

This article was published in the Journal Of The Diabetic Association Of India 1995 : Vol. 35, No. 4.

Emerging Facts About Aspartame

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INTRODUCTION

Aspartame is a high-intensity, artificial, non-nutritive sweetener which is being marketed under various brand names like Equal, Nutrasweet, Spoonful, Indulge, Equal-Measure etc. It is also added to Diet-Colas, about 1200 food products & even children's vitamins & chewing gum.

Aspartame is the most widely used artificial sweetener & has captured 50% of the world market since it was introduced in 1981. It is available in 90 countries over the world, in more than 5000 products. The largest consumer is the United States of America (54% of adult Americans). In India it is still being used only as a table-top sweetener (e.g. Equal, Sugar-Free & Sweetex-Gold), the users being limited to a part of the diabetic population & the affluent diet-conscious population, mostly in urban areas.

The information in this article has been obtained not only from world experts & highly respected researchers on Aspartame, but also from large voluntary American organisations (like "Operation Mission Possible" & "The Aspartame Consumer Safety Network"), who have made it their mission to alert the people & make them aware of the dangers & adverse effects of Aspartame.

Since in India, it's use is still limited, we felt it prudent to spread this important information to our colleagues & to the people, so as to try & prevent it's extensive use in the future.

ASPARTAME

Aspartame was discovered by accident in 1965, when James Schlatter, a chemist of G.D. Searle Company was testing an anti-ulcer drug.

Aspartame was approved for dry goods in 1981 and for carbonated beverages in 1983 by the American FDA. In a 1993 act, the FDA approved aspartame as an ingredient in numerous food items that would always be heated to above 86 F (30 C).

Aspartame is, by far, the most dangerous substance on the market that is added to foods. Aspartame accounts for over 75 percent of the adverse reactions to food additives reported to the U.S. Food and Drug Administration (FDA). Well over 7,000 citizens have submitted adverse reaction reports to the FDA since 1982 (DHHS 1993b, DHHS 1995). These reports detail well over 10,000 complaints of 92 different symptoms.

Many of these reactions are very serious including seizures and death as recently disclosed in a February 1994 Department of Health and Human Services report.[1].

A few of the 90 different documented symptoms listed in the report as being caused by aspartame include:

Headaches/Migraines	Dizziness
Seizures	Nausea
Numbness	Muscle spasms

Weight gain	Rashes
Depression	Fatigue
Irritability	Tachycardia
Insomnia	Vision Problems
Hearing Loss	Heart palpitations
Breathing difficulties	Anxiety attacks
Slurred Speech	Loss of taste
Tinnitus	Vertigo
Memory loss	Joint Pain

Many health professionals, including nutritionists have known all along that aspartame was hazardous. Now, a growing number of those professionals are seeing the consequences of medium- and long-term aspartame use and have begun to warn their clients to stay away from aspartame.

FDA officials believe that as little as 1% of the serious adverse drug reactions are reported to the FDA (Kessler 1993). The reporting rate may be lower than 1% because :

a) there is no requirement that adverse reactions to food additives be reported. b) Many physicians do not take such reports seriously having been told that aspartame is "safe" by the FDA and AMA. c) It is often very difficult for a consumer to link adverse reactions to aspartame because many of the adverse effects are either delayed and/or gradual damage from prolonged use. Immediate reactions such as headaches and asthma are more easily linked to the culprit.

According to researchers and physicians studying the adverse effects of aspartame, the following chronic illnesses can be triggered or worsened by ingesting of aspartame [2]: (Mission Possible 1994)*:

Brain tumors	Multiple sclerosis
Epilepsy	Chronic fatigue syndrome
Parkinson's Disease	Alzheimer's
Mental retardation	Lymphoma
Birth defects	Fibromyalgia
Diabetes	

*Note: In some cases such as MS, the severe symptoms mimic the illness or exacerbate the illness, but do not cause the disease.

COMPONENTS & BREAKDOWN PRODUCTS OF ASPARTAME & THEIR ADVERSE BIOCHEMICAL EFFECTS

Aspartame (C₁₄H₁₈O₅:- L-Aspartyl-L-Phenylalanine Methyl Ester) is made up of three chemicals, 1.) aspartic acid, 2.) phenylalanine, and 3.) methanol.

Some of the breakdown products include formaldehyde & formic acid.

Real-world products also can contain: aspartylphenylalanine diketopiperazine (DKP) (Some is absorbed intact) beta-aspartame racemized amino acids other dipeptides.

Aspartame becomes unstable

- i) when ingested
- ii) when exposed to high temperatures & prolonged storage &
- iii) in solution.

It could be argued that phenylalanine and aspartic acid are important amino acids and that they are commonly found in many foods (bound to proteins). The amino acids in aspartame are absorbed and metabolized differently from those found in normal foods. This is because the proteins in food are "very gradually" broken down and the amino acids (a full range of them) are gradually absorbed. The gradual absorption leads to a very slow and small increase in some of the plasma amino acid levels. With aspartame, the aspartic acid and phenylalanine (free and unbound to protein) are very quickly absorbed and this causes a rush of these amino acids into the system (unlike what is seen with foods) which can lead to a spike in the plasma amino acid levels. See the industry study published in *Metabolism* (36(5):507-12), for example.

