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How Gut Bacteria May Trigger Binge Eating and Weight Gain

Analysis by Dr. Joseph Mercola | August 26, 2024

STORY AT-A-GLANCE

- Gut bacteria may trigger binge eating and weight gain. Studies show similarities in microbiome patterns between humans and mice with compulsive eating behaviors, including increased Proteobacteria and decreased Actinobacteria and Blautia
- The gut-brain axis plays a crucial role in food addiction and binge eating disorders. Gut microbiota can produce substances affecting appetite and mood, potentially influencing eating behaviors through the vagus nerve
- Research has identified distinct neural pathways for fat and sugar cravings originating in the gut. When activated simultaneously, these pathways lead to increased dopamine release, potentially driving overeating
- Akkermansia muciniphila, a beneficial gut bacterium, is associated with improved metabolic health and weight management. It enhances gut barrier function, reduces inflammation, and may help regulate appetite through effects similar to GLP-1 medications
- Healing the gut microbiome may help break food addiction. Nurturing beneficial oxygen-intolerant bacteria strengthens intestinal defenses, while imbalances can lead to leaky gut syndrome and contribute to binge eating behaviors

If you've ever experienced symptoms of food addiction, like intense cravings for specific (usually unhealthy) foods or eating to the point that you feel sick, your gut bacteria could be to blame. Both humans and mice who engage in compulsive eating share similar

microbiome patterns, including an increase in Proteobacteria and a decrease in Actinobacteria and bacteria called Blautia.[1]

The findings, published in the journal Gut,[2] suggest that addressing your gut health may be instrumental in curbing binge eating and its associated weight gain.

"We speculate that the gut talks with the brain," study author Elena Martin-Garcia, an associate professor at the Universitat Pompeu Fabra in Barcelona, Spain, told NBC News. "And that may change the function of some brain areas, such as the prefrontal cortex, which is involved in self-control."[3]

Gut Microbiota May Trigger Food Addiction

The Gut study uncovered a potential link between gut microbiota and food addiction, a disorder characterized by loss of control over food intake. It's estimated that up to 20% of adults may struggle with food addiction,[4] which can lead to compulsive eating behaviors that are similar to drug addiction.

Researchers used the Yale Food Addiction Scale 2.0 to identify food addiction. While human participants answered 35 questions, mice were observed for signs of food addiction, including persistent food-seeking, compulsive behavior and high motivation for food.[5]

Gut bacteria were then compared among humans and mice who were and were not addicted to food. The study revealed striking similarities in gut microbiota signatures linked to food addiction in both mice and human cohorts. Bacteria belonging to the Proteobacteria phylum were associated with potentially harmful effects, while Actinobacteria showed potential protective effects against food addiction development.[6]

Notably, a decreased abundance of the Blautia genus was observed in food addicted humans and mice. Researchers found that feeding non-digestible carbohydrates like lactulose and rhamnose, prebiotics known to promote Blautia growth, led to increased Blautia abundance in mice feces. Further, this change occurred along with significant

improvements in food addiction symptoms. Similar positive results were found after the mice were given Blautia wexlerae orally as a probiotic.[7]

The study suggests that specific gut microbiota content may serve as a biomarker for food addiction vulnerability, opening new avenues for diagnosis and treatment. It also paves the way for innovative treatments using beneficial microbes and dietary supplementation. This new understanding could revolutionize approaches to managing food addiction and potentially contribute to addressing the broader issue of weight gain and obesity. According to Martin-Garcia:[8]

> *"We have demonstrated for the first time a direct interaction between the gut composition and brain gene expression, revealing the complex and multifactorial origin of this important behavioral disorder related to obesity. Understanding the crosstalk between alterations in behavior and bacteria in the gut constitutes a step forward for future treatments for food addiction and related eating disorders."*

Disrupted Gut Microbiome Linked to Binge Eating Disorder

Binge eating disorder (BED), a condition defined by recurrent episodes of eating large amounts of food in a short time, shares many similarities with food addiction, including a link to gut microbiota.

