which regulate appetite, thereby contributing to weight gain and obesity.

The Dietary Guidelines for Americans (America's basic nutrition policy) recommends that people consume no more than about 10 percent of calories (12 teaspoons in a 2,000-calorie diet) in the form of refined sugars. The American Heart Association has a stricter recommendation: six teaspoons of refined sugars per day for women and nine teaspoons for men. That's far less than the current average of 13 percent of calories. The bottom line: the less added sugars—fructose, glucose, sucrose, or HFCS—one consumes the better (though small amounts are safe).

Some companies have been replacing high-fructose corn syrup with sugar, pretending that that makes their products more healthful. In fact, there's essentially no nutritional difference between sugar and high-fructose corn syrup, so just ignore the marketing hype.

SULFITES (SULFUR DIOXIDE, SODIUM BISULFITE)

Preservative, bleach: Dried fruit, wine, processed potatoes.

Sulfiting agents prevent discoloration (dried fruit, some "fresh" shrimp, and some dried, fried, or frozen potatoes) and bacterial growth (wine). They also destroy vitamin B-1 and, most important, can cause severe reactions, especially in asthmatics. To non-sensitive individuals, sulfites are safe. If you think you may be sensitive, avoid all forms of this additive, because it caused at least twelve identifiable deaths in the 1980s and probably many, many more in the preceding decades. Deaths and less severe reactions were linked most commonly to restaurant foods. Sulfite levels in the lettuce and potatoes served at restaurants were often extremely high, because workers would allow the vegetable to sit in a sulfite solution for far too long a time. As a result of pressure from the Center for Science in the Public Interest (CSPI), a congressional hearing, and media attention, the FDA banned the most dangerous uses of sulfites and required that wine labels list sulfite, when used. Since those actions, CSPI has not been aware of any additional deaths.

T

TAGATOSE

Sugar Substitute: Breakfast cereals, cereal bars, diet and non-diet soft drinks, jelly, pudding, meal replacement drink mix, coffee mix powder, candy, chewing gum.

This relatively new additive is chemically related to (the mirror image of) fructose, but is poorly absorbed by the body. That's why it yields only about one-third as many calories and why large amounts cause diarrhea, nausea, and flatulence. In one study, 20 grams (about five teaspoons) caused nausea. Tagatose does not promote tooth decay. It is nearly (92 percent) as sweet as sugar. It is found at low levels in apples, pineapples, oranges, raisins, dates, heated cow's milk, and other foods.

TARTARIC ACID, POTASSIUM ACID TARTRATE, SODIUM POTASSIUM TARTRATE, SODIUM TARTRATE

Antioxidant: Beverages, candy, ice cream, baked goods, yogurt, gelatin desserts, baking powder.

Tartaric acid occurs naturally in grapes, other fruits, and coffee beans. It has an extremely tart, acidic taste, which is useful in some foods. Most of the tartaric acid we ingest is digested by bacteria in the intestines. The 20 percent that is absorbed is rapidly excreted in the urine.

When tartaric acid is partially neutralized with potassium hydroxide, the result is potassium acid tartrate, or cream of tartar.

TAURINE

Pretend benefits: Energy drinks.

Taurine occurs naturally in shellfish, other seafood, and meat. Companies add large amounts to energy drinks because it's supposedly energizing, but no credible evidence exists for that claim. There are no reports of harm from the taurine added to drinks.

TBHQ (TERT-BUTYLHYDROQUINONE)

Antioxidant: vegetable oil, snack foods, cereals, other fat-containing foods.

This preservative prevents rancidity. It is sometimes used along with similar preservatives, including BHA, BHT, and propyl gallate, with which it has a synergistic effect. (TBHQ is chemically related to BHA and forms when BHA is metabolized by the body.) One benefit of TBHQ over those other preservatives is that it does not cause discoloration in the presence of iron.

In a government study which used a better design than other similar studies, TBHQ increased the incidence of tumors in rats.

THAUMATIN

"Natural" high-potency sweetener: Used as a flavor modifier in a variety of foods and beverages.