It has been pointed out that some fruit juices and alcoholic beverages contain small amounts of methanol. It is important to remember, however, that methanol never appears alone. In every case, ethanol is present, usually in much higher amounts. Ethanol is an antidote for methanol toxicity in humans.[9] In aspartame there is no ethanol.

All components & breakdown products of aspartame are of questionable toxicity.

1.) Aspartic Acid (40% of aspartame)

Dr. Russell L. Blaylock, a professor of Neurosurgery at the Medical University of Mississippi, recently published a book thoroughly detailing the damage that is caused by the ingestion of excessive aspartic acid from aspartame. Dr. Blaylock uses almost 500 scientific references to prove how excess free excitatory amino acids such as aspartic acid and glutamic acid in our food supply are causing serious chronic neurological disorders and a myriad of other acute symptoms.[3]

Aspartate acts as a neurotransmitter in the brain by facilitating the transmission of information from neuron to neuron. Aspartic acid is an amino acid. Taken in its free form (unbound to proteins) it significantly raises the blood plasma level of aspartate.

The excess aspartate leads to a high level of this neurotransmitter in certain areas of the brain. Too much aspartate 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.

Some of the areas of the brain affected by spiked levels of aspartate are not protected by the blood brain barrier (BBB). The large majority (75%+) of neural cells in a particular area of the brain are killed before any clinical symptoms of a chronic illness are noticed.

Aspartic acid has a cumulative harmful effect on the endocrine system and reproductive system. Several animal experiments have shown that excitotoxic amino acids can penetrate the placental barrier and cause damage to the fetus.

In both human and animal study experiments, the plasma aspartate level has been shown to spike to high levels after liquid administration of aspartame. Humans are 5 times more susceptible to aspartic acid and glutamic acid than rodents and 20 times more susceptible than monkeys because they concentrate these excitatory amino acids in their blood plasma to much higher levels and for a longer period of time.

A few of the many chronic illnesses that have been shown to be contributed to by long-term exposure to excitatory amino acid damage include:

MS	Parkinson's Disease
Hormonal Problems	Hypoglycemia
Hearing Loss	AIDS Dementia
Epilepsy	Brain Lesions
Alzheimer's Disease	Neuroendocrine Disorders
Amyotrophic Lateral Sclerosis (Lou Gehrig's Disease)	

The exact mechanism of acute reactions to excess free aspartate is currently being debated. As reported to the FDA, those reactions include [5]:

Headaches/Migraines	Vision Problems
Nausea	Anxiety attacks
Abdominal Pains	Depression
Sleep Problems	Asthma/Chest Tightness
Memory Loss	Fatigue (blocks sufficient glucose entry into brain)

2.) Phenylalanine (50% of aspartame)

Phenylalanine is an amino acid normally found in the brain. Persons with the genetic disorder, phenylketonuria (PKU) cannot metabolize phenylalanine. This leads to dangerously high levels of phenylalanine in the brain (sometimes lethal).

It has been shown that ingesting aspartame, especially along with carbohydrates can lead to excess levels of phenylalanine in the brain even in persons who do not have PKU. It was shown in human testing that phenylalanine levels of the blood were increased significantly in human subjects who chronically used aspartame.[6] Even a single use of aspartame raised the blood phenylalanine levels...

Excessive levels of phenylalanine in the brain can cause the levels of serotonin in the brain to decrease, leading to emotional disorders such as depression. Moreover, decrease in serotonin levels can result in carbohydrate craving which could lead to increased consumption of carbohydrates (normally serotonin blunts the sensation of craving carbohydrates and thus is a part of the body's feedback system that helps limit consumption to appropriate levels.).

In his testimony before the U.S. 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 metabolised much more effeciently by rodents than by humans.[7] As Dr. Blaylock points out in his book, early studies measuring phenylalanine buildup in the brain were flawed. Investigators who measured specific brain regions and not the average throughout the brain noticed significant rises in phenylalanine levels. Specifically the hypothalamus, medulla oblongata, and corpus striatum areas of the brain had the largest increases in phenylalanine. He further elaborates that excessive buildup of phenylalanine in the brain can cause schizophrenia or make one more susceptible to seizures.

Aspartylphenylalanine Diketopiperazine (DKP) DKP is a breakdown product of phenylalanine. DKP has been implicated in the occurance of brain tumors. Dr. John Olney noticed that DKP, when nitrosated in the gut, produced a compound which was similar to N-nitrosourea, a powerful brain tumor causing chemical. DKP has also been implicated as a cause of uterine polyps and changes in blood cholesterol by FDA Toxicologist Dr. Jacqueline Verrett in her testimony before the U.S. Senate.[13]

Before aspartame was foisted upon the public, the amount of this particular DKP in the diet was essentially zero (Federal Register 1983). Therefore, no claim can automatically be made that DKP ingestion is safe. Several quality studies would have to be performed in order to conclude that DKP probably does not have a detrimental effect on humans. No such quality studies have ever been done.

