

Aspartame an in depth look at sweeteners biology essay



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This paper highlights the research and controversy surrounding the food additive, aspartame. Why as we, most Americans are unaware of the dangers of aspartame, although a large amount of research has been done. This paper will highlight the components of aspartame; how it was invented, approved by the FDA, is made and metabolized within the human body. As well as scientific studies and research on the substance. Overall, I will explain why it is important to educate ourselves as consumers.

Aspartame, An In-depth Look

At One of the Most Commonly Used Artificial Sweeteners

Aspartame can be found almost everywhere. Currently, there are only three alternative sweeteners in the United States that can be used in food products. The most common and most popular is aspartame. Aspartame is consumed by over 200 million people around the world and is found in more than 6, 000 products. (Calorie Control Council, 2010) Artificial sweeteners are manmade and used in many reduced calorie foods. Products containing aspartame include powdered soft drinks, breath mints, chewing gum, puddings and fillings, jams and jellies, juice blends, maple syrups, meal replacements, cereals, frozen desserts, canned goods, carbonated soft drinks (sodas), tabletop sweeteners (such as Sweet & Low) and some pharmaceuticals such as vitamins and sugar-free cough drops. Aspartame has established itself as an important component in many low-calorie, sugar-free foods and beverages and is primarily responsible for the growth over the last two decades in the sugar-free market. (Calorie Control Council, 2010) Aspartame is the technical name for the brand names Nutrasweet, Equal,

Spoonful, and Equal. In America, we are at war with obesity and it is quite evident throughout the years. As consumers, we seem to always obsess over the new low-calorie, no sugar foods. Whether aspartame is safe or not is the big question. For this paper, I am curious as to whether or not the use of aspartame is safe or not. I will highlight scientific information and research to help bring a conclusion to this question and why education and awareness of food additives is important for us to know as consumers.

There has been much buzz and controversy surrounding aspartame since it was first discovered thirty-five years ago. James M. Schlatter, a chemist, and American drug researcher at G. D. Searle and Co. in 1965. He unintentionally discovered it while he was working on an anti-ulcer drug. Schlatter mixed aspartic acid and phenylalanine, two naturally occurring amino acids (that are the building blocks of protein). This combination has been designated the chemical name N-L-aspartyl-L-phenylalanine-1-methyl ester (APM). Schlatter got a bit of the mixture stuck on his finger and decided to taste it, knowing it was not lethal. After tasting the sweetness of the mixture, Schlatter knew he had come on to something. And with that, a new, low-calorie sweetener was born. This initial breakthrough then led the company to screen hundreds of modified versions of APM. The Skokie, Illinois based pharmaceutical company, G. D. Searle & Co., employer to Schlatter, decided to manufacture it. (Nill, Ashley, 2010) Aspartame was now entered into the vigorous sugar-substitute competition that would be battled for years. As required by law, Searle petitioned the FDA for approval to market aspartame as a sweetening agent in certain foods. Included in its petition, was extensive data from the research that had been performed on aspartame, all of which purported the

safety of the additive. After reviewing the data included in the petition, FDA approved Searle's food additive petition for aspartame on July 26, 1974. The agency then issued a regulation authorizing the use of aspartame in certain foods and for certain technological purposes. The regulation that the FDA approved aspartame for use as a sweetener in the following foods: a) dry, free-flowing sugar substitutes for table use (not to include use in cooking) in package units, not to exceed the sweetening equivalent of 2 tablespoons of sugar. b) sugar substitute tablets for sweetening hot beverages, including coffee and tea. c) cold breakfast cereals. d) chewing gum. e) Dry bases for: i) beverages; ii) instant coffee and tea; iii) gelatins, puddings and fillings; and iv) dairy products and toppings. In chewing gum, aspartame was also approved for use as a flavor enhancer in addition to use as a sweetener.

