THE SKINNY ON SUGAR SUBSTITUTES ©Dr John Freedman 2026

Table sugar is SUCROSE - a disaccharide made up of glucose and fructose in equal quantities. SUGAR SUBSTITUTES are a very heterogeneous group of non-sucrose substances that trigger our sweet taste receptors to mimic sucrose. These include true 'ARTIFICIAL SWEETENERS' (synthetic compounds) as well as a host of natural products or processed natural products. The following chart provides an overview of the most common sugar substitutes and their characteristics:

	BRAND NAME	SOURCE	SWEETNESS (compared to sucrose	ADVERSE HEALTH EFFECTS?	COMMENTS
STEVIA	*Truvia*	Glycosides from Stevia leaf	150X	Possible GI upset	Heat-stable Slight licorice flavor No calories
SACCHARIN	*Sweet 'N Low*	Synthetic	300X	None known in humans Bladder cancer at high doses in rats, not humans.	Heat-stable, metallic after-taste. Negligible calories
SUCRALOSE	*Splenda*	Synthetic	600X	Possible impaired glucose metabolism. Possible toxic compounds with high heat.	Heat-stable sweetness (though concerns have been raised about toxins produced). No calories.
ASPARTAME	*Equal* *Nutrasweet* *Sugar Twin*	Synthetic	8X	Possible carcinogen - (limited evidence). Avoid in phenylketonuria. FDA approved as safe.	Not heat-stable. Contains phenylalanine Negligible calories
XYLITOL	Various	Natural sugar alcohol	1X	Possible bloating, GI upset. Highly toxic to dogs!	Heat-stable. 9 calories/tsp
ERYTHRITOL	Various	Natural sugar alcohol	1X	Possible bloating, GI upset. Non-toxic to dogs	Heat-stable. 9 calories/tsp
MONK FRUIT	Various	Monk fruit glycosides (Asian melon)	200X (pure extract) 1X when mixed with bulking agent	None known in humans. GI effects when mixed with erythritol.	Heat-stable. Usually sold mixed with erythritol for baking. No calories in pure extract.
CYCLAMATE	*Sweet 'N Low* (in Canada)	Artificial	30X	Testicular atrophy at high doses in animals. Banned in USA 1970.	No calories. ©JFreedman2026

The **HEALTH ASPECTS OF THESE SUBSTANCES** are the subject of extensive ongoing research and also very commonly the subject of sensationalized headlines and articles in the mainstream press. For the most part these substances (except for cyclamates in the USA) are categorized as "generally recognized as safe" by the United States Food & Drug Administration in that there is very limited data suggesting harm. In some cases such as ASPARTAME with respect to diabetes and coronary disease there appears to be an association - but that does not prove causation. Populations that consume high amounts of sugar substitutes are often the populations most at risk for diabetes and heart disease and more research is necessary to tease out whether there is a causal relationship. That said, here is some more information to flesh out the 'ADVERSE HEALTH EFFECTS ?' column in the above chart:

STEVIA (***Truvia***) The steviol glycosides can cause some people to experience bloating, nausea or other GI effects. People allergic to ragweed-family plants may sometimes have a cross-allergy with stevia leaf. Note that stevia is sold as a processed extract. Some sources consider stevia a preferred sugar substitute because of the lack of data suggesting harm, its heat stability for baking, and its lack of an unpleasant after-taste. On the 'feelings' side - not the scientific side - many people seem to like the fact that is a natural product. But note that the actual crude stevia leaf has not been well-studied and is not approved by the FDA - so this is one case where you don't want to go 'organic'.

SACCHARIN (*Sweet 'N Low* in the USA) has been linked to bladder tumors in male rats through a mechanism that does not appear to apply to humans, and it was removed from the US list of carcinogens in 2000 because there is no evidence to suggest human carcinogenicity. Rarely, people with sulfa allergies can react to it.

SUCRALOSE (Splenda): Some research suggests that sucralose, like everything we ingest, can have effects on gut bacteria (our microbiome). This in turn may affect how we absorb and metabolize glucose. A sucralose metabolite has shown genotoxic potential in *in vitro* lab studies, but clinical relevance and human relevance is unclear at best. Heating sucralose at high temperatures may form potentially toxic compounds and in Germany (where the studies were done) it is not recommended for baking. Overall sucralose is considered safe by the FDA, though studies are ongoing, as they should be.