However, statistically significant increase in cancer rates in several of the pre-approval experiments are an indication that aspartame may cause cancer. Two pre-approval studies showed an unusually large number of brain tumors in the test animals. Those studies were called, E33/34 and E70. E33/34 was a 104-week study of Charles River CD rats. Twelve brain tumors were found in the experimental rats and zero in the control rats (Gross 1987b, page 2-3): As Dr. John Olney stated (Olney 1987, page 7):

"Being a neuropathologist, I know that spontaneous brain tumors in laboratory rats are extremely rare. The archival literature documents an incidence not exceeding 0.6%. Since the above incidence in Nutrasweet-fed rats is 3.75%, this suggests that Nutrasweet may cause brain tumors and certainly suggests the need for additional in depth research to rule out that possibility.

In 1991, Dr. H.J. Roberts published an article in the Journal of Advancement in Medicine (Roberts 1991), which showed a possible correlation between the sudden, rising incidence of Primary Brain Cancer and Primary Brain Lymphoma and the years soon after aspartame went on the market. Roberts concludes with a recommendation for a closer look at the relationship between aspartame and brain cancer.

It should be noted that it may take a generation or two of ingesting aspartame before a significant increase in brain cancer incidence (due to aspartame ingestion) is noticed.

3.) Methanol (aka wood alcohol/poison) (10% of aspartame)

Methanol is a deadly poison. Methanol is gradually released in the small intestine when the methyl group of aspartame encounter the enzyme chymotrypsin. The absorption of methanol into the body is sped up considerably when free methanol is ingested. Free methanol is created from aspartame when it is heated to above 86 Fahrenheit (30 Centigrade). This would occur when aspartame-containing product is improperly stored or when it is heated. Whether absorbed quickly as free methanol or somewhat slower in the small intestine from fresh aspartame, the total amount of methanol absorbed will be approximately 10% of aspartame ingested. An EPA assessment of methanol states that methanol "is considered a cumulative poison due to the low rate of excretion once it is absorbed."

The absorbed methanol is then slowly converted to formaldehyde by alcohol dehydrogenase in the liver (DHHS 1993a, Liesivuori 1991). The formaldehyde is then converted to formic acid by aldehyde dehydrogenase in the liver, by formaldehyde dehydrogenase in the blood, or through the tetrahydrofolic acid- dependent one-carbon pool (Liesivuori 1991). Methanol, thus breaks down into formic acid (a venom in ant stings) and formaldehyde (embalming fluid) in the body.

Formaldehyde :

Formaldehyde is a deadly neurotoxin Formaldehyde is a known carcinogen (known to cause Squamous Cell Carcinoma in experimental animals.), causes retinal damage, interferes with DNA replication, causes birth defects. [10] Formaldehyde stores in fat cells, particularly on the hips & thighs. It is potentially toxic to the retina & optic nerve. These organs are highly vulnerable to metabolic disturbances & neurotoxins because of their unique metabolic

requirements. Methanol & its by-products cause swelling of the optic nerve & degeneration of ganglion cells in the retina.

Repeated exposure to low doses of formaldehyde has been shown to cause a wide range of health problems (John 1994, Liu 1991, Molhave 1986, National Research Council 1981 page 175-220, Srivastava 1992). Srivastava (1992) stated the following at such low level exposure:

"Complaints pertaining to gastrointestinal, musculoskeletal and cardiovascular systems were also more frequent in exposed subjects. In spite of formaldehyde concentrations being well within the prescribed ACGIH [American Conference of Governmental Industrial Hygienists] limits of 1ppm, the high rates of sickness emphasise the need for detailed studies on formaldehyde-exposed subjects...."

Formaldehyde appears to be much more toxic to the body in small amounts than formic acid. The National Research Council (1981, page 179) stated the following about formaldehyde:

"Some adverse effects of formaldehyde may be related to its high reactivity with amines and formation of methylol adducts with nucleic acids, histones, proteins, and amino acids. The methylol adducts can react further to form methylene linkages among these reactants.

"It appears that before formaldehyde reacts with amino groups in RNA, the hydrogen bonds forming the coiled RNA are broken. Formaldehyde reacts with DNA less frequently than with RNA, because the hydrogen bonds holding DNA in its double helix are more stable.

"Reaction of formaldehyde with DNA has been observed, by spectrophotometry and electron microscopy, to result in irreversible denaturation. In reactions with transfer RNA, formaldehyde interferes with amino acid acceptance. The equilibrium reaction of formaldehyde with DNA involves thermally activated opening and closing of hydrogen bonds between matching base pairs in the helix. If permanent cross links are formed between DNA reactive sites and formaldehyde, these links could interfere with the replication of DNA and may result in mutations."

It is now thought by some researchers that persons with certain illnesses may be suffering from formaldehyde toxicity when excess methylamine and semicarbazide- sensitive amine oxidase (SSAO) react to form formaldehyde (Yu 1993, Boor 1992). Yu states the following:

"The cytotoxicity seems, therefore, to be a consequence of the deamination of methylamine. Our findings suggest that formaldehyde, the deaminated product of methylamine, may be responsible for these toxic effects. Human serum, which also contains SSAO, was also capable of deaminating methylamine and cause cytotoxicity to cultured endothelial cells. Both methylamine and SSAO circulate in human blood, and their concentrations in the blood of normal healthy subjects are quite close to those required to induce cytotoxicity in tissue-cultured cells. Both SSAO activity and methylamine levels have been reported to be increased in the blood of diabetic individuals. ... It is possible, therefore, that an abnormal metabolism of methylamine may be involved in endothelial injury, and that it may subsequently induce atherosclerotic plaque formation and thus be involved in the cardiovascular disorders seen in diabetes."

