

The Truth About Aspartame

Aspartame is one of several low-calorie sweeteners (the others are acesulfame-K, neotame, saccharin, and sucralose) currently approved for food use in the United States. Often referred to by its brand names NutraSweet or Equal, aspartame is found in a variety of food products including soft drinks, yogurt, puddings, frozen desserts, baked goods, and chewing gum and other candies. It is also used as a “tabletop” powder to sweeten coffee and other beverages, as well as in pharmaceuticals such as cough drops and vitamins. In addition to being a sugar substitute, aspartame can intensify fruit flavors and make them last longer in products such as chewing gum.

Although aspartame was discovered in 1965, the Food and Drug Administration (FDA) did not approve it as a low-calorie tabletop sweetener and for use in powdered mixes until 1981, and for use in carbonated “diet” beverages until 1983. In 1996 FDA approved aspartame as a general purpose sweetener, allowing it to be used in all types of foods.

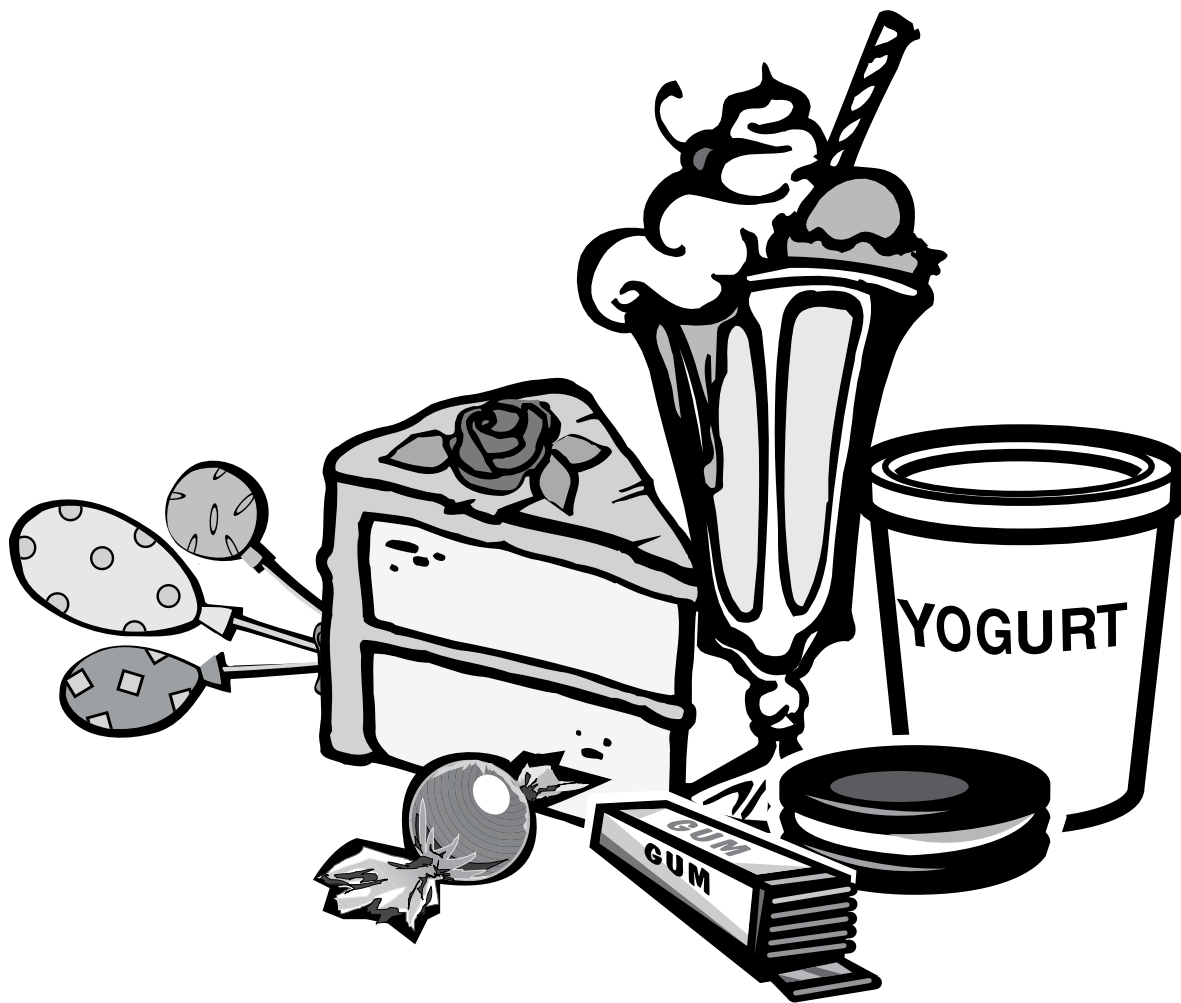


Almost from the time of its approval, aspartame has been a controversial food additive. Reports in the media—and especially on the Internet—have linked aspartame to a variety of illnesses and adverse effects, although none of these have ever been substantiated. This fact sheet provides background and practical information about aspartame, and summarizes the results of studies regarding its safety.