This sweetener, which has the brand name Talin, consists of a couple of proteins extracted from the katemfe fruit grown in West Africa. It is about 2,000 times sweeter than sugar. Although approved as a sweetener in Europe, Australia/New Zealand, Canada, Mexico, and a number of other countries, you won't find it at the store or listed on food labels in the United States. That's because it has not been approved as a sweetener in the United States, although it has been designated "generally recognized as safe" (GRAS) as a flavor modifier. Like rebiana and mogrosides, other natural, high-potency sweeteners, it is said to have a "licorice-like" aftertaste, which consumers may find distasteful and might be the reason it is rarely used. As a protein it is presumably safe, but might cause occasional allergic reactions.

THIAMIN MONONITRATE

Vitamin B-1.

Perfectly safe, despite adding minuscule amounts of nitrate to our food.

TORULA YEAST

Natural flavoring and flavor enhancer: Snack foods, crackers, cheese and snack dips, seasoning blends, processed meats, soups and bouillons, gravies and sauces, salad dressings, rice and pasta dishes.

Torula yeast can be grown on wood sugars obtained as a byproduct of paper production, as well as other sources of sugar. It is inactivated and then used as a flavoring or taste enhancer, thanks to its monosodium glutamate (MSG) content and umami taste. People who believe they are sensitive to MSG might try to avoid foods containing Torula, but there have not been any studies testing Torula for MSG-type reactions. On food labels, Torula yeast may be listed by name or hidden under the term "natural flavorings."

When Germany experienced food shortages in World War I, Torula yeast was used as a protein-rich food source.

TRANS FAT

See [PARTIALLY HYDROGENATED VEGETABLE OIL](#)

Fat, oil, shortening

TRANSGLUTAMINASE ("MEAT GLUE")

Enzyme to bind proteins: Beef, poultry dairy, seafood, and other protein-rich products.

You'll never see this ingredient listed on food labels, because it appears to be used primarily by restaurant chefs. Transglutaminase's marketer (Ajinomoto) calls it "a revolutionary new way to improve existing food products or allow 'out of the box' thinking in making new food products." What it does is enable a chef to "glue" together a bunch of scraps of meat and sell it as a steak, bind bacon to meat, improve the texture of cheese, and do other tricks. Transglutaminase is a naturally occurring enzyme that is presumably safe, but used to deceive consumers. Also, because binding two pieces of food together puts into the protected center of meat or seafood any bacteria that were on the outside of a piece and, hence, easily killed in cooking. It is for that reason that we consider this ingredient, which on its own is safe, as a potential safety risk.

TRIACETIN (GLYCEROL TRIACETATE)

Wetting agent: Beverages.

This safe chemical is used in small amounts in foods and drinks to reduce the surface tension of water.

V

VANILLIN, ETHYL VANILLIN

Substitute for vanilla: Ice cream, baked goods, beverages, chocolate, candy, gelatin desserts.

Vanilla flavoring is derived from a bean, but vanillin, the major flavor component of vanilla, is cheaper to produce in a factory. A derivative, ethyl vanillin, comes closer to matching the taste of real vanilla. Both chemicals are safe.

VEGETABLE OIL STEROLS

See [PHYTOSTEROLS OR PHYTOSTANOLS](#)

VITAMIN D (D3)

Nutrient: Fortified milk.

Vitamin D is an essential nutrient that is produced by sunlight in the skin and that occurs naturally in such animal foods as fatty fish, eggs, butter, and liver. Recent research indicates, but has not yet proven, that the great majority of people are not getting enough vitamin D from sunlight or consuming enough in the form of foods or dietary supplements (look for vitamin D3). Increasing our consumption of vitamin D might reduce the risks of colon cancer, high blood pressure, and heart disease. Though the official recommended intake of D is 400 IU per day, it would be worth shooting for closer to 1,000. (Talk to your doctor about any special concerns related to your specific health situation.)

X

XYLITOL

Sugar-free sweetener: Chewing gum, packaged sweeteners, other sugar-free foods.

The sweetest of the sugar alcohols, xylitol is about as sweet as sugar. Like most other sugar alcohols (maltitol, mannitol, sorbitol), xylitol is not well absorbed by the body, so it has fewer calories than table sugar (although slightly more than most other sugar alcohols). Also, it does not promote tooth decay. Large amounts may have a laxative effect, leading to diarrhea.

