

Artificial Sweetener Neotame Can Damage Your Gut

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Neotame caused healthy gut bacteria to become diseased and invade the gut wall, which could lead to irritable bowel syndrome and sepsis

Previous research by the scientists found that other artificial sweeteners, including saccharin, sucralose and aspartame, may similarly harm the gut

Artificial sweeteners are also linked to additional health risks, including increased risk of Type 2 diabetes, cardiovascular diseases, cancer, anxiety and mortality in adults

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Neotame, an artificial sweetener that's chemically similar to aspartame,¹ may seriously damage the human intestine and overall gut health.² Sometimes listed on food ingredient labels as E961, neotame is a relative newcomer to the artificial sweetener market, despite well-known health concerns, is expected to reach a global market value of \$3 billion by the end of 2025.³

Neotame, developed in 2002 as an alternative to aspartame, is up to 13,000 times sweeter than sugar⁴ and widely used in drinks, sauces, sweets, savory foods and chewing gum. Yet, "Despite widespread global use of neotame, there are surprisingly few research studies on

the biological and physiological effects of the sweetener,” researchers wrote in *Frontiers in Nutrition*.⁵

The team, from Anglia Ruskin University in Cambridge, England, found neotame poses serious risks to gut health, including causing healthy gut bacteria to become diseased.⁶

Neotame May Damage Gut Microbes, Leading to Irritable Bowel Syndrome and Sepsis

The in vitro study involved models of the intestinal lining (Caco-2 cells) and gut bacteria (*Escherichia coli* and *Enterococcus faecalis*) to examine the effects of neotame exposure. Not only did neotame cause cell death in intestinal cells but it also damaged bacteria commonly found in the gut.

The damage to the intestinal epithelium decreased when researchers reduced the expression of a specific taste receptor, T1R3, which suggests neotame’s impact might be linked to taste perception pathways. As noted in an Anglia Ruskin University press release:⁷

“The study is the first to show that neotame can cause previously healthy gut bacteria to become diseased and invade the gut wall — potentially leading to health issues including irritable bowel syndrome and sepsis — and also cause a breakdown of the epithelial barrier, which forms part of the gut wall.”

Neotame also disrupted the intestinal barrier, leading to increased leakage and decreased presence of claudin-3, a protein important for cell binding, again through a T1R3-dependent mechanism. In experiments involving gut bacteria, neotame increased harmful biofilm formation, which further reduced the viability of the intestinal lining, and increased the ability of *E. coli* and *E. faecalis* to stick to and invade intestinal cells.⁸

According to study author Havovi Chichger, associate professor in biomedical science at Anglia Ruskin University, “When bacteria form a biofilm, they cluster together as a protective mechanism which makes them more resistant to antibiotics. Our study also shows that neotame increases the ability of the *E. coli* to invade and kill human gut cells.”⁹

What’s more, even consuming small amounts of neotame could be toxic. Chichger said, “Even when we studied neotame at very low concentrations, 10 times lower than the acceptable daily intake, we saw the breakdown of the gut barrier and a shift in bacteria to a more damaging behavior, including increased invasion of healthy gut cells leading to cell death. This can be linked to issues such as irritable bowel diseases and sepsis.”¹⁰

Aspartame, Sucralose May Also Damage Your Gut

Previous research by the scientists found that other artificial sweeteners, including saccharin, sucralose and aspartame, may similarly harm the gut. Study author Havovi Chichger, associate professor in biomedical science at Anglia Ruskin University, explained:¹¹

“There is now growing awareness of the health impacts of sweeteners such as saccharin, sucralose and aspartame, with our own previous work demonstrating the problems they can cause to the wall of the intestine and the damage to the ‘good

bacteria' which form in our gut.

This can lead to a range of potential health issues including diarrhea, intestinal inflammation, and even infections such as septicemia if the bacteria were to enter the blood stream. Therefore, it is important to also study sweeteners that have been introduced more recently and our new research demonstrates that neotame causes similar problems, including gut bacteria becoming diseased.

Understanding the impact of these pathogenic changes occurring in the gut microbiota is vital. Our findings also demonstrate the need to better understand common food additives more widely and the molecular mechanisms underlying potential negative health impacts.”

