

# Artificial Sweeteners



## Overview of Artificial Sweeteners

Artificial sweeteners, which are zero- or low-calorie substitutes used to enhance the sweetness of foods and beverages, range from 200 to 20,000 times sweeter than sugar. Originally developed to aid in weight loss while allowing enjoyment of sweet treats, the widespread use of these sweeteners has raised health concerns over time.

In the United States, the Food and Drug Administration (FDA) has approved several artificial sweeteners, including:

**Aspartame (NutraSweet®, Equal®, Sugar Twin®)** is 200 times sweeter than sugar. Used in diet sodas, sugar-free gums, low-calorie dessert options like puddings and ice creams, as well as certain yogurts and tabletop sweeteners. Additionally, aspartame is used in some pharmaceutical products like chewable vitamins and sugar-free cough drops.

**Neotame (Newtame®)**, similar in structure to aspartame but approximately 7,000 to 13,000 times sweeter. Used in baked goods, beverages, candies, chewing gum, dairy products, frozen desserts, puddings, and yogurt-type products.

**Sucralose (Splenda®)**, which is calorie-free because it's not digestible, is excreted mostly via feces, with some absorbed and excreted through urine. It is found in diet sodas, flavored waters, ready-to-drink teas, sugar-free cookies, cakes, muffins, pastries, yogurts, sugar-free ice creams, sugar-free jams, syrups, low-calorie salad dressings, sugar-free candies, gum, mints, Splenda packets, granulated and liquid sweeteners, and protein shakes.

**Saccharin (Sweet 'N Low®, Sweet Twin®, Necta Sweet®)** is about 300 times sweeter than sugar and is excreted through urine, as it cannot be metabolized by the body. Used in diet sodas, sugar-free gums, candies, tabletop sweeteners, sugar-free jams, jellies, baked goods, low-calorie desserts, toothpastes, mouthwashes, and some pharmaceutical products.

**Acesulfame potassium (Ace-K) (Sunett®, Sweet One®)** is also 200 times sweeter than sugar. You can find it in diet sodas, fruit juices, alcoholic beverages, ice cream, yogurt, and in some processed snacks such as candies and chewing gum.

**Erythritol** is a sugar alcohol that's 70% as sweet as sugar. It is commonly found in sugar-free and low-calorie candies, chocolates, baked goods, diet sodas, flavored waters, ketchup, barbecue sauce, sugar-free gums, mints, and some dairy products. Protein bars, meal replacements, and dietary supplements also use erythritol to enhance flavor. Available as a standalone product, often blended with other sweeteners like stevia or monk fruit, it is used in coffee, tea, and cooking.

While these artificial sweeteners provide a sweet taste with minimal calories, growing evidence suggests that they may have several health risks.

## Potential Health Risks

### Heart Disease and Stroke

Several studies have linked the consumption of artificial sweeteners to an increased risk of heart disease and stroke. Research indicates that individuals who consume large amounts of artificially sweetened beverages may have a higher likelihood of experiencing cardiovascular events. A study in "Stroke" reported that higher intake of artificially sweetened beverages were associated with increased risk of stroke, particularly small artery occlusion subtype, coronary heart disease, and all-cause mortality. In a 2023 study, findings reveal that erythritol is both associated with increased major adverse cardiovascular events and fosters enhanced thrombosis.

### Type 2 Diabetes & Obesity

Contrary to their intended purpose of helping with weight management and blood sugar control, artificial sweeteners may increase the risk of developing type 2 diabetes. Recent studies have shown that artificial sweeteners affect glucose absorption, insulin secretion, and gut microbiota composition, potentially worsening glycemic control. These findings suggest that artificial sweeteners are not effective for treating obesity and diabetes and may be associated with increased health risks, warranting a reevaluation of their use. Another study found that higher consumption of artificial sweeteners is positively associated with an increased risk of developing type 2 diabetes. In May 2023, the World Health Organization recommended against the use of artificial sweeteners to control body weight, based on a systematic review of the evidence.

## Cancer

The relationship between artificial sweeteners and cancer has been debated for decades. A large cohort study found that higher consumption of artificial sweeteners, particularly aspartame and acesulfame-K, is associated with an increased risk of overall cancer, including breast cancer and obesity-related cancers. These results suggest the need for a reevaluation of the safety of these food additives by health authorities. Another study in the "American Journal of Clinical Nutrition" found that in men, consuming at least one daily serving of diet soda increased risks of non-Hodgkin lymphoma (NHL) (31% increased risk) and multiple myeloma (102% increased risk). Additionally, an increased risk of leukemia was associated with both regular and diet soda when data for men and women.

In July 2023, the World Health Organization noted that aspartame is "possibly carcinogenic to humans" and advised that an acceptable daily intake of aspartame is 40 milligrams per kilogram of body weight.

## Mental Health

Emerging research indicates that artificial sweeteners may negatively impact mental health. Aspartame has been associated with various behavioral and cognitive issues, including headaches, seizures, mood disorders, and insomnia. The review suggests that aspartame consumption can disrupt neurotransmitter balance and elevate cortisol levels, potentially increasing oxidative stress in the brain and contributing to adverse neurobehavioral health outcomes. A study published in JAMA shows that consuming nine daily servings of artificially sweetened ultra-processed foods is linked with a 50 percent higher risk of depression in women.

## Gut Health

The effects of artificial sweeteners on intestinal flora composition have been a research topic since the late 1980s. Research indicates that artificial sweeteners may negatively impact gut health. Artificial sweeteners have been shown to alter the composition and function of gut microbiota, which can lead to dysbiosis—a microbial imbalance that can affect overall health. Studies suggest that these changes in gut microbiota may contribute to metabolic disorders, including glucose intolerance and obesity. The disruption of the gut microbiome can also influence immune function and may play a role in the development of inflammatory diseases.

## Take Home Message

Artificial sweeteners, commonly used to reduce calorie intake and enhance the sweetness of foods and beverages, are significantly sweeter than sugar and are found in a variety of products. Despite their intended benefits for weight management and diabetes control, evidence suggests that these sweeteners may pose several health risks. Studies have linked artificial sweeteners to an increased risk of heart disease, stroke, type 2 diabetes, obesity, cancer, mental health issues, and negative impacts on gut health. Given these potential risks, it is essential to approach the consumption of artificial sweeteners with caution and consider natural alternatives when possible.

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