While xylitol is harmless to humans, even small amounts (such as in several sticks of chewing gum) can kill dogs. Dogs quickly absorb xylitol into their bloodstream, which may trigger a potent release of insulin from the pancreas. The insulin, in turn, may cause a rapid, steep decrease in blood sugar (hypoglycemia), an effect that can occur within 10 to 60 minutes. Untreated, that can quickly be life-threatening. Xylitol also causes fatal liver disease in dogs.

Y

YELLOW PRUSSATE OF SODA

Anticaking agent: Salt.

Some salt manufacturers add yellow prussiate of soda (sodium ferrocyanide) to salt when they crystallize it. The additive generates jagged and bulky crystals which resist caking. That mitigates the need for extra anticaking agents.

Although this additive contains cyanide, it is not toxic because the cyanide is tightly bound to iron atoms.

More Loophole than Law: The Food Additives Testing and Approval Process

Although consumers likely presume that a federal agency ensures the safety of ingredients in the food supply, in reality, this isn't the case. For more information, [view the infographic. \(http://www.cspinet.org/resource/food-additive-safety-infographic\)](http://www.cspinet.org/resource/food-additive-safety-infographic)

First, many additives have not been thoroughly tested. And the vast majority of safety testing of food additives is done by food manufacturers (or by people hired by manufacturers), not the government or independent laboratories. Second, because of a loophole in the law, companies can declare on their own that an additive is "Generally Recognized As Safe" (GRAS), and start adding it to food without even informing the government. Such ingredients are required to be listed on labels although in some cases they appear simply as "artificial flavorings." The infographic shows the convoluted process that the food industry follows.

Some additives do undergo a more formal government approval process, but even that is no guarantee of safety. There are approved additives that have been shown in subsequent independent studies to harm health, and are in the "Avoid" category in Chemical Cuisine. But the FDA rarely reviews the safety of additives (including GRAS substances) once they enter the food supply.

Banned Additives

The food and chemical industries have said for decades that all food additives are well tested and safe. And most additives are safe. However, the history of food additives is riddled with additives that, after many years of use, were found to pose health risks. Those listed below have been banned. The moral of the story is that when someone says that all food additives are well tested and safe you should take their assurances with a grain of salt.

Additive	Function	Problem (Year Banned)
Artificial Colorings:		
Butter yellow	artificial coloring	Toxic, later found to cause liver cancer (1919)
Green 1	artificial coloring	Liver cancer (1965)
Green 2	artificial coloring	Insufficient economic importance to be tested (1965)
Orange 1	artificial coloring	Organ damage (1956)
Orange 2	artificial coloring	Organ damage (1960)
Orange B	artificial coloring	Contained low levels of a cancer-causing contaminant. Orange B was used only in sausage casings to color sausages, but is no longer used in the United States (1978, ban never finalized).
Red 1	artificial coloring	Liver cancer (1961)
Red 2	artificial coloring	Possible carcinogen (1976)
Red 4	artificial coloring	High levels damaged adrenal cortex of dog; after 1965 it was used only in maraschino cherries and certain pills; it is still allowed in externally applied drugs and cosmetics (1976).
Red 32	artificial coloring	Damages internal organs and may be a weak carcinogen; since 1956 it continues to be used under the name Citrus Red 2 only to color oranges (2 ppm) (1956).
Sudan 1	artificial coloring	Toxic, later found to be carcinogenic (1919).
Violet 1	artificial coloring	Cancer (it had been used to stamp the Department of Agriculture's inspection mark on beef carcasses) (1973).
Yellow 1 & 2	artificial coloring	Intestinal lesions at high dosages (1959).
Yellow 3	artificial coloring	Heart damage at high dosages (1959).
Yellow 4	artificial coloring	Heart damage at high dosages (1959).
Artificial Flavorings:		
Benzophenone	artificial flavoring (floral or basalm)	Cancer (2018 (https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm))
Ethyl acrylate	artificial flavoring (fruity)	Cancer (2018 (https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm))
Methyl eugenol	artificial flavoring (spicy)	Cancer (2018 (https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm))
Myrcene	artificial flavoring (spicy)	Cancer (2018 (https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm))
Pulegone	artificial flavoring (minty)	Cancer (2018 (https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm))