Despite the somewhat limited approval that was granted at this stage, the FDA's regulation included three conditions for the use of aspartame regarding final product labeling. First, the label of any food containing aspartame was required to bear the following statement: “

PHENYLKETONURICS: CONTAINS PHENYLALANINE.” This requirement was designed to alert persons who, because of specific health reasons, need to restrict carefully their phenylalanine intake. Second, when aspartame was to be used as a tabletop sweetener, its label was required to bear instructions not to use aspartame in cooking or baking. This is because aspartame breaks down when exposed to prolonged heat, resulting in a loss of sweetness.

Finally, the regulation required that if a food containing aspartame alleged to be, or was represented, for special dietary uses, as might be expected of a low calorie product, it was required to be labeled in compliance with FDA's special dietary foods regulations. (Nill, Ashley, 2010)

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Aspartame is a white, odorless, crystalline powder. It is about 200 times sweeter than sugar, without the high energy value of sugar and is readily dissolvable in water. It has a sweet taste without the bitter chemical or metallic aftertaste as reported in other artificial sweeteners which could explain as to its popularity. (Encyclopedia Britannica, 2010) These properties make aspartame a good ingredient to replace sugar in many food recipes. However, aspartame does not tend to interact with other food flavors, so it cannot perfectly replace sugar. All amino acids molecules have some common characteristics. These chemicals are used by plants and animals to create proteins that are essential for life. Aspartame consists of the three components, amino acids phenylalanine and aspartic acid, and methanol. Upon ingestion, aspartame breaks down into these three components and then is further converted to formaldehyde, formic acid, and a diketopiperazine. Formaldehyde is a highly toxic known carcinogen that causes retinal damage and acts to alter DNA. Although it is claimed that the amino acids in aspartame are metabolized in the same way that their natural counterparts found in foods, research suggests otherwise. Consumption of aspartame in sodas, for instance, has been shown to cause a flooding of the amino acids in the bloodstream (a prompt rise that does not occur after the ingestion of dietary protein). This rise may produce reactions in those that consume aspartame-sweetened foods. (Schmidt, 2010)

As early as 1970 Olney presented evidence of aspartate's neurotoxicity; it was on these grounds that he objected to aspartame's approval in 1974.

Aspartate, like glutamate (MSG), is an amino acid that acts as a neurotransmitter in the brain. It is primarily Olney who is responsible for

demonstrating that neurons (brain cells) exposed to excessive amounts of aspartate and glutamate become overstimulated and die. In a series of experiments since the 1970s Olney has conclusively demonstrated that glutamate and aspartate administered orally to mice cause cell death in certain areas of the brain. The circumventricular organs, which lack the protection of the blood brain barrier, show the worst evidence of neuronal destruction, even at low doses of glutamate and aspartate. (Martini, Gold, & Metcalfe, 2000)

One of the three chemicals that make up aspartame, phenylalanine, (which makes up 50% of aspartame) is an amino acid that is normally found in the brain. People with the genetic disorder, phenylketonuria (PKU) cannot metabolize phenylalanine. They are missing the enzyme needed to convert phenylalanine from being properly metabolized. As a result, high concentrations of phenylalanine accumulate and cause brain damage. It has been shown that ingesting aspartame, especially along with carbohydrates can lead to excess levels of phenylalanine in the brain even in those who do not have PKU. It has been proven that in people who have consumed large amounts of aspartame over a long period of time and do not have PKU have been shown to have excessive levels of phenylalanine in the blood.

Excessive levels of phenylalanine in the brain cause the levels of serotonin in the brain to decrease, leading to emotional disorders such as depression. In his testimony before the US Congress, Dr. Louis J. Elsas showed that high blood phenylalanine can be concentrated in parts of the brain and is especially dangerous for infants and fetuses. He also showed that

phenylalanine is metabolized much more efficiently by rodents than by humans. (Elsas, 2004)

It should be noted that a number of people who have disorders other than PKU, like people with iron deficiencies and kidney disease, may also be prone to high levels of phenylalanine. For such people, the consumption of aspartame may increase the risk of toxicity. Other reactions associated with aspartame include headaches, mood swings, changes in vision, nausea, diarrhea, sleep disorders, memory loss and confusion, and even convulsions in result to the rise of amino acids in the bloodstream after the consuming of aspartame-containing food and drink. (Schmidt, 2010)