Therefore, regular ingestion of aspartame may be adding "formaldehyde fuel to the fire" so to speak. It would be especially worrisome to give aspartame to persons with abnormally high SSAO and methylamine levels such as some diabetics.

Persons with chronic immune system disorders are often very sensitive to low level chemical exposure including formaldehyde. As stated by the National Resource Council (1981, pg177):

"In some persons not previously sensitized, repeated exposure to formaldehyde may result in the development of hypersensitivity."

Fujimaki (1992) & Vojdani (1992) have shown immune system alteration from exposure to formaldehyde. Dr. Sherry Rogers, an expert in environmental exposure and chemical sensitivity discusses how aldehydes, especially formaldehyde can cause significant damage in the body (Rogers 1990). She lists the following symptoms found for persons exposed to urea foam formaldehyde insulation (UFFI) at levels of formaldehyde as low as 0.12 ppm:

Depression, dizzy or spacey, poor memory, burning eyes or throat, fatigue, flushing of face, inability to concentrate, laryngitis, can't think straight, chronic cough, asthma, "like thinking in a fog", arthritis feel unreal, rashes, headache, heart palpitations, and much more..... S

Dr. Rogers cites Main (1983) where adverse health effects to formaldehyde exposure were found at levels between 0.12-1.6 ppm.

"One path the chemical may pass through in order for the body to get rid of it is called the ALDEHYDE PATHWAY. When the aldehyde pathway, for example, becomes over burdened through inhaling many other chemicals, or through an undiscovered vitamin or mineral deficiency that is crucial in that pathway, the body then shunts the chemistry to produce chloral hydrate, the old 'Mickey Finn' or 'knockout drops.' So, indeed, these people have a very good reason for the spacey, dizzy, inability to think and concentrate symptoms that they complain of."

It may very well be that it is the formaldehyde metabolite of the methanol in aspartame that causes the most slow and silent damage, especially in combination with other breakdown products of aspartame. If this is the case the formic acid measurements may not tell us what we need to know about the damage being done by the formaldehyde.

Formic Acid :

After studying workers exposed to formic acid, Liesivuori addressed the issue of it being a cumulative poison (Liesivuori 1986):

"The data indicated that formic acid may have a long biological half-life possibly causing an accumulation of the acid in the body. This might constitute a hitherto unappreciated toxicological hazard, as the acid is an inhibitor of oxygen metabolism."

Liesivuori later points out that formic acid can accumulate in the brain, kidneys, spinal fluid, and other organs because of the slow excretion from the body (Liesivuori 1991). He also described formic acid's effects at the cellular level:

"Exposure to either methanol or formic acid leads to accumulation of acid in the body. Formic acid inhibits cytochrome oxidase, causing decreased synthesis of ATP. This is followed by anaerobic glycolysis and lactic acidosis. At the same time, and also because of acidosis, the generation of superoxide anions and hydroxyl radicals is enhanced leading to membrane damage, lipid peroxidation and mitochondrial damage. This, and the decreased pH in acidosis, allows the influx of calcium into the cells. Although the mitochondrial dysfunction may be secondary to calcium overload in the mitochondria, the final consequence is cell death."

While severe acidosis would obviously not be likely by a consequence of small amounts of formic acid, the other damaging aspects of formic acid such as the inhibition of cytochrome oxidase and decreased production of ATP are still possible problems. The recommended limit of consumption is 7.8 mg/day. Heavy users of aspartame- containing products consume as much as 250 mg of methanol daily or 32 times the EPA limit.[9]

Symptoms from methanol poisoning include headaches, ear buzzing, dizziness, nausea, gastrointestinal disturbances, weakness, vertigo, chills, memory lapses, numbness and shooting pains in the extremities, behavioral disturbances, and neuritis. The most well known problems from methanol poisoning are vision problems including misty vision, progressive contraction of visual fields, blurring of vision, obscuration of vision, retinal damage, & blindness.

Due to the lack of a couple of key enzymes, humans are many times more sensitive to the toxic effects of methanol than animals. Therefore, tests of aspartame or methanol on animals do not accurately reflect the danger for humans. As pointed out by Dr. Woodrow C. Monte, Director of the Food Science and Nutrition Laboratory at Arizona State University,

"There are *no* human or mammalian studies to evaluate the possible mutagenic, teratogenic, or carcinogenic effects of chronic administration of methyl alcohol." [11]

ARE ADVERSE EFFECTS OF ASPARTAME DOSE RELATED ?

The FDA claims that a daily dose of up to 50mg./kg. body weight is safe. Estimated daily consumption of regular users is 2-10mg./kg. body weight.