Pyridine	artificial flavoring (sour)	Cancer (2018 (https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm))
Styrene	artificial flavoring (floral or basalm)	No longer used (also causes cancer) (2018 (https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm622475.htm))
Other Additives:		
agene (nitrogen trichloride)	flour bleaching and aging agent	Dogs that ate bread made from treated flour suffered epileptic-like fits; the toxic agent was methionine sulfoxime (1949).
cinnamyl anthranilate	artificial flavoring	Liver cancer (1982)
cobalt salts	stabilize beer foam	Toxic effects on heart (1966)
coumarin	natural flavoring	Liver poison (1970)
cyclamate	artificial sweetener	Bladder cancer, damage to testes; now not thought to cause cancer directly, but to increase the potency of other carcinogens (1969).
diethyl pyrocarbonate (DEPC)	preservative (beverages)	Combines with ammonia to form urethane, a carcinogen (1972)
dulcin (p-ethoxy-phenylurea)	artificial sweetener	Liver cancer (1950)
ethylene glycol	solvent	Kidney damage (1998)
monochloroacetic acid	preservative	Highly toxic (1941)
nordihydroguaiaretic acid (NDGA)	plant-derived antioxidant	Kidney damage (1968 by FDA, 1971 by USDA)
oil of calamus	natural flavoring	Intestinal cancer (1968)
partially hydrogenated vegetable oil	shortening/frying oil	2015 ban (2018 compliance deadline)
polyoxyethylene-8-stearate (Myrj 45)	emulsifier	High levels caused bladder stones and tumors (1952)
safrole	natural flavoring (root beer)	Liver cancer (1960)
thiourea	preservative	Liver cancer (c. 1950)

Glossary

Acidulant

is used to make foods more acidic for reasons of taste, preservation, or other purpose.

Antioxidants

retard the oxidation of unsaturated fats and oils, colorings, and flavorings. Oxidation leads to rancidity, flavor changes, and loss of color. Most of those effects are caused by reaction of oxygen in the air with fats.

Carcinogen

is a chemical or other agent that causes cancer in animals or humans.

Chelating Agents

trap trace amounts of metal atoms that would otherwise cause food to discolor or go rancid.

Emulsifiers

keep oil and water mixed together.

Flavor Enhancers

have little or no flavor of their own, but accentuate the natural flavor of foods. They are often used when very little of a natural ingredient is present.

Thickening Agents

are natural or chemically modified carbohydrates that absorb some of the water that is present in food, thereby making the food thicker. Thickening agents "stabilize" factory-made foods by keeping the complex mixtures of oils, water, acids, and solids well mixed.

Cancer Testing

Chemicals usually are tested for an ability to cause cancer by feeding large dosages to small numbers of rats and mice. Large dosages are used to compensate for the small number of animals that can be used (a few hundred is considered a big study, though it is tiny compared to the U.S. population of more than 300 million). Also, the large dosages can compensate for the possibility that rodents may be less sensitive than people to a particular chemical (as happened with thalidomide). Some people claim that such tests are improper and that large amounts of any chemical would cause cancer. That is not true. Huge amounts of most chemicals do not cause cancer. When a large dosage causes cancer, most scientists believe that a smaller amount would also cause cancer, but less frequently.

It would be nice if lower, more realistic dosages could be used, but a test using low dosages and a small number of animals would be extraordinarily insensitive. It would also be nice if test-tube tests not using any animals were developed that could cheaply and accurately identify cancer-causing chemicals. While some progress has been made in that direction, those tests have not proven reliable. Thus, the standard high-dosage cancer test on small numbers of animals is currently the only practical, reasonably reliable way to identify food additives (and other chemicals) that might cause cancer. Ideally, faster, cheaper, more reliable tests that don't involve animals will be developed in the next few years.

The Delaney Clause is an important part of the federal Food, Drug, and Cosmetic Act. That important consumer-protection clause specifically bans any additive that "is found to induce cancer when ingested by man or animal." The food and chemical industries have tried, but so far failed, to weaken or repeal that law.

SODIUM CASEINATE

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NUTRITION TIPS

We can't get enough of these easy black lentil dishes (/tip/we-can%E2%80%99t-get-enough-these-easy-black-lentil-dishes)

All recipes in this post developed by Kate Sherwood, The Healthy Cook.

[Click here for a printer-friendly version of these recipes. \(https://www.nutritionaction.com/wp-content/uploads/hc_september2018_download-1.pdf\)](https://www.nutritionaction.com/wp-content/uploads/hc_september2018_download-1.pdf)

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