



Sugar Substitutes: Artificial Sweeteners and Sugar Alcohols

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Most people enjoy the sweet taste of food. Artificial sweeteners and sugar alcohols can provide the sweet flavor and be beneficial for people with diabetes or those choosing to avoid sugars because they contain lower calories and carbohydrates than regular sugars. These products are also beneficial in that they do not cause tooth decay.

Sugar substitutes are food additives that duplicate the taste of sugar in food, but do not supply food energy or calories. Some sugar substitutes are natural and others are synthetically produced. These synthetically produced sweeteners are generally called artificial sweeteners.

In the United States, there have been six sugar substitutes approved for use by the United States Food and Drug Administration (FDA). The six products are: aspartame, sucralose, neotame, acesulfame potassium, saccharin and stevia (approved as a supplement and GRAS-generally safe and natural products do not need FDA approval). There is some controversy over the safety of artificial sweeteners, but they have been approved by the FDA. To date, the FDA has not been presented with scientific information that would support a change in conclusions about the safety of these approved high-intensity sweeteners. These conclusions of the FDA are based on a large review of information, including hundreds of toxicological and clinical studies.

Names and Characteristics of Artificial Sweeteners

Aspartame (Equal, NutraSweet,) contains 4 calories per gram, but it is 160 to 220 times sweeter than table sugar, so it provides negligible calories. Aspartame is made from two amino acids (protein building blocks); aspartic acid and phenylalanine. It is not heat stable so it is not recommended for cooking. Aspartame safety has been evaluated by several agencies including the Food and Drug Administration and has been approved. In the 20 years it has been available there have been no adverse effects reported. People with phenylketonuria (PKU), a rare genetic disorder, cannot use Aspartame, because it contains phenylalanine.

Acesulfame K (Sunett and Sweet One) has no caloric value and is 200 times sweeter than table sugar. It is heat stable and blends with other sweeteners. No safety concerns have been raised about it, and it is safe for all individuals.

Saccharin (Sweet and Low) is 200 to 700 times sweeter than table sugar and has no caloric value. It is heat stable. People have been concerned about the safety of this product due to the publicized research results found in the 1970s linking it to bladder tumors in laboratory rats. Studies have now documented that saccharin is safe for humans.

Sucralose (Splenda) is 600 times sweeter than table sugar. It is made directly from sugar, but is not a natural product. It has been approved for use in the US since 1998. It was developed in 1976 and has undergone intensive testing for the past 25 years with Food and Drug Administration (FDA) and several national medical, scientific and regulatory organizations. All entities have found sucralose to be a safe food product. Individual packages contain less than 1 gram of carbohydrate. Sucralose is heat stable and may be used in cooking and baking.

Neotame (NutraSweet) is 7,000 to 13,000 times as sweet as table sugar. It has very little aftertaste that is associated with other sweeteners. Neotame is made from two amino acids, aspartic acid and phenylalanine. However, unlike aspartame, it does not carry a warning for individuals with PKU because the metabolism reduces the availability of phenylalanine. Neotame is heat stable and can be used in beverages, dairy products, and baked goods.

Stevioside (Truvia and RureVia) is 250 to 300 times sweeter than table sugar. It is extracted from the leaf of a stevia plant which is native to South America. It can be used in a variety of foods and is heat stable. From the information submitted by the industry, the FDA has concluded there is no basis to object to the use of certain refined stevia preparations in food. The FDA has issued a “no objection” for the use of the Truvia and RureVia which are derivatives of the leaf stevia. The stevia plant has not been approved for use as a food additive. Its refined product called rebaudioside A is the approved food product.

Sugar alcohols (also called polyols) are considered as sugar substitutes. Sugar alcohols are manufactured carbohydrates (made by adding hydrogen atoms to sugar) that occur naturally in certain fruits and vegetables. Sugar alcohols contain calories and have some natural sweetness. Sugar alcohols are lower in calories and convert to glucose more slowly than sugars. Though they are listed as sugar alcohols, they are not alcoholic. They do not contain ethanol, which is found in alcoholic beverages.

Sugar alcohols are: erythritol, hydrogenated starch hydrolysates, isomalt, lactitol, maltitol, sorbitol, and xylitol.

The FDA regulates sugar alcohols as food additives. They are labeled GRAS (generally recognized as safe and do not require FDA approval).

Few health concerns are associated with sugar alcohols. Large amounts (usually more than 50 grams) can have a laxative effect, causing bloating, intestinal gas and diarrhea. FDA requires a laxative effect warning on products containing over 50 grams of a sugar alcohol.

Sugar alcohols are generally not used for home cooking, but used in manufactured baked goods, candy, gum, toothpaste, and fruit spreads. Sugar alcohols keep foods moist and add volume to the product. These sugar substitutes are “bulky” and generally equal the amounts of sugar.

Names and Characteristics of Sugar Alcohols

Erythritol occurs naturally in fruits such as pears, melons and grapes, as well as foods such as mushrooms and fermentation-derived foods such as wine, soy sauce and cheese. Since 1990, erythritol has been commercially produced and added to foods and beverages to provide sweetness, as well as enhance their taste and texture.

Hydrogenated starch hydrolysates (HSH) are products found in a variety of foods. These sugar alcohols serve a number of functional roles, including use as a bulk sweetener, adding viscosity or body to foods, and serving as sugar-free carriers for flavors and colors. HSH products have been used by the food industry for many years, especially in confectionery products. HSH are produced by the partial hydrolysis of corn, wheat or potato starch. The end product is an ingredient composed of sorbitol, maltitol and higher hydrogenated saccharides.

Isomalt is a substitute sugar made from the sugar sucrose. Isomalt is unique among replacement sugars because it retains almost all of the physical properties of real sugar. Isomalt absorbs little water, so products do not become sticky which is an added benefit for sugar artists, cake decorators and pastry chefs.

Lactitol is currently used as a bulk sweetener in calorie-controlled foods. Due to its stability,

solubility and similar taste to sucrose, lactitol can be used in a variety of low-calorie, low-fat and/or sugar-free foods such as ice cream, chocolate, hard and soft candies, baked goods, sugar reduced preserves, chewing gums and sugar substitutes.

Maltitol is about 90% as sweet as sugar, non-cariogenic, and has half the calories of sugar. Maltitol is useful in the production of sweets, including sugarless hard candies, chewing gum, chocolates, baked goods and ice cream.

Mannitol is about 50% as sweet as sugar. It is manufactured for use in food and pharmaceuticals and is found naturally in mushrooms and trees. It is often used as a dusting powder for chewing gum products.

Sorbitol is a bulk sweetener found in numerous food products. Sorbitol is about 60 percent as sweet as sucrose with one-third fewer calories. It has a sweet, cool and pleasant taste and feels smooth in your mouth. It is non-carcinogenic. Sorbitol is found naturally in fruits and berries. Sorbitol has been safely used in processed foods for almost half a century.

Xylitol is a white crystalline powder that is gaining increasing acceptance as an alternative sweetener due to its role in adding sweetness to foods and in reducing the development of dental caries (cavities). Xylitol occurs naturally in many fruits and vegetables and is even produced by the human body during normal metabolism. It is commercially produced from plants such as birch and other hard wood trees. Xylitol is approved as a direct food additive for use in foods for special dietary uses.

Artificial sweeteners and sugar substitute products add sweetness and flavors to food while being safe

alternatives for reduction of sugars and calories in daily diets. Substitutes may be helpful, in reasonable amounts, for controlling diabetes, weight, and tooth decay. The American Diabetes Association recommends that these products should not be used in excess.

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