SUGAR REFORMULATION: COMMONLY USED INGREDIENTS

Efforts to reduce or remove sugar from foods and beverage products require reformulation. No single ingredient can replace real sugar's flavor and function; when sugar is removed, often several ingredients are added. Ingredients commonly used to replace one or more functions of sugar in products are shown below. It's important to note that none of these ingredients are declared as added sugars on the Nutrition Facts Label and can only be found on the ingredient list. For reference, sugar is also included below.

the Sugar association
There's more to sugar.

INGREDIENT	CALORIES	SWEETNESS COMPARED TO SUGAR %	SOURCE/PRODUCTION	FUNCTION: SWEETNESS	FLAVOR	TEXTURE / BULK	PRESERVATION	FERMENTATION	FREEZING POINT DEPRESSION	COLOR	MOISTURE RETENTION	APPLICATION
Sugar	4 calories/gram	**Standard** for sweetness	Extracted from sugar beet and sugar cane plants.	●	●	●	●	●	●	●	●	Used in foods and beverages for a variety of functional purposes.
SUGAR ALCOHOLS (POLYOLS)												
Erythritol	0 calories/gram	**70%** as sweet	Produced by fermentation of cornstarch.	●	●	●						Commonly used in low-sugar and sugar-free foods.
Hydrogenated Starch Hydrosylate (mixture of sugar alcohols)	3 calories/gram	**20-50%** as sweet	Produced by the partial hydrolysis of starch, corn being the most prominent source.	●		●						Used in low-sugar and sugar-free foods.
Isomalt	2 calories/gram	**50%** as sweet	Manufactured from sucrose, the fructose portion of the glucose-sucrose bond is converted to equal parts sorbitol and mannitol.	●		●						Used in hard and soft candies, chocolate, ice cream, jams and jellies, baked goods, fillings and fondants, chewing gum and cough drops.
Maltitol	2.1 calories/gram	**70-90%** as sweet	Manufactured through hydrogenation of maltose derived from cornstarch.	●		●					●	Used in hard and soft candies, jams and jellies, baked goods, baking mixes, chewing gum and cough drops.
Mannitol	1.6 calories/gram	**50-70%** as sweet	Widespread in nature, it is commercially manufactured from fructose (from cornstarch) through hydrogenation.	●	●	●						Used in hard and soft candies, jams and jellies, frostings, chewing gum and cough drops.
Sorbitol	2.6 calories/gram	**60%** as sweet	Small amounts are present in some fruits. Commercially it is manufactured by hydrogenating dextrose (from cornstarch).	●		●					●	Used in hard and soft candies, jams and jellies, baked goods, baking mixes, chewing gum and cough drops.
Xylitol	2.4 calories/gram	**Equal** sweetness	Can be extracted from the bark of birch trees. Commercially it is produced from corn.	●	●	●						Has a pronounced mint flavor. Used in chewing gums, candies, pharmaceuticals, toothpastes and mouthwashes.