Structure and function

What is aspartame made from?

Aspartame is a molecule produced by joining two amino acids (protein building blocks) called phenylalanine and aspartic acid. When aspartame is consumed, it is completely broken down by the digestive system into these amino acids and a type of alcohol called methanol. The amino acids in aspartame occur naturally in all protein-containing foods, and methanol occurs naturally in fruit juices, fruits, and



vegetables. Aspartame itself does not occur naturally but is a manufactured substance.

The table on p. 8 compares the amounts of aspartame's constituents in various foods. For example, a serving of nonfat milk provides about 6-9 times more phenylalanine and 13 times more aspartic acid than the same amount of beverage sweetened with aspartame. A serving of tomato juice provides about 4-6 times more methanol than the same amount of aspartame-sweetened beverage.

How sweet is aspartame?

Aspartame is about 180-200 times sweeter than sucrose (ordinary table sugar), so only a small amount is needed to sweeten food. Although aspartame contains the same amount of calories per gram as sugar, it contributes virtually no calories to foods because of the extremely low levels that are used.

How stable is aspartame in food products?

Aspartame is unstable in foods that are cooked, baked, or exposed to high heat. It also gradually breaks down over time in carbonated and noncarbonated beverages. The breakdown products of aspartame include phenylalanine, aspartic acid and methanol, and another form of aspartame, all of which are safe for human consumption. However, because the sweetness of aspartame is lost when it breaks down, people are more likely to reject the food than consume it.

Can aspartame be used in cooking or baking?

Yes. In foods requiring lengthy heating or baking, a loss of sweetness occurs but the food is still safe to eat. To help with this problem, recipes specifically designed for

aspartame can be used, or aspartame can be added at the end of the cooking process. Some products containing aspartame may have a label statement informing consumers that aspartame loses its sweetness when heated, but this has nothing to do with safety.

Digestion

What happens to aspartame in the body after it is eaten?

During digestion, aspartame is completely broken down into its components—the amino acids, aspartic acid and phenylalanine, and a small amount of methanol—which are then absorbed into the blood and used by the body for energy and building body tissues. It makes no difference whether these components come from aspartame or food, as the body uses them in exactly the same way. Even when aspartame is consumed in huge amounts, the intact molecule never actually enters the bloodstream, and the levels of aspartame’s components in blood do not change any more than they do when we eat foods.

Labeling

How can you tell if a food contains aspartame?

All food ingredients, including aspartame, must be listed on the food label.

Why do foods containing aspartame carry a warning label?

Foods and beverages that contain aspartame must carry a label statement (“Phenylketonurics: Contains Phenylalanine”) because phenylalanine is released when aspartame is broken down during digestion. This statement is targeted to individuals with phenylketonuria (PKU) who must strictly limit their intake of the amino acid phenylalanine. PKU is a rare inherited disease (occurring in

Nutrition Facts	
Serving size 8 fl oz (240 mL)	
Amount Per Serving	
Calories 0	
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 25mg	1%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Sugars 0g	0%
Protein 0g	
Not a significant source of other nutrients.	
INGREDIENTS: CARBONATED WATER, CARAMEL COLOR, ASPARTAME, PHOSPHORIC ACID, POTASSIUM BENZOATE (PRESERVES FRESHNESS), CAFFEINE, CITRIC ACID, NATURAL FLAVORS (PHENYLKETONURICS: CONTAINS PHENYLALANINE)	

about 1 of every 15,000 births in the U.S.) in which phenylalanine is not properly metabolized and accumulates in the body. If phenylalanine intake is not controlled, serious health problems including mental retardation may occur in these individuals.

Routine screening for PKU is required for all newborns, and those with this defect are placed on a special phenylalanine-restricted diet from birth. Because of effective screening and treatment, many people with PKU are able to live near-normal lives except for having to restrict the amount of phenylalanine in their diet.

The phenylalanine label statement on aspartame-sweetened products may confuse consumers into believing that phenylalanine is an inherently dangerous substance, rather than a normal constituent of proteins. However, this label statement is only directed to individuals with PKU and is not relevant for the general population, which does not need to restrict phenylalanine intake. Unlike diabetes or high blood pressure, which may go undetected, people

with PKU are always aware of their disease. For these individuals, aspartame is an additional dietary source of phenylalanine that must be considered in their diet plan.

Consumption levels

How much aspartame can people safely consume?

