Sugar Substitutes

Sugar substitutes, also called artificial sweeteners, take the place of sucrose (table sugar) and other sugars (see Appendix A) to sweeten foods and beverages. The U.S. Food and Drug Administration (FDA) regulates artificial sweeteners through the Food Additives Amendment to the Food, Drug and Cosmetic Act, passed by Congress in 1958. This law requires the FDA to approve food additives, including artificial sweeteners, before they can be made available for sale in the United States.

Studies show conflicting evidence of potential harm caused by sugar substitutes. Most have little or no calories, so contribute nothing in terms of nutritional value to our foods. Many are made from ingredients we would never consider eating under normal circumstances. Recent studies indicate that despite their lack of calories, most sugar substitutes seem to contribute to weight gain rather than prevent it. Sugar substitutes do not seem to contribute to tooth decay as sugars do.

The following list gives the names and some information about common sugar substitutes approved by the FDA.

**Acesulfame K**, sold under the trade names Sunett and Sweet One, was accidentally discovered by a chemist in 1967 and is widely used in foods, beverages and pharmaceutical products around the world. It is 180-200 times sweeter than sucrose (table sugar), as sweet as aspartame, about half as sweet as saccharin, and one-quarter as sweet as sucralose, and has a slightly bitter aftertaste, especially at high concentrations. Blending it with other sweeteners (usually sucralose or aspartame) gives it a more sugar-like taste as each sweetener masks the other's aftertaste and/or makes it taste sweeter than its components. It can be used in baking and is often used to sweeten protein shakes or make chewable and liquid medications more palatable.

**Aspartame**, sold under the brand names NutraSweet, AminoSweet, Equal, and Candarel, was first synthesized by a chemist in the course of producing antiulcer drug candidates in 1965. It is found in approximately 6,000 consumer foods and beverages sold worldwide, including (but not limited to) diet sodas and other soft drinks, instant breakfasts, breath mints, cereals, sugar-free chewing gum, cocoa mixes, frozen desserts, gelatin desserts, juices, laxatives, chewable vitamins supplements, milk drinks, pharmaceutical drugs and supplements, shake mixes, tabletop sweeteners, teas, instant coffees, topping mixes, wine coolers and yogurt. It breaks down when heated and loses much of its sweetness making it less suitable for baking than other sweeteners. When eaten aspartame breaks down into natural residual components, including aspartic acid, phenylalanine, methanol, and further breakdown products including formaldehyde and formic acid. Because its breakdown products include phenylalanine, aspartame must be avoided by people with the genetic condition phenylketonuria (PKU).

**Cyclamate** has been banned by the FDA for use in the United States, but is used as an approved sweetener in over 55 countries including Canada where Sweet'N Low and Sugar Twin contain cyclamate. It was discovered in 1937 by graduate student working in the lab on the synthesis of anti-fever medication. It is 30–50 times sweeter than sugar making it the least potent of the commercially used artificial sweeteners. It is often combined with other artificial sweeteners, especially saccharin; the common mixture of 10 parts cyclamate to 1 part saccharin masks the off-tastes of both sweeteners. It is less expensive than most sweeteners, including sucralose, and can be used in cooking an baking.
Maltitol, a sugar alcohol or polyol, made from maltose has 75-90% of the sweetness of sucrose (table sugar) and nearly identical properties, except for browning. Used to replace table sugar because it has fewer calories, does not promote tooth decay, and has a somewhat lesser effect on blood glucose, it is known under trade names such as Maltisorb, Maltisweet and Lesys. Like other sugar alcohols, large quantities can have a laxative effect.

Mannitol, another of the naturally occurring sugar alcohols or polyols, can act as diuretic agent and weak renal vasodilator. It was originally isolated from the secretions of the flowering ash, and can be synthesized through the hydrogenation of fructose or extracted from a wide variety of plants.

Neotame, produced by the NutraSweet Company is the most recent addition to FDA’s list of approved artificial sweeteners and was developed specifically as an artificial sweetener. Food manufacturers find it attractive for use in diet soft drinks and low-calorie foods because it lowers the cost of production compared to using sugar or high fructose corn syrup (due to the lower quantities needed to achieve the same sweetening). The body appears to rapidly metabolize, completely eliminate and not accumulate this sweetener.

Saccharin, sold under the brand name Sweet’N Low was discovered by a chemist working on coal tar derivatives in 1878. Commercialized not long after its discovery, it took sugar shortages during World War I to reach widespread use. Its popularity further increased during the 1960s and 1970s among. Saccharine, used to sweeten products such as drinks, candies, biscuits, medicines, and toothpaste, is much sweeter than sucrose, but has a bitter or metallic aftertaste, especially at high concentrations.

Sorbitol, is a sugar alcohols or polyols metabolized slowly by the body. Obtained by reduction of glucose sorbitol is found in apples, pears, peaches, and prunes. It is also sold as glucitol, Sorbogem and Sorbo.

Stevia, the common name of stevia rebaudiana, grows in subtropical and tropical regions of North and South America. As an herb it is used by native healers to treat diabetes. The herb can have a bitter or licorice-like which diminishes somewhat with low concentrations of the extracts. Stevia leaf may be ground into a green powder or appear as white powder or liquid extracts. It is sold under a variety of names – Truvia, PureVia, Steviva, SweetLeaf – among others. Sometimes stevia gets combined with dextrose or other products to give it more bulk. Read the product ingredient labels and try different brands for taste.

Sucralose, sold under the brand name Splenda, Sukrana, SucraPlus, Candys, Cukren and Nevella, discovered in 1976 by scientists researching ways to use sucrose as a chemical intermediate in non-traditional areas. It has no nutritive (or caloric) value as the body does not break it down and excretes it whole. It also does not readily break down in the environment and is currently found in wastewater. Sucralose does not react to heat or melt allowing it to be used in cooking and baking recipes which do not require caramelizeing sugar. Sucralose is often mixed with maltodextrin and/or dextrose which adds approximately 2-4 calories per teaspoon however the FDA allows for any product containing less than 5 calories to be labeled as "zero-calorie".

Xylitol is a naturally occurring sugar alcohol sweetener. Usually made from hardwood or maize, it is
found in the fibers of many fruits and vegetables, and can be extracted from various berries, oats, and mushrooms, as well as fibrous material such as corn husks and sugar cane bagasse (maize and sorghum husks also used to make biofuels). Xylitol is roughly as sweet as sucrose with only two-thirds the food energy. Use may result in temporary gastrointestinal side effects, such as bloating, flatulence, and diarrhea, which will diminish with frequent consumption. It has been shown to benefit dental health in humans but can be toxic to dogs.