

# Straight Facts on Aspartame & Health

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Dr. Bernadene Magnuson recently joined Cantox Health Sciences International as a Senior Scientific and Regulatory Consultant and the University of Toronto as Associate Adjunct Professor of Nutritional Sciences. Previously, she was Assistant Professor at the University of Maryland. Dr. Magnuson has published numerous peer-reviewed articles, book chapters, abstracts and professional articles and is on the editorial board of two journals. She is an active member of various committees of the Institute of Food Technologists and the Society of Toxicology.

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Consumers look to health professionals for sound advice about a myriad of nutrition and health issues, including the safety of food ingredients. In particular, some consumers might have questions about aspartame, a low-calorie sweetener that Internet rumors link to formaldehyde toxicity, cancer and other serious health problems.

To help you provide the facts, the Beverage Institute For Health & Wellness of the Coca-Cola Company asked Dr. Bernadene Magnuson, lead author of a recent expert panel review of aspartame safety published in *Critical Reviews of Toxicology*,<sup>1</sup> to provide an overview of the panel's findings.

“The expert panel concluded that aspartame is a thoroughly-studied, safe sweetener that can help reduce the calorie content of many foods.”

### Actual Aspartame Intakes Are Far Below the ADI

The Food and Drug Administration (FDA) sets the Acceptable Daily Intake (ADI) for food ingredients at a level determined to be safe to consume every day for a lifetime without risk. Consuming more than the ADI does not mean an effect will occur because the ADI includes a wide margin of safety above the No Observed Effect Level (NOEL) in animals. The ADI for aspartame is set at 50 mg/kg bw/day, which is 100 times lower than the NOEL.

US Aspartame Intakes (Estimated) vs ADI		
Low Calorie Sweetener Users	Est. Aspartame Intake (mg/kg bw/day)	Percent of ADI (ADI=50 mg/kg bw/day)
<b>All</b>		
50th Percentile	4.8	10%
95th Percentile	13.3	27%
<b>Children, 6-11 yrs (subgroup)</b>		
50th Percentile	5.5	11%

To compare doses used in safety studies with current usage levels, the panel used food consumption data from the 2001-2002 National Health and Nutrition Examination Survey (NHANES) and concentrations of aspartame in foods to determine current aspartame consumption levels. For the analysis, it was assumed that aspartame was the sole sweetener in reduced-calorie foods and beverages consumed. Among low-calorie sweetener users, mean aspartame consumption was found to be about 10% of the ADI. Even among the highest consumers (95th percentile), intakes were only about 27% of the ADI. Subgroup analysis showed average consumption among children, 6 to 11 years, was 5.5 mg/kg bw or 11% of the ADI.

Aspartame Content of Common Foods vs. ADI			
Food/Beverage	Serving Size	Aspartame (mg)	Number of Servings Equal to ADI for a 150 lb. Person*
Diet Coke	8 oz.	125	27
Flavored Sweetened Gelatin	4 oz.	81	42
Tabletop Sweetener	Packet	35	97

\*ADI=50 mg/kg bw/day



The Beverage Institute For Health & Wellness

The Beverage Institute For Health & Wellness of The Coca Cola Company supports research and educational outreach, with a primary focus on beverage nutrition and science. The Beverage Institute is responsible for clinical research programs related to existing brands and the development of new beverages. The Institute also serves as a resource for health professionals and others seeking science-based information about beverages, their ingredients, and their role in active, healthy lifestyles. For more information, visit [www.beverageinstitute.org](http://www.beverageinstitute.org).

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## Aspartame Metabolism Well Understood

Aspartame consumed orally never enters the bloodstream. It is completely broken down in the intestinal lumen or mucosa cells into the amino acids, aspartic acid and phenylalanine, and a small amount of methanol. These are naturally-occurring compounds found in many other foods, often in much higher amounts.

Phenylalanine, Aspartic Acid & Methanol Content of Common Foods (mg)			
Food/ Beverage	Phenylalanine*	Aspartic Acid*	Methanol
Diet Coke (8 oz.)	60	48	12
Milk (8 oz.)	404	592	-
Banana (med)	58	146	21
Tomato juice (8 oz.)	39	231	71

\*Amino acids

## Aspartame Poses No Health Risk

The panel reviewed every published animal and human study that evaluated aspartame safety. Below are highlights of the findings which led the panel to conclude that, at levels found in the human diet, aspartame poses no health risk; there is no credible link between aspartame and conditions related to the nervous system and behavior or any other symptom or illness; and there is no evidence of genetic toxicity, no credible evidence of carcinogenicity, and no evidence to support an association between aspartame and the development of obesity.

“Consumers ingest more methanol from foods like a medium banana and tomato juice than from diet soft drinks.”

**Methanol/Formaldehyde from Aspartame.** Internet stories often cite methanol production from aspartame and the methanol metabolite, formaldehyde, as causing harmful effects. However, few consumers know that the body is constantly exposed to and capable of handling small amounts of both metabolites. Consumers ingest more methanol from foods like a medium banana (21 mg) and tomato juice (71 mg/8 oz) than from diet soft drinks (~12 mg/8 oz). A healthy adult can safely consume up to two grams of methanol. The liver can metabolize 22 milligrams of formaldehyde per minute to formic acid and carbon dioxide and water. According to some calculations, an adult human body produces and metabolizes more than 50,000 milligrams of formaldehyde daily. Studies in humans show that doses of aspartame

more than four times the ADI of 50 mg/kg bw/day do not change blood methanol or formic acid beyond normal levels, and formaldehyde is not detected.

**Cancer.** Fourteen animal studies found no evidence that aspartame causes cancer. Only the European Ramazzini Foundation alleges that aspartame has carcinogenic potential. However, the panel agreed with FDA's assessment that the Ramazzini study contained numerous methodological and interpretation errors and did not provide credible evidence of carcinogenicity. A preponderance of epidemiological studies shows no association between aspartame consumption and cancers.

**Reproduction.** Aspartame does not adversely affect pregnancy or development. In animal studies at doses up to nearly 1,000 times average human consumption levels, aspartame showed no effect on the ability to mate, conceive or lactate, or on pregnancy, pregnancy outcomes, or offspring development. In humans, doses up to 50 mg/kg bw (10 times average consumption levels) did not affect breast milk composition or other lactation parameters.

**Headaches.** Most studies investigating a relationship between aspartame and headaches show no effect. However, some small studies have been positive, suggesting a susceptible population subset, although there is no biological explanation. Inconsistent findings may be caused by lack of objective measurements for headache onset or duration.

**Learning, Behavior and Seizures.** Extensive research in both animals and humans demonstrates that aspartame has no effect on learning and behavior. Studies in animals and in human adults and children do not support a relationship between aspartame and seizures.

**Obesity.** Most human studies show that aspartame does not increase hunger in users. Randomized controlled trials that measured food consumption show that aspartame does not increase energy intake. Rather, significant reduction in energy intakes were observed with aspartame consumption compared to controls, except for non-sucrose controls such as water. In these cases, there was no significant difference.

## References

1 Magnuson BA, Burdock GA, Doull J, Kroes RM, Marsh GM, Pariza MW, Spencer PS, Waddell WJ, Walker R, Williams GM. Aspartame: a safety evaluation based on current use levels, regulations, and toxicological and epidemiological studies. *Crit Rev Toxicol.* 2007;37:629-727.

## FREE CPE PROGRAM:

A podcast presentation based on the expert panel review of aspartame safety discussed in this article has been approved for 1.5 CPE hours by the Commission on Dietetic Registration.

See: [www.beverageinstitute.org](http://www.beverageinstitute.org)