NON-CALORIC SWEETENERS

INGREDIENT	CALORIES	SWEETNESS COMPARED TO SUGAR %	SOURCE/PRODUCTION	FUNCTION: SWEETNESS	FLAVOR	TEXTURE / BULK	PRESERVATION	FERMENTATION	FREEZING POINT DEPRESSION	COLOR	MOISTURE RETENTION	APPLICATION
Acesulfame K	0 calories/gram	200x sweeter	A potassium salt, made by combining acetoacetic acid and potassium.	●								Widely used. Found in foods, beverages, oral hygiene and pharmaceutical products. Often mixed with Aspartame.
Advantame	0 calories/gram	20,000x sweeter	Chemical composition of Aspartame and vanillin.	●								Used in processed foods and cooking.
Allulose	0.4 calories/gram	70% as sweet	A "rare sugar" naturally present in wheat, figs and raisins. Commercially, it is manufactured from corn through enzymatic reactions.	●	●	●			●	●		Used in beverages, baked goods and frostings, yogurt, frozen dairy desserts, salad dressings, jams and jellies, chewing gum, candies, sauces and syrups, gelatins and fat-based cream used in modified fat/calorie cookies.
Aspartame	4 calories/gram	150-250x sweeter	Aspartame is a methyl ester of aspartic acid/phenylalanine dipeptide. Typically aspartame is made through chemical synthesis.	●								Ubiquitous. Used in sodas, cookies, chewing gum, mints and diet products. Not heat stable. Individuals with Phenylketonuria (PKU) should avoid consuming aspartame.
Monk fruit (Lou Han Guo)	0 calories/gram	200-400x sweeter	Monk fruit mogrosides are extracted by crushing, adding water, filtering and spray drying.	●								Used in low-sugar and sugar-free foods and beverages.
Neotame	0 calories/gram	8,000x sweeter	A derivative of the amino acids phenylalanine and aspartic acid.	●								Used in baked goods, beverages, candies, chewing gum, dairy products, frozen desserts, puddings and yogurts, and as a tabletop sweetener.
Saccharin	0 calories/gram	300-500x sweeter	Saccharin is a sodium salt, made through the oxidation of 0-toluensulfaonamide and/or phthalic anhydride.	●								Used in a wide range of diet foods and beverages including soft drinks, baked goods, jams, canned fruit, sweets and salad dressings. Also used in personal care products, pharmaceuticals and vitamins.
Stevia (Stevioside and Rebaudioside A)	0 calories/gram	200x sweeter	Stevia leaves are boiled, passed through a resin and washed in alcohol to release the glycosdies, which provide the sweet taste. The glycosides are then recrystallized. Stevioside and Rebaudioside A (or Reb A) are common steviol glycosides.	●								Used in soft drinks, candies, chocolate, chewing gum, ice cream, yogurt, jams and puddings, and as a tabletop sweetener. Stevia consumer products are often mixed with erythritol or sugar, in some cases 99% of the product is erythritol.
Sucralose	0 calories/gram	400-600x sweeter	Manufactured through chlorination of sucrose in a multistep process.	●								Ubiquitous. Used worldwide in over 4,000 foods and drinks such as no-sugar-added fruit, diet soft drinks and reduced sugar juices.

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FIBERS												
Fructooligosacchardies (chicory root)	1.5-2 calories/gram	30% as sweet	Found in many different plants, most commonly extracted from chicory root or blue agave. Can also be made through chemical processes.	●		●						Use to replace part of the sugar in reduced calorie foods and beverages. Also have a prebiotic effect.
Inulin (chicory root)	1.5 calories/gram	10% as sweet	Found in many different plants, most commonly extracted from chicory roots. Can also be synthesized from sucrose.			●						Widely used in functional foods.
Isomalto-oligosaccaride (IMO)	2 calories/gram	50% as sweet	Found naturally in some fermented foods and can also be manufactured commercially from starch from cereal crops.			●						Mainly used in protein and health bars.
Oligofructose	1.5 calories/gram	30-50% as sweet	Found in many different plants, most commonly derived from hydrolysis of inulin derived from chicory roots. Can also be synthesized from sucrose by transfructosylation.			●						Widely used in functional foods and reduced-sugar foods and beverages. Can mask aftertaste of high intensity sweeteners.
Polydextrose	1 calories/gram	Much less sweet	Does not occur in nature. Synthesized from glucose, sorbitol and citric acid.			●					●	Used as a replacement for sugar, starch and fat in diet and "diabetic friendly" processed foods such as candy, frozen desserts, cultured dairy products, bakes goods, nutrition bars, fruit spreads and fillings.
PRESERVATIVES												
Benzoates	N/A	N/A	Occur naturally in many foods. Produced industrially by the neutralization of benzoic acid.				●					Most widely used in acidic foods such as salad dressings, carbonated drinks, jams, pickles and condiments.
Sorbate	N/A	N/A	Produced industrially by neutralizing sorbic acid with potassium hydroxide.				●					Used in cheese, wine, yogurt, dried meats, rehydrated fruits, soft drinks, fruit drinks and baked goods. Also used by fast-food restaurants.
OTHER												
Colors	N/A	N/A	Can be natural (plant-based) or artificial.							●		Ubiquitous.
Flavorings	N/A	N/A	Can be natural or artificial.		●							Ubiquitous.
Glycerol (glycerin)	4 calories/gram	40% as sweet	Produced by hydrolysis, saponification or transesterification of triglycerides occuring in plants, most commonly soybeans.	●							●	Used as a food ingredient for its low GI (diabetic products). No special application for calorie control.
Hydrocolloids	0-3.3 calories/gram	N/A	Can be isolated from plants or animals, obtained by fermentation or plant-derived and chemically modified.			●						Widely used as thickening and gelling agents. Xanthan gum and guar gum are examples.

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