However, "some people have suffered aspartame related disorders with doses as small as that carried in a single stick of chewing gum. In pregnancy the effects of aspartame can be passed directly on to the fetus, even in very small doses." (Flying Safety Magazine May, 1992.) Even small doses of methanol in the blood stream can damage vision.

Moreover, aspartic acid, phenylalanine & methanol & its breakdown products have a cumulative effect due to rapid absorption & slow excretion. No studies address the issue of long term, chronic ingestion of 'real world' aspartame.

SUSCEPTIBILITY

Folic acid is believed by most researchers to play a large role in protecting from methanol poisoning by increasing the conversion of formic acid to carbon dioxide and water (Roe 1982, Tephly 1984, DHHS 1993a). Persons who have a folic acid deficiency are likely to be much more susceptible to damage from chronic methanol ingestion. Other nutrients may play an important part in protecting from formic acid damage. As Tephly points out (Stegink 1984a, page 114):

"Nutritional differences among individuals, such as folic acid deficiency, may play an important part in the ability of an individual to metabolize formate. Different degrees of nutritional deficiency may be observed in debilitated and inebriated persons who have not had an adequate diet. In addition to the protective factors of ethanol, folic acid, and possibly other nutrients, Posner (1975) pointed out that the presence of food in the stomach seems to lower the toxicity of methanol. The reason food slightly lowers the toxicity is probably because the food offers protective factors (as does alcohol and juices) and/or the food delays absorption (as does the administration of aspartame in capsules). This does not mean that aspartame in food is safe in long-term use, but probably slightly less toxic.

· Methanol ingestion may be even more dangerous for persons taking certain pharmaceuticals. The enzyme aldehyde dehydrogenase is believed to play a major role in methanol oxidation and elimination (DHHS 1993a, Liesivuori 1991). The drug disulfiram (trade name Antabuse) inhibits the activity of aldehyde dehydrogenase (Merck 1992, page 2638). Animal experiments have shown a significant increase in toxicity of methanol and a slowing down of methanol elimination when disulfiram was given (Posner 1975). The results are likely to be similar in humans for this particular adverse effect. Antabuse is currently being taken by 400,000 persons in the U.S. and many more are taking generic brands of disulfiram (Roberts 1990a, page 43). Posner (1975) lists research on several pharmaceuticals which shows that ingesting aspartame while on these drugs may present an additional health hazard. Some of these include sulfonylureas (for diabetics), metronidazole (anti-bacterial), and allopurinol (reduces uric acid). There may be other pharmaceuticals which cause adverse reactions when taken with the methanol in aspartame, but few studies have been done.

- Complications are magnified in certain high-risk groups, such as :-
- Diabetes
 - Hypoglycemia
 - Pregnant women
 - Children
 - Patients with epilepsy, liver, kidney disease & eating disorders
 - Patients with phenylketonuria
 - Relatives of aspartame reactors
 - Older patients with memory impairment

A search of the medical literature shows that in general, for every study showing no risk associated with aspartame, there are other studies finding health problems associated with aspartame.

A *few* of the many disorders that are of particular concern include the following.

Neuropsychiatric disorders

Some medical studies have demonstrated that aspartame can be neurotoxic, has triggered seizures in previously non-convulsive adults, can increase the risk of human systemic damage when heated, and has induced neuropsychiatric symptoms like panic attacks.[27-34].

Some migraine headache sufferers maybe especially susceptible to ingestion of aspartame as a precursor of headache, but aspartame has also been linked to the onset of severe headaches in persons without a medical history of migraine.[35-39]. Brain damage and brain cancer in animals have been associated with aspartame ingestion.[40-43].

Some researchers point to aspartame's excitotoxic activity and suggest it may contribute to a number of neurological disorders, including epilepsy, chronic neurodegenerative diseases like Huntington's Chorea and Amyotrophic Lateral Sclerosis (ALS/Lou Gehrig's Disease) [76].

Another study showed that aspartame exposure during the gestation period of guinea pigs resulted in disrupted odor-associative learning in the newborn, a condition that could affect human newborns.[77].

Dr, John Olney, Neuropathologist, and Professor at Washington University in St. Louis, has written extensively on the dangers of aspartame after he found a higher than normal rate of brain tumours in laboratory rats fed aspartame. He also noted in his research that retinal

and hypothalamic lesions as well as brain damage occurred in mice fed glutamate and aspartate.[40,41,63]. The connection between both brain damage and weight gain after aspartame ingestion has been reinforced by other animal studies.[42,64,65].

Numerous medical studies cite evidence of the danger aspartame poses for PKU victims because of its phenylalanine content. Phenylalanine can result in brain damage, convulsions and other symptoms for those with the hereditary PKU condition.[46-52]. At least one study suggested that aspartame ingestion increases similar risks for non-PKU individuals by inducing higher than normal ranges of phenylalanine, and researchers advised that manufacturers indicate the amount of aspartame in their products.[53]. In a July 1973 study, two researchers found a correlation between phenylalanine passing in utero and the presentation of cleft lip and cleft palate.[54].

A double blind study of the effects of aspartame on persons with mood disorders was recently conducted by Ralph G. Walton. The study showed a large increase in serious symptoms for persons taking aspartame. Since some of the symptoms were so serious, the Institutional Review Board had to stop the study.