It's likely that the gut microbiome is influencing eating behaviors through the microbiota-gut-brain axis. This is a complex communication system between your gut and your brain. Your microbiome can produce various substances, like short-chain fatty acids and neurotransmitters, that affect your appetite and mood. For instance, some gut bacteria produce molecules that mimic your body's own appetite-regulating hormones.[9]

The vagus nerve, which connects your gut to your brain, also plays a crucial role in this communication. Recent studies have shown that certain metabolites produced by gut bacteria can interact with receptors on the vagus nerve, potentially influencing your eating behaviors.

One such metabolite, kynurenic acid (KYNA), has been found to be lower in individuals with bulimia nervosa, which involves binge eating behaviors. When researchers administered KYNA to mice prone to binge eating, it reduced their preference for palatable food and overall calorie intake.[10]

Brain imaging studies have revealed that individuals with BED show differences in brain activity, particularly in areas involved in reward processing, motivation and decision-making. These differences might explain why people with BED have stronger food cravings, make riskier decisions around food and have difficulty controlling their eating.

"Emerging evidence corroborates the notion that dysbiosis of gastrointestinal microbiome and its metabolites, alteration of gut-brain axis, as well as malfunctioning central circuitry regulating motivation, execution and reward all contribute to the pathology of binge eating," researchers explained in Gut Microbes.[11]

Gut-Brain Circuits May Control Overeating

Separate research also highlights the complex interplay between your gut, your brain and your desire to eat — or overeat. The study, by scientists from the Monell Chemical Senses Center in Philadelphia, uncovered distinct neural pathways for fat and sugar cravings that originate in the gut.[12]

When the pathways were simultaneously activated, it led to significantly more dopamine release, setting the stage for cravings and, potentially, overeating. Study author Guillaume de Lartigue, Ph.D., explained in a news release:[13]

> *"Food is nature's ultimate reinforcer. But why fats and sugars are particularly appealing has been a puzzle. We've now identified nerve cells in the gut rather than taste cells in the mouth are a key driver. We found that distinct gut-brain pathways are recruited by fats and sugars, explaining why that donut can be so irresistible.*
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> *… It's like a one-two punch to the brain's reward system. Even if the total calories consumed in sugar and fats stays the same, combining fats and sugars leads to*

> *significantly more dopamine release and, ultimately, overeating in the mice … The communication between our gut and brain happens below the level of consciousness … We may be craving these types of food without even realizing it."*

In another example, obesity also alters the gut microbiome, which in turn influences the host's metabolism, including appetite.[14] In a study published in the journal Microbiome, researchers used fecal transplants from lean or obese mice to recipient mice, revealing that gut microorganisms influence food reward mechanisms, including the desire for and learning associated with pleasurable eating.

These microbes may be responsible for an excessive drive to obtain sugar pellets and changes in dopamine and opioid indicators in brain regions linked to reward. The researchers identified 3-(3'-hydroxyphenyl)propanoic acid (33HPP) — a metabolite produced by certain gut microbes through the breakdown of dietary compounds — as strongly correlated with this heightened motivation. When they gave mice this compound, it affected their desire for food.

"Our data suggest that targeting the gut microbiota and its metabolites would be an interesting therapeutic strategy for compulsive eating, preventing inappropriate hedonic food intake," the scientists explained.[15] By better understanding how the gut microbiome influences eating behaviors, therapies that target the microbiome may one day help manage binge eating disorders. However, you can take steps now to help heal a damaged gut.

Gut Microbe Akkermansia Benefits Metabolic Health and Weight Management

Akkermansia muciniphila is a beneficial bacterial species naturally found in the human gut. Ideally, Akkermansia should make up about 3% to 5% of a healthy gut microbiome. However, genetic analyses indicate that approximately one-third of individuals have low or undetectable levels of Akkermansia, possibly due to compromised mitochondrial function leading to increased oxygen in the gut environment.

