C Is Aspartame Addictive?

"*The wife of a man consuming up to six liters of diet cola daily concluded: 'He is truly addicted and unable to help himself.... When not drinking it, he is like a new person, or at least the person I once knew. But when he then drinks it after abstaining for a week (as a result of incredible determination), I see depression, verbal aggression, a sense of hopelessness, inability to sleep, poor concentration, trouble with eyesight, chest problems, and weight gain.'*"[1]

—From an online article by H. J. Roberts, MD

What could be worse than a popular diet aid that makes you fat? One that is also addictive!

What could be worse than a popular diet aid that makes you fat? One that is also addictive! (See "Does Aspartame Make You Fat?" on page 69.)

"The anguished friend of an aspartame addict stated: 'She could hardly walk. She could hardly see. She was already going to a neurologist because they thought she had multiple sclerosis.... Her physician ... told her that aspartame was the problem, especially after he started researching its role in brain tumors—because two persons in her family died from brain tumors! When told aspartame would kill her, she said: 'I'm addicted to it and can't live without it. If they try to take it off the market, I'll get it on the black market!'"[2]

A scientist wrote the following description of alcohol addiction: "A person is said to be an alcohol addict when he or she continues to drink despite health and negative social and family problems."[3]

Substituting the word *aspartame* for *alcohol*, there is anecdotal evidence that aspartame is addictive. An article from a website for recovering alcoholics and addicts, cleanandsoberissexy.com, asks: "*Is diet soda bad for alcoholics, addicts*?"[4] The author responds:

"I had heard of several alcoholics and addicts who had been drinking large amounts of diet cola and had suffered side effects. "My friend is an alcoholic with 15 years sobriety. He said he had been drinking between 6 and 8 cans of diet cola daily for several months. He had been suffering for some time several symptoms similar to when he was drinking. All his symptoms disappeared when he stopped drinking diet cola sweetened with aspartame. His symptoms were:

- *Mood changes*
- *Depression*
- *Anxiety*
- *Anger*

- *Headaches*
- *Cloudy thinking*
- *Muscle aches and pains*
- *Tinnitus (ringing in the ears)*
- *Upset stomach*
- *Constipation*
- *Abdominal pain (left side)*
- *Poor skin tone*
- *Psoriasis (red scaly skin patches)*
- *Skin rash*
- *Frequent urination*
- *He had been told his liver and kidneys were not working effectively*
- *He often felt compelled to have the first diet cola after breakfast*
- *He often craved for the next diet cola."*

Dr. Roberts was first to draw attention to the addictive nature of aspartame. In an online article, he provides confirmation for this story when he writes: "*A previous alcoholic patient expressed concern that he had traded alcoholism for aspartame addiction. He observed in a letter: 'There are MANY just like me. You will rarely see a recovered alcoholic without a drink in hand, day or night, whether it be coffee or soda ... usually DIET. We can hardly keep sweeteners on hand at our meetings. MANY of us suffer from tremendous mood bouts. If aspartame has contributed to the difficulties I have had with depression and mood swings, I WANT TO KNOW!'*"[5]

"Recovered alcoholic patients repeatedly stated that they felt worse after avoiding aspartame than alcohol, and asserted that they had traded one addiction for another."

Dr. Roberts states that "*Thirty-three (5.6%) of 540 aspartame reactors ... found it difficult or impossible to discontinue* [diet products with aspartame] *because of severe withdrawal effects. They or their reporting relatives (especially parents of afflicted children) specifically used the terms 'addict' and 'addiction.' Others who used comparable terms were excluded even though they experienced similar withdrawal symptoms.... Recovered alcoholic patients repeatedly stated that they felt worse after avoiding aspartame than alcohol, and asserted that they had traded one addiction for another.*"[6]

Two components of the aspartame molecule appear to cause the addiction: the methyl ester—about 10% of the aspartame molecule—that quickly becomes free methyl alcohol after consumption, and phenylalanine—about 50% of the molecule.