Dr. Walton concludes that "individuals with mood disorders are particularly sensitive to this artificial sweetener; its use in this population should be discouraged." [18] Dr. Walton was recently quoted as saying, "I know it causes seizures. I'm convinced also that it definitely causes behavioral changes." There are numerous reported cases of low brain serotonin levels, depression and other emotional disorders that have been linked to aspartame and often are relieved by stopping the intake of aspartame.

551 persons who had reported reactions to aspartame were surveyed. (Roberts 1988- Journal of Applied Nutrition). The neuropsychiatric adverse effects were as follows:

Neurologic

- Headaches	249 (45%)
- Dizziness, unsteadiness, or both	217 (39%)
- Confusion, memory loss, or both	157 (29%)
- Severe drowsiness and sleepiness	93 (17%)
- Paresthesias ("pins and needles," "tingling") or numbness of the limbs	82 (15%)
- Convulsions (grand mal epileptic attacks)	80 (15%)
- Petit mal attacks and "absences"	18 (3%)
- Severe slurring of speech	64 (12%)
- Severe tremors	51 (9%)
- Severe "hyperactivity" and "restless legs"	43 (8%)
- Atypical facial pain	38 (7%)

Psychologic-Psychiatric

- Severe depression	139 (25%)
- "Extreme irritability"	125 (23%)
- "Severe anxiety attacks"	105 (19%)
- "Marked personality changes"	88 (16%)
- Recent "severe insomnia"	76 (14%)
- "Severe aggravation of phobias"	41 (7%)

Epilepsy/Seizures

At Massachusetts Institute of Technology, 80 people who had suffered seizures after ingesting aspartame were surveyed. Community Nutrition Institute concluded the following

about the survey: "these 80 cases meet the FDA's own definition of an imminent hazard to the public health, which requires the FDA to expeditiously remove a product from the market."

Both the Air Force's magazine "Flying Safety" and the Navy's magazine, "Navy Physiology" published articles warning about the many dangers of aspartame including the cumulative deleterious effects of methanol & the greater likelihood of birth defects. The articles note that the ingestion of aspartame can make pilots more susceptible to seizures & vertigo.[20] Articles sounding warnings about ingesting aspartame while flying have also appeared in the National Business Aircraft Association Digest (NBAA Digest 1993), Aviation Medical Bulletin (1988), The Aviation Consumer (1988), Canadian General Aviation News (1990), Pacific Flyer (1988), General Aviation News (1989), Aviation Safety Digest (1989), & Plane & Pilot (1990) & a paper warning about aspartame was presented at the 57th Annual Meeting of the Aerospace Medical Association (1986).

Recently, a hotline was set up for pilots suffering from acute reactions to aspartame ingestion. Over 600 pilots have reported symptoms including some who have reported suffering grand mal seizures in the cockpit due to aspartame.[21]

Diabetes

While a number of studies have concluded that aspartame use poses no harm to diabetics, researchers at Wayne State University School of Medicine who studied the effects of aspartame on normal and diabetic rats warn otherwise. Their findings indicated that aspartame may adversely affect the capacity to control glucose metabolism in the already compromised diabetic.[45]. According to research conducted by H.J. Roberts, a diabetic specialist, a member of the ADA, and an authority on artificial sweeteners, aspartame:

1. Leads to the precipitation of clinical diabetes.
2. Causes poorer diabetic control in diabetics on insulin or oral drugs.
3. Leads to the aggravation of diabetic complications such as retinopathy, cataracts, neuropathy and gastroparesis.
4. Causes convulsions.

In a statement concerning the use of products containing aspartame by persons with diabetes and hypoglycemia, Dr. Roberts says:

"Unfortunately, many patients in my practice, and others seen in consultation, developed serious metabolic, neurologic 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, and the precipitation, aggravation or simulation of diabetic complications (especially impaired vision and neuropathy) while using these products."

"Dramatic improvement of such features after avoiding aspartame, *and* the prompt predictable recurrence of these problems when the patient resumed aspartame products, knowingly or inadvertently."

Dr. Russell L. Blaylock, a professor of Neurosurgery at the Medical University of Mississippi has stated that excitotoxins such as that found in aspartame can precipitate diabetes in persons who are genetically susceptible to the disease.[5]

According to Dr. Roberts, the possible mechanisms maybe:-

*Marked changes in appetite & weight leading to paradoxical weight gain or severe loss of weight.

*Excessive insulin secretion & depletion of insulin reserve.

*Possible alteration of cellular receptor cells for insulin with ensuing insulin resistance.

*Neurotransmitter alteration within brain & peripheral nerves.

Visual Problems

Researchers have noted high concentrations of methanol in the blood of aspartame users.[9,66-69]. Woodrow Monte, R.D.Ph.D. Director of the Arizona State University Food Sciences and Nutrition Laboratory, has warned that aspartame releases into the human bloodstream one molecule of methanol for each molecule of aspartame consumed.

It is true that there is minimal scientific literature regarding the effects of aspartame on vision. There have been no double-blind studies of any reasonable length that looks at such effects and there are only a few case reports in the literature. On the other hand, there are countless reports from patients that aspartame caused changes (sometimes mild, sometimes severe) to their vision. These reports have been filed with the FDA, with the Aspartame Consumer Safety Network, and with concerned researchers.