In 2022, a study published in *Microorganisms* also revealed that consuming sucralose — in “amounts, far lower than the suggested ADI [acceptable daily intake]”¹² — for just 10 weeks was enough to induce gut dysbiosis and altered glucose and insulin levels in healthy, young adults.¹³

The bacteria most affected by sucralose appeared to belong primarily to the phylum Firmicutes, which are centrally involved in glucose and insulin metabolism. However, it doesn't end there. Animal studies suggest the sucralose-altered gut microbiome may be involved in inflammation of the gut and liver, as well as cancer. According to the *Microorganisms* study researchers:¹⁴

“A study in mice showed that sucralose ingestion for six weeks increases the relative abundance of bacteria belonging to the phylum Firmicutes, such as *Clostridium symbiosum* and *Peptostreptococcus anaerobius*.

Notably, sucralose-induced intestinal dysbiosis also appeared to aggravate azoxymethane (AOM)/dextran sulfate sodium (DSS)-induced colitis and colitis-associated colorectal cancer in these animals.

Likewise, sucralose ingestion resulted in gut dysbiosis and pronounced proteomic changes in the liver of mice, where most of the overexpressed proteins related to enhanced hepatic inflammation.”

Artificial Sweeteners Interfere with Normal Activity of Gut Bacteria

Researchers are only beginning to tap the surface when it comes to unveiling the complex relationship microbes have with human health and disease. However, gut microbes' effects don't only apply to your gastrointestinal tract. They interact with your central nervous system via the microbiota-gut-brain axis, a two-way information highway that involves neural, immune, endocrine and metabolic pathways.¹⁵

In short, if you value your overall health, tending to your gut healthy is key — and this includes avoiding artificial sweeteners. Yet another study, this one published in the journal *Molecules*,¹⁶ found [multiple artificial sweeteners](#) approved and deemed safe by the U.S. Food and Drug Administration cause DNA damage in, and interfere with the normal and healthy activity of, gut bacteria. The artificial sweeteners included in this study included:

Artificial sweetener	Brand name(s)
Aspartame	NutraSweet, Spoonful, Canderel, Equal, NatraTaste Blue
Sucralose	Splenda, Zerocal, Sukrana, SucraPlus, Candys, Cukren and Nevella
Saccharin	Sweet 'N Low, Sweet Twin, Sugar Twin, Necta Sweet
Neotame	Newtame
Advantame	(No brand names)
Acesulfame potassium-k	Sunnette, Sweet One, ACE, ACE K, Sweet 'N Safe

The researchers concluded that all of these sweeteners “had a toxic, stressing effect, making it difficult for gut microbes to grow and reproduce.” The effects on your gut health may in turn affect your body’s ability to process regular sugar and other carbohydrates. According to this study, the toxic limit for these artificial sweeteners appears to be around 1 milligram per milliliter (mg/mL).

Ariel Kushmaro, Ph.D., professor of microbial biotechnology at Ben-Gurion University and lead study author, told Business Insider, “We are not claiming that it’s toxic to human beings. We’re claiming that it might be toxic to the gut bacteria, and by that, will influence us.”¹⁷ Specific damage caused by the artificial sweeteners included:

- **Saccharin** caused the greatest, most widespread damage, exhibiting both cytotoxic and genotoxic effects, meaning it is toxic to cells and damages genetic information in the cell (which can cause mutations).
- **Neotame** was found to cause metabolic disruption in mice and raised concentrations of several fatty acids, lipids and cholesterol. Several gut genes were also decreased by this artificial sweetener.
- **Aspartame and acesulfame potassium-k** — The latter of which is commonly found in sports supplements — were both found to cause DNA damage.

Artificial Sweeteners May Also Harm Your Brain

The authors of the featured *Frontiers in Nutrition* study pointed out that the negative effects of neotame on the “epithelium-microbiota relationship in the gut has the potential to influence a range of gut functions resulting in poor gut health which impacts a range of conditions including metabolic and inflammatory diseases, neuropathic pain, and neurological conditions.”¹⁸

Neotame’s relative aspartame is among the artificial sweeteners that’s particularly noted for its neurotoxicity. When you consume aspartame, it’s broken down into aspartic acid,

phenylalanine — a precursor of monoamine neurotransmitters — and methanol, which may have “potent” effects on your central nervous system, Florida State University (FSU) College of Medicine researchers noted.¹⁹

Their study, published in PNAS, linked aspartame consumption to anxiety and, worse yet, found the mental health changes were passed on to future generations. The FDA’s recommended maximum daily intake value for aspartame is 50 milligrams per kilogram. The FSU study involved mice drinking water that contained aspartame at a dosage of approximately 15% of the FDA’s maximum daily intake for humans.