Methyl alcohol—also known as methanol, wood alcohol, carbinol, wood spirits, or wood naphtha[7]—is the most toxic form of alcohol,[8] with a smell and taste similar to ethanol.[9] It is found in windshield washer liquid and other organic solvents, gasoline, antifreeze, copy machine fluid, small stove fuel, shellac, varnish, paint strippers,[10] perfumes, and in some eau de colognes.[11] When compared to ethanol—the alcohol used in most adult bev-

erages—methanol is only mildly intoxicating. It is, however, metabolized over a 12-to-24-hour period[12] into the highly toxic chemicals formaldehyde and formic acid, that can be responsible for headaches, cramps, convulsions, depressed breathing, acidosis, destruction of the optic nerve, permanent blindness, and death.[13] Methanol is estimated to be lethal for adults at doses of 50-100 mL (1.69-3.38 fl oz U.S.), however, blindness and death have occurred after consuming as little as 0.1 mL/kg, equivalent to about 6-10 mL, (0.20 - 0.34 fl oz U.S.) varying with the weight of the individual.[14]

A twenty-six-year old man was diagnosed with methanol poisoning. He was given ethanol to block formic acid production. He suffered two cardiac arrests and was declared brain dead. He was pronounced dead after a third cardiac arrest.

For example, a 26-year-old man was hospitalized 60 hours after ingesting a significant amount of an alcoholic beverage mixed with eau de cologne or perfume. He had complained of abdominal pain, nausea, vomiting, and blurred vision, and then lapsed into a coma. He was found to have severe metabolic acidosis, and was diagnosed with methanol poisoning, with a blood methanol of 14.6 mg/dL and formic acid content of 30 mg/L. He was given intravenous sodium bicarbonate and dialysis for the acidosis and the removal of the methanol and its metabolites. He was given ethanol to block additional formic acid production. The acidosis was eventually corrected, but he had suffered two cardiac arrests, and was declared brain dead the third day after hospitalization. He died after a third cardiac arrest.[15]

The administration of methanol to pregnant lab rats has also been shown to produce birth defects.[16]

Note: Folic acid, found in green leafy vegetables, is critical in the body's detoxification of methanol. When deficient, formic acid accumulates in the blood, causing acidosis. An article in the New England Journal of Medicine estimates that up to 30% of pregnant women in the United States and Europe, and 50% of pregnant women in India, have folic acid deficiencies.[17]

According to Dr. Roberts, "*The daily intake of methyl alcohol from natural sources averages less than 10 mg. Aspartame beverages contain 55 mg methanol per liter, and nearly double as much in some carbonated orange sodas. Persons ingesting five liters* [of diet orange soda] *a day can therefore consume over 400 mg of methanol.*"[18] Food scientist and methanol expert Dr. Woodrow C. Monte calculated that a daily intake of 250 mg of methanol is 32 times the daily limit set by the Environmental Protection Agency (EPA),[19] which amounts to (250 mg/day)/32 = 7.8 mg/day. So an intake of 400 mg/day of methanol would be 400/7.8 = 51 times the EPA limit!

As you can see from the story of the man who died from methanol poisoning, ethanol is an antidote to methanol. The enzyme that metabolizes methanol—alcohol dehydrogenase—also oxidizes ethanol in the liver, and the oxidation of ethanol takes precedence over that of methanol. This allows the body to slowly excrete the methanol through the kidneys and breath with minimal formation of the deadly metabolites, formaldehyde and formic acid.[20]

Ajinomoto, the world's largest producer of aspartame, states on its website, aspartame.net, that: "*Methanol is a natural and harmless component of many foods we eat every day. The methanol produced by aspartame is identical to the methanol produced in much larger amounts from fruits, vegetables and*

their juices. In fact, a cup of tomato juice provides about six times more methanol than a cup of an aspartame-sweetened soft drink. The amount of methanol in the human diet is nowhere near the levels that cause toxicity. You would have to drink over 600 cans of diet soft drink at one sitting to reach the toxic level."[21]

The problem with Ajinomoto's statement is that plant foods that naturally contain methanol also contain its antidote, ethanol. A search on the U.S. Department of Agriculture (USDA) website shows that oranges, onions, pineapple, cauliflower, tomato, and black current each contain methanol. Each of those foods also contain the antidote ethanol (also called ethyl alcohol).[22] For example, according to the USDA website, the amount of *methanol* in orange juice is between 0.8 - 80 ppm, whereas the *ethanol* content of orange juice is 64 - 900 ppm, or 11 - 80 times the methanol.[23] According to Dr. Monte in his ground-breaking work on methanol, "*Inhibition is seen in vitro even when the concentration of ethyl alcohol* [is] *only 1/16th that of methanol.*[24] *The inhibitory effect is a linear function of the log of the ethyl alcohol concentration, with a 72% inhibition rate at only a 0.01 molar concentration of ethanol. Therefore if a liter of a high methanol content orange juice is consumed, with 33 mg/liter of methanol and a 20/1 ratio of ethanol/methanol, only one molecule of methanol in 180 will be metabolized into dangerous metabolites until the majority of the ethanol has been cleared from the bloodstream.*"[25]

Aspartame contains no ethanol, and its metabolite formaldehyde, which breaks down into formic acid, has been found to collect and stay in the body after the consumption of aspartame.