It is important to consider the "possibility" since there have been such a large number of reports.

There are a number of theories as to which aspartame breakdown products cause the adverse reactions. They may be due to methanol's metabolites (e.g. formaldehyde, formic acid, fatty acid methyl esters). It is probably the combination of the aspartic acid and the methanol metabolites (i.e. a synergistic reaction).

The following is a letter presented before the U.S. Senate hearings on NutraSweet. It was written by Dr. Margan B. Raiford, M.D., Ps, Msc Med. Ophthalmology (Raiford 1987):

"I had the opportunity, in Atlanta, Ga., to see the effects of methyl alcohol toxicity in 1952-1953 which resulted in visual damage to the optic nerves and retina in over 300 cases and the deaths of over 30 persons.

"I examined Shannon Roth on July 7, 1986, along with several other patients [65 cases as of July 10, 1986 (Roberts 1990a, page 136)]. I observed evidence of effects in her eye and the eyes of the other patients that were comparable to the effects observed in the patients who suffered methyl alcohol toxicity in 1952-1953.

"There was damage in the central fibers, 225,000 of the total 137,000,000 optic nerve fibers (resulting in optic nerve atrophy) in her case, which would be comparable to that observed from patients suffering methyl alcohol toxicity. The extent of damage to these fibers would explain partial to total blindness.

"But in the kind of chronic low dose exposure to methyl alcohol experienced by Shannon Roth (in NutraSweet consumption) and other NutraSweet consumers, it is likely that they would experience the impact on the optic nerve differently in each eye.

"The important point is that the damage observed in Shannon Roth's eye was identical to the damage I observed repeatedly in the eyes of individuals whose eyes have been damaged by methyl alcohol toxicity."

In an epidemiological study which appeared in the Journal of Applied Nutrition (Roberts 1988), 551 persons who have reported reactions to aspartame were surveyed.

What follows is a listing of the adverse effects related to the eye:

	# of people (%)
Decreased vision &/or other eye problems (blurring, "bright flashes," tunnel vision)	140 (25%)
- Pain (one or both eyes)	51 (9%)
- Decreased tears, trouble with contact lens or both	46 (8%)
- Blindness (one or both eyes)	14 (3%)

Further, Dr. Roberts adds that, "in most of these patients, there was no convincing evidence for underlying glaucoma, occlusion of a retinal vessel, toxic amblyopia (related to excessive alcohol or smoking), or optic neuritis due to multiple sclerosis and other causes that might account for the symptoms. CT scans and MRI studies of the brain or optic nerves generally proved normal in these patients.

"Furthermore, that patients had known cataracts, astigmatism, macular degeneration or diabetic retinopathy did not necessarily disprove the role of aspartame . . . especially when vision promptly improved after stopping aspartame products.

"Ophthalmologists and other professionals have told me about dramatic improvement of vision in their patients after the cessation of aspartame products."

Dr. Roberts has further recommended that :-

*Surgery of Immature Cataract should be deferred in patients who consume aspartame until after abstaining from it for 1-2 months to determine if spontaneous improvement occurs.

*Impaired Vision in diabetic patients should not be assumed to be due Diabetic Retinopathy without such a "no aspartame" trial. *Similar trial warranted for persons diagnosed as having macular degeneration.

*Diagnosis of "early M.S." based on concomitant eye & neurological features should be deferred pending "no aspartame test".

A history of aspartame use should be inquired into, in patients who present with optic neurites, dry eyes, flashes, unexplained detachments, decreased vision, pain in the eyes, etc.

Cancer (Brain Cancer)

In 1981, Satya Dubey, an FDA statistician, stated that the brain tumor data on aspartame was so "worrisome" that he could not recommend approval of NutraSweet.[14]

The late Dr. Adrian Gross, an FDA toxicologist, testified before the U.S.Congress that aspartame was capable of producing brain tumors. This made it illegal for the FDA to set an allowable daily intake at any level. He stated in his testimony that Searle's studies were "to a large extent unreliable" & that "at least 1 of those studies has established beyond any reasonable doubt that aspartame is capable of inducing brain tumors in experimental animals"

It is interesting to note that the incidence of brain tumors in persons over 65 years of age has increase 67% between the years 1973 and 1990. Brain tumors in all age groups has

jumped 10%. The greatest increase has come during the years 1985-1987.[17] In his book, "Aspartame (NutraSweet). Is it Safe?" Dr. H.J. Roberts gives evidence that aspartame can cause a particularly dangerous form of cancer -- primary lymphoma of the brain.

Birth Defects

A Genetic Pediatrician at Emory University has testified that aspartame is causing birth defects. [7]

In the book, "While Waiting: A Prenatal Guidebook" by George R. Verrilli, M.D. and Anne Marie Mueser, it is stated that aspartame is suspected of causing brain damage in sensitive individuals. A fetus may be at risk for these effects...some researchers have suggested that high doses of aspartame may be associated with problems ranging from dizziness and subtle brain changes to mental retardation."