The dose was equivalent to a human drinking six to eight 8-ounce cans of diet soda daily.²⁰ The mice consumed the aspartame-laced water for 12 weeks, which led to “robust, dose-dependent anxiety.”²¹ “It was such a robust anxiety-like trait that I don’t think any of us were anticipating we would see,” study author Sara Jones said. “It was completely unexpected. Usually you see subtle changes.”²²

WHO Advises Against Artificial Sweeteners for Weight Loss

Many believe they’re doing their health a favor by swapping out sugar for artificial sweeteners, but the opposite is true. Even the World Health Organization (WHO) advises against using these synthetic sweeteners for weight loss.

A systematic review and meta-analysis conducted by WHO revealed “there is no clear consensus on whether non-sugar sweeteners are effective for long-term weight loss or maintenance, or if they are linked to other long-term health effects at intakes within the ADI.”²³

In May 2023, WHO took it a step further, releasing a new guideline that advises people not to use non-sugar sweeteners (NSS) for weight control because they don’t offer any long-term benefit in reducing body fat in adults or children.²⁴ Francesco Branca, WHO director for nutrition and food safety, said in a news release:

“Replacing free sugars with NSS does not help with weight control in the long term. People need to consider other ways to reduce free sugars intake, such as consuming food with naturally occurring sugars, like fruit, or unsweetened food and beverages. NSS are not essential dietary factors and have no nutritional value. People should reduce the sweetness of the diet altogether, starting early in life, to improve their health.”

WHO’s systematic review also revealed “potential undesirable effects from long-term use of NSS, such as an increased risk of Type 2 diabetes, cardiovascular diseases, and mortality in adults.” The recommendation applies not only to aspartame but also other artificial sweeteners, including acesulfame K, advantame, cyclamates, neotame, saccharin and sucralose.

A 2022 population-based cohort study published in PLOS Medicine, which involved 102,865 adults, also revealed artificial sweeteners — especially aspartame and acesulfame-K — were associated with increased cancer risk, including breast cancer and obesity-related cancers.²⁵

How to Give Up Artificial Sweeteners

If you're hooked on artificial sweeteners but want to ditch them to protect your health, the video above shows how to use the Emotional Freedom Techniques (EFT), a psychological acupressure tool, when you feel a craving coming on. It can help you overcome the urge to consume a poisonous artificial sweetener.

Other natural craving-busters include sour foods like fermented vegetables or water with lemon juice. When you feel the urge to eat something artificially sweet, grab a glass of water or tea with citrus juice added for a much healthier treat. You can also try eating a piece of fruit, many of which are naturally sweet and can be a great substitute for sweet cravings.

You should also become vigilant about reading ingredient lists on food and beverage packaging. Artificial sweeteners are not only in diet sodas and sugar-free products but can also be found in foods you might not expect, including yogurts, breakfast cereals, condiments and snack foods.

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Notes

¹ [FoodNavigator Europe May 2, 2024](#)

^{2, 5} [Front. Nutr., 24 April 2024, Sec. Nutrition and Microbes, Volume 11 - 2024](#)

³ [Front. Nutr., 24 April 2024, Sec. Nutrition and Microbes, Volume 11 - 2024, Introduction](#)

^{4, 9} [The Conversation April 26, 2024](#)

^{6, 7, 11} [Anglia Ruskin University April 24, 2024](#)

⁸ [StudyFinds April 25, 2024](#)

¹⁰ [The Guardian April 24, 2024](#)

¹² [Microorganisms 2022, 10\(2\), Conclusions](#)

¹³ [Microorganisms 2022, 10\(2\)](#)

¹⁴ [Microorganisms 2022, 10\(2\), Discussion](#)

¹⁵ [Scientific Reports March 31, 2023, Introduction](#)

¹⁶ [Molecules 2018; 23\(10\): 2454](#)

¹⁷ [Business Insider October 2, 2018](#)

¹⁸ [Front. Nutr., 24 April 2024, Sec. Nutrition and Microbes, Volume 11 – 2024, Discussion](#)

^{19, 20, 22} [Florida State University News December 8, 2022](#)

²¹ [PNAS December 2, 2022, 119 \(49\) e2213120119](#)

²³ [WHO April 12, 2022](#)

²⁴ [WHO May 15, 2023](#)

²⁵ [PLOS Medicine March 24, 2022](#)

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