Although its components - aspartic acid, phenylalanine, and methanol-occur naturally in foods, aspartame itself does not and must be manufactured. NutraSweet' (aspartame) is made through fermentation and synthesis processes. The quality of the compounds is checked regularly during the manufacturing process; of particular importance are frequent checks of the bacterial culture during fermentation. (Encyclopedia Britannica 2010) Also, various physical and chemical properties of the finished product are checked, such as pH level, melting point, and moisture content.

Although the government has declared aspartame safe for consumption, it has been suspected of causing neurological disturbances and memory loss. Research conducted by Father (1990) found that a carbonated soda, sweetened with aspartame, can change the chemistry of the brain by allowing higher concentrations of aspartame components to cross the blood brain barrier (BBB). The blood brain barrier protects the brain from too many

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of any one amino acid crossing and from excess glutamate and aspartate (Gold, 1995). The problem is that if aspartame can affect memory, it can affect the learning and achievement of college students. (Orange, 1998)

Mark D. Gold claims that aspartame is by far the most dangerous substance on the market today that is added to foods. In February of 1994, the United States Department of Health and Human Services released the listing of adverse reactions reported to the FDA. Aspartame accounted for more than 75% of all adverse reactions reported to the FDA's Adverse Reaction Monitoring System (ARMS). According to researchers and physicians studying the adverse effects of aspartame, the following chronic illnesses can be triggered or worsened by the ingestion of aspartame; brain tumors, multiple sclerosis, epilepsy, chronic fatigue syndrome, Parkinson's disease, Alzheimer's disease, mental retardation, lymphoma, birth defects, fibromyalgia and diabetes.

FDA's human "safety" determination for Aspartame is based upon some 112 studies submitted to FDA by the original manufacturer, Searle Pharmaceuticals. (Monsanto acquired Searle Pharmaceuticals in the mid-1980s.) Of those 112 studies, FDA designated 15 studies "pivotal".

Critics have been relooking those "pivotal" studies and come away puzzled how FDA can deduce human "safety". Take, for example, one of the 15 "pivotal" studies: "52 Week Oral Toxicity Infant Monkey Study (SC-18862)." This study orally dosed Aspartame to seven infant Rhesus monkeys for 52 weeks, in work conducted at the University of Wisconsin Medical Center at Madison, Wisconsin. The work was reported in 1972. In this study, the

monkeys were in three groups: a low dose group (1.0 g/kg), a medium dose group (3.0 g/kg) and a high dose group (4-6 g/kg). Aspartame was put into milk formula and administered to the monkeys orally. There was no control group, due to the lack of availability of monkeys and skilled laboratory personnel. The study reported that all of the monkeys in the medium and high dose groups exhibited seizure activity. Seizures of the grand mal type, were observed for the first time following 218 days of treatment. This study correlates brain seizures with high amounts of phenylalanine ingested by the monkeys.

Aspartic Acid makes up 40% of aspartame. Aspartic acid is an amino acid. Taken in its free form (unbound to proteins) it significantly raises the blood plasma level of aspartate and glutamate. The excess aspartate and glutamate in the blood plasma shortly after ingesting aspartame or products with free glutamic acid (glutamate precursor) leads to a high level of those neurotransmitters in certain areas of the brain. Aspartate and glutamate act as neurotransmitters in the brain by facilitating the transmission of information from neuron to neuron. Too much aspartate or glutamate in the brain kills certain neurons by allowing the influx of too much calcium into the cells. This influx triggers excessive amounts of free radicals which kill the cells. The neural cell damage that can be caused by excessive aspartate and glutamate is why they are referred to as "excitotoxins." They "excite" or stimulate the neural cells to death.