Aspartame contains no ethanol, and its metabolite formaldehyde, which breaks down into formic acid, has been found to collect and stay in the body after the consumption of aspartame, as mentioned in the discussion of the Trocho study on page 59.

The case of Santiago Echiverria provides an extreme example of this phenomenon. A diabetic for fifteen to twenty years, Echiverria reportedly drank copious amounts of diet cola and coffee sweetened with Equal.

Upon his death in 1994, the funeral director found so much formaldehyde in his body that he had to close the casket because the putrid-smelling chemical was seeping through Echiverria's skin. The director was puzzled by the formaldehyde content of his body *before* arterial embalming,[26] which is done by injecting a formaldehyde solution into the jugular vein and carotid artery of the deceased.[27]

Like ethanol, methyl alcohol appears to be highly addictive. Growing evidence indicates that the dopamine D3 receptor of the nucleus accumbens (NAc)—the reward, laughter, pleasure, addiction, and fear center of the forebrain[28]—is involved in dependence on alcohol. The NAc is also where nicotine, cocaine, amphetamines, and opiates have been found to effect physical changes that make us vulnerable to addiction.[29, 30, 31] Such substances are thought to enhance dopamine neurotransmission into the NAc, but their repeated consumption leads to physical changes that reduce their initial pleasurable effects, and leave an addict wanting more.[32] Scientists have found that persistent intense dopamine transmissions into the NAc create cravings that continue long after acute symptoms of withdrawal have subsided.[33]

Withdrawal from chronic ethanol use, for example, has been found to substantially decrease dopamine neuron activity and NAc dopamine levels, resulting in long-term neuroadaptations within the dopamine systems that partially account for the high rate of relapse into alcohol-seeking behaviors, even years after drinking has stopped. Deficits in dopamine transmission in animals with a history of dependence appear to be long lasting. For example, decreased dopamine release in the NAc was found as long as two months after ethanol withdrawal.[34] Since methanol has sedative properties similar to ethanol, presumably chronic methanol consumption from sustained and frequent ingestion of aspartame results in similar dependencies.

Methanol, however, comprises approximately 10% of the breakdown derivatives of aspartame. What of phenylalanine, comprising about 50% of the molecule?

When phenylalanine is carried to the blood-brain barrier, it competes with the amino acid tyrosine for passage into the brain. When excess phenylalanine is consumed, such as during chronic aspartame ingestion, the brain gets less and less tyrosine from food. This creates an addiction similar to that of methanol, because tyrosine is converted into the "feel-good" chemical dopamine.

Recall from our discussion of phenylalanine and aggressive behavior starting on page 48, when phenylalanine is carried to the blood-brain barrier, it competes with the amino acid tyrosine for passage into the brain. When excess phenylalanine is consumed, such as during chronic aspartame ingestion, the brain gets less and less tyrosine from food. This creates an addiction similar to that of methanol, because tyrosine is converted into the "feel-good" chemical dopamine. Continual flooding of the brain with phenylalanine results in a depletion of dopamine transmissions into the NAc, causing an addict to seek his or her drug of choice, aspartame.

Behind every craving is a powerful automated reward reinforcement system as basic as hunger or thirst. Though not fully understood, powerful internal forces affect our behaviors.[35] The healthy person achieves a balance of behaviors. We may overeat or over-indulge in alcohol or food at times, and then return to more moderate consumption. We balance the competing pleasurable reward reinforcement system and the control system that enables us to weigh the potential negative consequences.[36] Dopamine is crucial to the successful functioning of our reinforcement system. Even small amounts of chemicals that inhibit the activity of dopamine can block our reinforcement mechanisms. In one study, two groups of participants drank alcoholic beverages. One group was also given haloperidol, a drug that blocks the reception of dopamine's chemical messages of craving. The other group received a placebo. The haloperidol group consumed less alcohol.[37]

Notes