Many food additives, including aspartame, are assigned an Acceptable Daily Intake (ADI) by the FDA. The ADI of a substance is the level considered safe if eaten each day throughout one's lifetime. To reach the ADI for aspartame (which is 50 milligrams per kilogram of body weight), an adult would have to consume about 20 cans of diet soft drink, or 42 servings of sugar-free gelatin, or 97 packets of an aspartame-containing tabletop sweetener each day—which is obviously not likely.

Is it safe to consume more aspartame than the ADI?

Yes. The ADI has a very large built-in safety factor and is a conservative estimate of how much of a substance one can safely consume. The ADI is not an absolute cutoff point where safety ends and risks begin. Occasionally going over the ADI of aspartame should not be a concern. In studies where people were given aspartame in amounts much greater than the ADI, no adverse health effects were seen.

How much aspartame are people actually consuming?

Although aspartame is widely used, consumption levels are well below the ADI, even for teenagers and diabetics, who tend to have the highest intakes. Surveys have shown that adults consume about 6% of the ADI, while children 2-5 years of age consume about 10% of the ADI for aspartame. In the general population, 9 out of 10 people consume less than 10% of the ADI. In fact, the estimated intakes of all the low-calorie sweeteners used in the U.S. are



well below their respective ADIs. Because many of the foods containing aspartame and other sugar substitutes have low nutritional value to begin with, consumers should limit consumption of these foods anyway.

Weight control

Does aspartame help people lose weight?

It is tempting to assume that since aspartame is used in low calorie products, eating such foods can help people lose weight. For example, a can of diet soft drink has about 150 fewer calories than a regular soft drink. Substituting a packet of an aspartame sweetener for two teaspoons of sugar three times daily saves about 100 calories a day. However, since aspartame came onto the market, Americans in general have gotten heavier, and the obesity epidemic has gotten worse. Weight control is a complex issue, and while aspartame and other ingredients used in low calorie foods may be part of the solution, it is unlikely they will solve the nation's weight control problem. Although it has been suggested that aspartame can stimulate the appetite and cause people to eat more, the overall scientific evidence actually indicates the reverse is true.

Safety

Is aspartame considered to be safe?

Yes. Aspartame is the most studied sweetener on the market. Because aspartame breaks down during digestion into ordinary food components and because it accounts for only a small proportion of the total intake of these components, it is not plausible that aspartame could cause adverse health effects. Prior to its approval, aspartame underwent one of the most comprehensive scientific reviews ever conducted, being tested in over 100 scientific studies. Since its approval, more than 100 additional studies have been conducted by many research institutions, which further confirmed its safety for the general population. Moreover, the safety of aspartame has been acknowledged by the American Medical Association, the American Dietetic Association, the American Diabetes Association, the World Health Organization, the European Commission, and the food regulatory agencies of over 100 countries.

How was aspartame tested for safety before it was approved for use in foods?

Aspartame was studied in both laboratory animals and people, including several specific population groups such as young children, healthy infants, lactating women, elderly people, diabetics, obese individuals, individuals with kidney disease, individuals with behavior disorders, and people who carry the gene for PKU. Aspartame was tested in amounts many times higher than individuals would consume in the diet. The total body of research indicated that aspartame was safe.

Is there any basis for consumer complaints about aspartame?

Many complaints about aspartame were reported to FDA's Adverse Reaction Monitoring System when aspartame was first introduced to the market in 1981. The complaints reached a peak in 1985, when

aspartame received adverse publicity in the media but since then the complaints to FDA have gradually declined. However, by 2000, FDA had received more than 7,000 complaints by consumers, who blamed aspartame for headaches, mood changes, seizures, poor memory, or allergic reactions. FDA has investigated these complaints and concluded that they could not be substantiated. In addition, many studies were conducted in animals and humans to determine whether aspartame may cause any disease or symptom, but none were found. In fact, there is overwhelming scientific evidence that aspartame is not associated with adverse health effects.

Is the methanol contained in aspartame dangerous?

Consumers sometimes worry about the methanol produced when aspartame is digested because pure methanol in large doses is toxic. However, methanol is widely distributed in plants and occurs in fruit juices, vegetables, fermented products, and other foods and beverages. Our bodies rapidly break down methanol to water and carbon dioxide (which we breathe). Therefore, we routinely consume methanol without ill effects, as the levels from foods and aspartame are far too low to cause symptoms of toxicity.

Has aspartame been found to affect the behavior of children?

No. Despite anecdotal reports that claim there is an association between aspartame and behavioral problems, many studies have shown that aspartame does not affect children's learning or behavior. There is no evidence that aspartame contributes to hyperactivity or attention deficit disorder. Moreover, it is not possible for the consumption of aspartame to raise blood levels of aspartic acid and/or phenylalanine high enough to alter brain functions, because the human brain is well-adapted to withstand large differences in the diets of individuals.