Akkermansia has been tested in overweight and obese individuals with promising initial results. Akkermansia is associated with several positive health outcomes, including:[16]

- Improved gut barrier function
- Decreased inflammation
- Better metabolic health
- Potential weight loss effects

Interestingly, the effects of Akkermansia on glucagon-like peptide-1 (GLP-1) are similar to those of medications like **Ozempic**. GLP-1 plays a role in insulin regulation and may also affect the nervous system, potentially leading to reduced appetite. Given its significant health implications, Akkermansia is expected to remain an important focus of scientific research in the coming years.[17]

Akkermansia, a Gram-negative, anaerobic bacterium, grows in the absence of oxygen and colonizes the human gut early in life through breast milk. It's benefits stem largely from its ability to break down mucin, a key component of gut mucus. This process stimulates increased mucin production, enhancing intestinal barrier integrity.[18]

The bacterium also boosts the expression of tight junction proteins and reduces gut lipopolysaccharide (LPS) production, leading to anti-inflammatory effects.[19] Studies in rodents showed that administering Akkermansia led to less weight gain, improved glucose tolerance and reduced diet-induced endotoxemia. Meanwhile, in humans, Akkermansia improved insulin sensitivity and liver function markers, and decreased body weight and fat mass.[20]

There are some quality concerns with Akkermansia, however, as many manufacturers use AFU (Active Fluorescent Units) instead of the more traditional CFU (Colony-Forming Units) to measure the bacteria in their products. CFU is the gold standard in the industry, counting only the viable bacteria that can grow, multiply and form colonies within your digestive system.

When a company uses AFU, they're not just counting the live bacteria; they're also including cells that might be potentially viable or even dead; this can lead to inflated numbers that don't accurately represent the true potency of the probiotic.

Healing Your Gut May Help You Break Food Addiction

The gut microbiome's influence on binge eating can be understood through the intricate balance of bacteria in your intestines. A healthy gut hosts a diverse community of microorganisms that work in harmony to protect your overall health. Nurturing beneficial oxygen-intolerant bacteria, such as the crucial species Akkermansia, strengthens your intestinal defenses and helps create an environment that supports overall well-being.

These beneficial bacteria break down dietary fibers to produce short-chain fatty acids (SCFAs), particularly butyrate. This compound fuels colonic epithelial cells, strengthening the intestinal barrier. SCFAs also stimulate mucin production, forming a protective layer against harmful bacteria.

When oxygen-intolerant bacteria decrease, it can lead to leaky gut syndrome. This condition allows toxins, undigested food and harmful microbes to enter your bloodstream, potentially triggering systemic inflammation and chronic illnesses.

Oxygen-intolerant bacteria are crucial for converting indigestible plant fibers into beneficial fats. They thrive in an oxygen-free environment, which requires adequate cellular energy to maintain. However, modern factors like **seed oil consumption** and exposure to toxins like **endocrine-disrupting chemicals** in plastics can compromise this energy production, making it difficult to maintain the ideal no-oxygen gut environment.

This can cause a shift from oxygen-intolerant to oxygen-tolerant species. Importantly, oxygen-tolerant bacteria produce more potent endotoxins. As a result, individuals with more oxygen-tolerant gut bacteria may experience stronger negative reactions to plant carbohydrates due to increased endotoxin exposure. In the context of binge eating, this bacterial imbalance could contribute to the disorder in several ways:

- **Mood and behavior —** Increased inflammation from endotoxins can affect brain function, potentially influencing mood and eating behaviors.
- **Gut-brain axis disruption —** The compromised gut barrier might alter your gut-brain communication, affecting appetite regulation and emotional responses to food.
- **Stress response —** The chronic low-grade inflammation from a compromised gut can heighten stress responses, potentially leading to stress-induced binge eating.

Understanding the relationship between cellular energy production, gut oxygen levels and microbial diversity is crucial for overall wellness, including balanced eating behaviors. **Improving mitochondrial function** and **maintaining a healthy gut ecosystem** can promote beneficial bacteria growth while reducing harmful endotoxin effects, potentially helping to mitigate factors contributing to binge eating.

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