Perhaps most ironic of all, the artificial sweetener to aid dieters in their quest for weight loss may actually work in reverse, causing a weight gain. S.D. Stellman Garfinkel write in Preventive Medicine that (aspartame) users were more likely to gain weight.[55]. An article that appeared in the Lancet in 1986 echoed the same finding. J.E. Blundell and A.H. Hill wrote that aspartame increased rated motivation to eat and decreased ratings of fullness; these data indicate that aspartame, in some circumstances, has appetite-stimulating properties in comparison with the ingestion of water. After ingestion of aspartame, the volunteers were left with a residual hunger compared with what they reported after glucose....this may contribute to disordered patterns of eating prevalent among certain groups of normal weight individuals.[56].

Donald R. Johns, MD, Massachusetts General Hospital, said that a number of adverse reactions to aspartame have been reported, including granulomatous and lobular panniculitis (fat tumours) [59,60], urticaria (severe itching)[61], and the possible association between aspartame and seizures.[62].

Other unusual disorders have been medically attributed to aspartame ingestion, like development of coma in patients with liver disease [70], blockage of normal increase in brain serotonin (a brain chemical necessary for sleep and neural transmissions) [71,72], toxicity to the human brain [73,74], Alzheimers Disease [75], depression [18].

To date, studies have not adequately addressed the insidious issue of cumulative effects of aspartame combined with similar chemicals and food additives like monosodium glutamate. (See informed Consent, Nov/Dec. book review, Excitotoxins: The Taste That Kills.)

Erik Millstone, MD, Science Policy Research Unit, University of Sussex, summed up: "The public cannot be confident that aspartame is safe." [23].

The reason many people do not hear about serious reactions to aspartame is twofold:

- 1) Lack of awareness by the general population.
- 2) Most people do not associate their symptoms with the long-term use of aspartame. For the people who have killed a significant percentage of the brain cells and thereby caused a chronic illness, there is no way that they would normally associate such an illness with aspartame consumption.

CONCLUSION

Aspartame is a high intensity, non-caloric artificial sweetener which is the most widely used sweetener today in the world. In India, it has been in use since 5 to 6 yrs, as a table top sweetener (Equal, Sugar-Free & Sweetex Gold).

Scientific reasoning and large body of evidence indicate that this product should not be in the market. However, paradoxically, use of aspartame containing products are on the rise.

Reasons may be many fold :

- I. Aspartame has a sweet, clean taste without bitter after taste as experienced with Saccharin. For this reason it is preferred by both the vulnerable diabetic population & the affluent diet-conscious population.
- II. There is a rising craze to remain slim in the urban population.
- III. There is a lack of awareness of the adverse effects of aspartame both in the population and in the medical fraternity.
- IV. Aspartame enjoys a strong clout in order to protect its billion dollar market.
- V. High consumer confidence in the safety of aspartame

The components of aspartame can lead to a wide variety of ailments. Some of these problems occur gradually, others are immediate, acute reactions. There are other users of aspartame who *appear* not to be suffering immediate reactions to aspartame. But even these individuals are susceptible to the long-term damage caused by excitatory amino acids, phenylalanine, methanol, & DKP.

Aspartame not only causes individual symptoms, it can mimic entire syndromes! For eg, the CFIDS (chronic fatigue & immune deficiency syndrome) newsletter calls it the "sweet poison, NutraSweet," because it can mimic the symptoms of CFIDS. It can also cause grand mal seizures. According to H.J.Roberts, M.D., it can cause decreased vision, pain in the eyes, decreased tears, ringing in the ears, hearing impairment, headache, dizziness & unsteadiness, confusion, memory loss, drowsiness, sleepiness, slurring of speech, numbness & tingling, tremors, depression, irritability, aggression, anxiety, insomnia, phobias, heart palpitations, shortness of breath, high blood pressure, nausea, diarrhea, abdominal pain, itching, hives, menstrual changes, weight gain, hair thinning & hair loss, urinary burning & frequency, excessive thirst, fluid retention, bloating, increased infection, & even death.

To conclude, it must be kept in mind that aspartame is not an essential life-saving drug but a food additive meant to pamper our sweet tooth. Moreover it does not fulfil its own objectives, i.e. controlling weight gain or diabetes.

Since it is being used freely for various preparations which are consumed by both children and elderly people who are at much greater risk for developing these adverse effects, we felt it necessary to give this health alert.

We suggest that till such time that it is proved conclusively that there are no health hazards on prolonged use of aspartame, it will be prudent to refrain from its use.

Aspartame can be found in:

- instant breakfasts, gelatin desserts, soft drinks,
- breath mints, juice beverages, tabletop sweeteners
- cereals, laxatives, tea beverages
- sugar-free chewing gum, multivitamins, instant teas & coffees
- cocoa mixes, milk drinks, topping mixes
- coffee beverages, pharmaceuticals & supplements, wine coolers
- frozen desserts, shake mixes, yogurt

Acknowledgements :

· We would like to thank Mark D.Gold from Cambridge MA for his guidance and kind help and also for allowing us free access to his exhaustive data on aspartame. · We would also like to thank Betty Martini of "Operation Mission Possible" for making us aware of the adverse effects of aspartame, for her constant encouragement and guidance and for letting us use her data for this article.

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