ASPARTAME (***Equal, Nutrasweet, Sugar Twin)*** is the artificial sweetener in Diet Coke, Coke Zero and Diet Pepsi. It must be avoided by people with a rare metabolic disease (less than 1 in 10,000 people) known as phenylketonuria (PKU) because it contains phenylalanine which affected individuals cannot metabolize, causing it to build up to toxic levels. The WHO's cancer agency classified aspartame as "possibly carcinogenic" (specifically liver cancer) in 2023, based on limited evidence. The joint WHO/FAO Food Additives Committee kept the acceptable daily intake unchanged. Some people report headaches, though controlled studies are inconsistent.

SUGAR ALCOHOLS are themselves a heterogeneous group of sugar substitutes.
Xylitol: Gas, bloating, and diarrhea at higher intakes. Highly toxic to dogs - this is very real and very important as many gums, candies and other products contain xylitol which must be kept away from canines. Recent research from the Cleveland Clinic group found xylitol behaves similarly to erythritol in the bloodstream, and the team called for more long-term studies on cardiovascular safety.
Erythritol: Usually gentler on digestion, though large amounts can still upset the stomach. Observational studies have linked higher blood levels to heart attack and stroke and lab work suggests possible increased platelet activity which could lead to such events . The association of erythritol with vascular events is still debated, and a causal link has not been established.
Sorbitol, maltitol, mannitol, lactitol: These are the most likely to induce diarrhea. They can also cause cramping and gas. These are common ingredients in "sugar-free" candy and due to low doses usually have minimal or no adverse GI effects for most people. There is some evidence that higher doses can elevate blood sugar, with maltitol raising blood sugar more than the others. **Allulose** is often grouped with the sugar alcohols but technically it is not in that class - it is a simple monosaccharide sugar. It can cause GI side effects like the sugar alcohols. Some animal studies suggest adverse effects on the liver at high doses. There is no strong evidence linking it to effects on blood sugar or associations with cardiovascular events but studies in humans are lacking.

MONK FRUIT: No major safety concerns have been raised as yet, but long-term human research is limited. Rare allergy is possible in people sensitive to gourd-family plants. Note that monk fruit is increasingly used for baking 'keto' treats but most monk fruit sold to consumers is heavily mixed with erythritol (which gives it bulk and an approximately 1:1 volume ratio with table sugar to make it easy to use in recipes).

CYCLAMATE: Banned in the US since 1970 after rat studies showed testicular atrophy due to a metabolite, though it is still approved and available in many other countries including Canada where it uses the *Sweet N' Low* brand name (whereas in the USA *Sweet 'N Low* is the brand name for saccharin).

THE BOTTOM LINE:

Large observational studies link heavy use of some sugar substitutes to diabetes, cardiovascular disease, and weight gain, and this association has held up in many studies suggesting it is real. But this can reflect reverse causation, since people at higher risk often switch to diet products. Teasing this out is the focus of current long-term studies including true randomized controlled studies which may well help sort out whether these substances cause the problems or are innocent bystanders in those already at risk. There have been enough studies to show that the *association* is very real, and in a few studies to date the ingestion of sugar substitutes has been shown by statistical analysis to be a risk factor i*ndependent* of other predisposing factors such as pre-existing obesity, smoking and diabetes. So this remains a cause of concern for those with a large intake of some sugar substitutes. Gut microbiome changes are real (as is the case for many foods and additives) and may underlie these effects if causality is shown.

Moderate use of sugar substitutes is generally considered low risk for most healthy adults, with the exception of aspartame in phenylketonurics. Even if risks do pan out for some of these substances, quantifying the risk is extremely important because sucrose (table sugar) itself is unquestionably highly toxic to our bodies over time. Chronic high consumption of sucrose has been strongly linked to obesity, type 2 diabetes, cardiovascular disease, fatty liver disease, kidney disease, gout, and tooth decay, with some emerging evidence also suggesting possible connections to certain cancers and cognitive decline. Evidence also suggests that beverages sweetened with high fructose syrup are particularly toxic because of the way pure fructose is metabolized *vs.* the fructose-glucose disaccharide of table sugar. So it is necessary to consider any potential risks of sugar substitutes in comparison to the risks of ingesting sugar (table sugar or high fructose additives) itself. **Moderation in intake of sugar substitutes (as for all things!) seems like a very good idea to me, and one thing that the data indicates for sure is: avoid sugary beverages.**

For a good review of sugar substitutes, check out:
Beyond Sugar: A Review of Sweeteners and Their Role in Modern Nutrition
https://pmc.ncbi.nlm.nih.gov/articles/PMC12470175/

The usual disclaimer: This is my best up-to-date practical review of health concerns related to sugar substitutes. It is neither exhaustive nor meant to be taken as medical advice for any individual.