In Gold's research article, he highlights some of the reasons that answers the question as to why many of us do not hear about these serious reactions to aspartame. Many people are not aware (lack of awareness) of many of the <https://assignbuster.com/aspartame-an-in-depth-look-at-sweeteners-biology-essay/>

issues and problems surrounding aspartame because they are not reported in the newspapers or on the news like plane crashes. He states that this is due to the fact that these incidents of aspartame-caused diseases occur one at a time in thousands of different locations across the US. Another reason is because many people do not associate their symptoms with the long-term use of aspartame. Roberts goes on to say: “ I regret the failure of other physicians and the American Diabetes Association (ADA) to sound appropriate warnings to patients and consumers based on these repeated findings which have been described in my corporate-neutral studies and publications.” (Roberts, H. J. 1998)

The United States Food and Drug Administration (FDA) has set its acceptable daily intake for aspartame at 50 mg/kg. Numbers to consider, include that a 12 ounce can of diet soda contains 180 mg of aspartame. A liter of aspartame-sweetened soda contains 600 mg. Overall, United States diet beverage consumers average approximately 200 mg of daily aspartame consumption. (Schmidt, 2010)

Stephanie R. Schmidt, B. Sc.(Hones.), Naturopathic Doctor, recommends that it would be best to avoid any and all additives in foods, including aspartame, as they are synthetic chemicals. Instead, choose sweeteners that you recognize as foods such as rice syrup, honey, pure maple syrup, stevia, apple butter and black strap molasses.

Another question of interest would be if those patients with diabetes, in particular, should be concerned about aspartame. According to research conducted by H. J. Roberts, a diabetes specialist, member of the ADA and an

authority in artificial sweeteners has made a statement concerning the use of products containing aspartame;

Roberts talks of his patients with diabetes: “ Unfortunately, many patients in my practice, and others seen in consultation, developed serious metabolic, neurological and other complications that could be specifically attributed to using Aspartame products.” This was evidenced by the loss of diabetic control, the intensification of hypoglycemia, the occurrence of presumed insulin reactions, including convulsions, that proved to be Aspartame reactions. The precipitation, aggravation or simulation of diabetic complications (especially impaired vision and neuropathy) was associated with using aspartame-containing products. Dr. Roberts realized Aspartame was a poison when it was approved because his diabetic patients began going blind, being confused and their blood sugar could not be controlled. It was Dr. Roberts who declared aspartame disease to be a global epidemic and published the 1038 page medical text on it called Aspartame Disease: An Ignored Epidemic.

To bring awareness to Americans, Dr. Janet Starr Hull has written a book, Sweet Poison, has a website and a documentary, Sweet Misery. In her book, she highlights events in which most major networks have been unwilling to air segments on the dangers and health risks of Nutrasweet. Making the general public unaware, and yet millions continue to consume aspartame products and the Nutrasweet companies continue to gain profit. Dr. Janet Starr Hull has taken a strong stance against Aspartame. She strongly believes the product is extremely dangerous due to both her own and others personal experiences with the hazardness of the product.

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“ My point is this: Aspartame is dangerous and unhealthy and anyone who knows this should not be afraid to speak out against the product and those who market it. Only when the public has been made aware of this health risk can we look forward to change.” (page 133, Sweet Poison) She urges of the importance of public awareness.

I personally believe that when the public is made aware it is then when people can make their own decisions on whether they choose to consume aspartame products or not. In most cases, man-made food additives have been associated with both physical and mental health risks. When people remain unaware of such hazards, this is when global epidemics happen. When the public is given such options after being educated and hearing the research, personal accounts of the controversy and dangers surrounding aspartame, it is then when we can work together as a general population to live healthier lives. All too many times aspartame has been shown to cause damage, people should be aware of this. From the studies with rodents and monkeys to personal and medical accounts, read, listen and take in all of this information at your own will. Education is the most powerful weapon which you can use to change the world, as Nelson Mandela stated. It is wise to make healthy choices when purchasing food and beverages. Strive to spend your money on whole, natural, organic products whenever possible.

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