Does aspartame cause allergic reactions?

No. In well-designed studies with people who believed they were allergic to aspartame, researchers found aspartame was no more likely than a placebo to cause allergic reactions. However, as with any substance, it is possible that a small number of people may be uniquely sensitive to aspartame.

Is there any relationship between aspartame and cancer or tumor formation?

No. It is not plausible that aspartame could cause cancer, because aspartame itself never enters the bloodstream. Rather, it is broken down during digestion into its component amino acids and methanol. We consume these same components in much greater amounts from common foods, such as milk, meat, grains, fruits, and vegetables. Furthermore, long-term studies in laboratory animals that were fed extremely large amounts of aspartame found no evidence of cancer associated with aspartame. In addition, large studies conducted worldwide with thousands of humans who have consumed aspartame for many years have also concluded that there is no association between aspartame and cancer. Although a few studies have suggested that aspartame could cause brain tumors and other types of cancer, reputable scientists have disputed these findings, citing flaws in methodology or statistics.

Special groups

Can children consume aspartame-containing products?

Yes. Studies have shown that children break down and use aspartame components the same way that adults do. Long-term studies in laboratory animals have shown that aspartame does not affect growth and development.

Can pregnant women consume aspartame?

Yes. The American Academy of Pediatrics concluded that aspartame is safe for both the mother and the developing baby, and the American Medical Association has stated that women who are pregnant or breastfeeding can safely use aspartame. It is important that women consult with their doctors about proper nutrition during pregnancy.

Can persons with diabetes consume aspartame?

Yes. The American Diabetes Association has stated that aspartame does not affect blood sugar levels and is an acceptable sugar substitute for diabetics. Products sweetened with aspartame may help diabetics comply with their meal plans, regulate their carbohydrate and caloric intake, and control their disease.

Is aspartame safe for people with epilepsy?

Yes. Scientific studies have found no association between aspartame and seizures or epilepsy.

Information on the Internet

Is there any truth to the negative information about aspartame on the Internet?

No. Entering the term “aspartame” into an Internet search engine will yield more than one million citations, many to websites containing misinformation or anecdotal reports linking aspartame to a multitude of ailments and adverse effects. For example, there are Internet sites claiming that aspartame causes multiple sclerosis, systemic lupus, vision problems, headaches, fatigue, fibromyalgia, chronic fatigue syndrome, Alzheimer’s disease, cancer, Parkinson’s disease, birth defects, and a variety of other disorders. No scientific evidence exists that links any of these health problems



to aspartame, and such unfounded claims have been rejected by independent health organizations.

A message widely circulated by e-mail in 1999 claimed that aspartame-sweetened soft drinks provided to American troops during the Persian Gulf War might have been responsible for health problems experienced by some Gulf War veterans. Such nonscientific misinformation disseminated on the Internet has come to be known as an “urban legend.” Another report of seizures in airplane pilots led to two extensive controlled studies with trained pilots, which found no effect of aspartame on brain function. FDA and other government agencies, leading health authorities, and expert scientific committees in North America and Europe have evaluated the Internet allegations and found them to be false.

Conclusions









Today, aspartame is used in over 6,000 products and in more than 100 countries around the world. Although there have been allegations and anecdotal reports linking aspartame to a variety of illnesses,

its safety is supported by hundreds of scientific studies, making it one of the most thoroughly studied ingredients in the food supply. Despite the overwhelming scientific evidence and a lack of biological plausibility that aspartame could be harmful, misinformation about aspartame continues to be spread via the Internet. However, the total body of scientific evidence demonstrates that—even in amounts many times greater than the levels eaten by consumers with the highest intake— aspartame is not associated with any adverse health effects. Whenever new findings on aspartame are released, they are carefully evaluated by international regulatory experts who continue to monitor the safety of aspartame.

References and further information

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Comparison of aspartame-sweetened beverage with other common foods and beverages¹

Food	Phenylalanine (mg) ¹	Aspartic Acid (mg) ¹	Methanol (mg) ²
 Aspartame-sweetened beverage (12 oz.)	90	72	18
 Non-fat milk (12 oz.)	606	953	—
 Chicken breast (3 oz.)	1,059	2,377	—
 Boiled egg (1 large)	334	632	—
 Banana (1 medium)	58	146	21
 Orange juice (12 oz.)	24	180	23
 Apple juice (12 oz.)	—	—	29
 Tomato juice (12 oz.)	58	346	107

¹ USDA Nutrient Data Laboratory, 2007 <<http://www.ars.usda.gov/nutrientdata>>

² Ajinomoto Food Ingredients LLC, 2006

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