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# Here's Why Drinking Soda Disrupts Your Gut Health and Weakens Immune Function

Analysis by Dr. Joseph Mercola | September 25, 2025

## STORY AT-A-GLANCE

- More than 63% of U.S. adults drink at least one sugar-sweetened beverage daily, rapidly disrupting gut bacteria, weakening immune defenses, and damaging the gut barrier at a genetic level
- Researchers found that the sugar in soda flips bacterial DNA "switches" within days, changing immune signals and gut wall strength, but stopping sugar reverses these effects quickly
- Artificial sweeteners in diet sodas alter gut microbe balance, lower diversity, and promote inflammatory bacteria, harming immunity and metabolism even without sugar or calories
- Inorganic phosphate in soda absorbs into the bloodstream nearly 100%, spiking hormones that deplete calcium, suppress vitamin D, stress the kidneys, and harden the arteries
- Sugar and phosphate together create a rapid, sustained metabolic storm, undermining gut health, hormone balance, and cardiovascular function from multiple angles at once

In the U.S., more than half (63%, to be specific) of adults 18 years old and above drink at least one sugar-sweetened beverage per day with soda being one of the most consumed options.[1] I've written numerous articles about the dangers of these products, as they overload your body with sugar and do absolutely nothing for your health. Now, another study confirms just how soda damages your well-being — by wreaking havoc on your gut microbiome and compromising your immunity.[2]

Your gut is home to trillions of microbes, known as the microbiome, that help digest food, protect you from harmful invaders, and train your immune system. These microbes are highly adaptable, switching certain genes on or off to respond to what you eat — a process known as functional plasticity.[3,4]

But when these microbes are exposed to the sugar in soda, their normal behavior is thrown off balance. Researchers found that sugary drinks cause genetic switches that alter immune signals and weaken your gut barrier — reshaping your gut microbiome and warping your body's immune defense.

## Drinking Soda Flips Genetic Switches in Your Gut

A recent study published in Nature Communications journal set out to examine how the sugar in soft drinks affects the DNA behavior of your gut bacteria. Conducted by researchers from the Technion-Israel Institute of Technology,[5] the study focused on a specific gut bacterium, Bacteroides thetaiotaomicron (B. theta). This gram-negative, obligate anaerobe resides in the human intestine, and is known for protecting the gut lining, reducing inflammation, and preventing harmful bacteria from taking hold.[6]

- **The research team worked with multiple test setups —** They conducted controlled lab experiments and mouse studies, and also used human gut bacterial samples. Across all tests, they found that white sugar caused the bacteria to perform "DNA inversions" — physical flips in specific segments of the bacterium's genetic code.

- **These flips act like on/off switches for certain genes —** They change how your gut bacteria communicate with the immune system. These inversions led to changes in T-cell populations, cytokine levels (chemical messengers of immunity), and a measurable weakening of the gut's protective barrier — all of which are tied to your immune function.

- **One of the most revealing discoveries was that the immune effects weren't caused by the usual gut byproducts, like short-chain fatty acids (SCFAs) —** Instead, the changes were driven by special proteins the bacteria released after sugar exposure.

These proteins were heat-sensitive, which is how scientists knew they were the key messengers.

Since proteins are more specific and direct in their immune communication, this means your gut bacteria are essentially sending your immune system new instructions based on what you drink.

- **Another striking detail from this research was the speed of the change —** In just seven days of consuming sugar water, mice showed a strong jump in these DNA flips. That change was tied to measurable immune effects, particularly reduced strength in the gut barrier, which acts like a wall between your digestive tract and your bloodstream. When it's weakened, toxins and harmful microbes have a clearer path into your body, which drives inflammation and other health issues.

- **Even more striking is that stopping the sugar reversed the effects —** Within days of eliminating sugar, the DNA orientation switched back to normal, immune markers stabilized, and the gut barrier regained its strength. This means even if you've been drinking soda regularly, your gut bacteria can recover — but only if you remove the sugar that's driving the problem.

The takeaway from this study is simple but powerful — Soda's impact on your gut and immune system isn't vague or slow; it's direct, rapid, and happens at the genetic level inside your microbes. According to a news article published by Technion-Israel Institute of Technology:

> *"This study stresses the importance of studying the complex effects of nutrition on the microbiome and our health state, and the researchers assess that this will allow tailored dietary recommendations to human subjects to improve their immune system's state and their health in general."*[7]

## Equally (or Even More) Damaging Are the Artificial Sweeteners in Diet Soda

If you think that the solution to this is just to forego regular soda and make the switch to diet versions to sidestep the white sugar overload, you're leading yourself toward a more damaging health trap. Diet sodas use artificial sweeteners to "cut the calories;" however, these chemical sweeteners not only cause DNA damage, but also have toxic effects on your gut bacteria.

In a 2023 review published in Nutrients, scientists examined how artificial sweeteners influence your gut microbiome. Pooling together findings from multiple studies, they investigated how these sweeteners alter the makeup and activity of the gut microbiota, and what it means for overall health.[8]

- **Artificial sweeteners tend to alter the proportions of specific bacterial groups —** The researchers found that saccharin, sucralose, and aspartame cause these shifts, which mimic the bacterial imbalances seen in obesity, insulin resistance, and inflammatory bowel conditions.

- **Even without sugar or calories, these sweeteners still send a strong "signal" to your gut bacteria —** For example, they cited studies that showed how saccharin reduced the diversity of gut microbes, while other findings found it increased pro-inflammatory bacteria.

- **Some of the strongest changes were seen with sucralose —** Multiple studies reported that sucralose exposure reduced beneficial bacteria like Bifidobacterium and Lactobacillus, while boosting populations of pathogenic Proteobacteria.

- **The biological mechanism comes down to how gut bacteria use and respond to these sweeteners —** While artificial sweeteners are designed to pass through the digestive tract without being absorbed like sugar, they still come into direct contact with your gut microbes. Some bacteria metabolize parts of these compounds or respond to them as chemical signals, changing their growth patterns, gene activity, and the types of byproducts they release into the gut environment.

This study shows that artificial sweeteners aren't "invisible" to your gut. They alter your microbiome and disrupt your immune function, metabolism, and long-term digestive health. This research makes it clear that swapping soda for "sugar-free" alternatives is never a safe fix.

## Phosphate — The Soda Ingredient That's Even More Metabolically Toxic Than Sugar

While these featured studies detail just how harmful sugar and artificial sweeteners in soft drinks are, there's an even more dangerous component in these drinks that's causing even more widespread damage — and it's hiding in plain sight. It's none other than phosphate.

- **So why is phosphate added to soda?** Apparently, soda manufacturers use phosphoric acid not just to prolong the shelf life of this product, but also to add flavor. And while they claim that phosphate is also found in whole foods like meat, eggs, or legumes, the one that's used in these drinks is completely different.

- **The phosphate in natural food sources is bound in protein or phytate —** This helps slow down absorption, allowing your body to process and break down the phosphate safely. You only absorb 40% to 60%, which is manageable for your body and does not overload your organs.

- **The phosphoric acid in soda is inorganic and not bound to anything —** Meaning, when you ingest it, it bypasses digestion and enters your bloodstream at nearly 100% absorption. This causes your blood phosphate levels to spike in just 30 to 60 minutes, putting severe burden on your organs.

- **It causes a surge in fibroblast growth factor 23 (FGF23)**[9] **—** This hormone sets off a chain reaction that disrupts calcium absorption, suppresses vitamin D, stresses your kidneys, and begins laying the groundwork for hardening of your arteries.

- **This compound also acts like a stealth hormone disruptor —** Every sip of soda hijacks your endocrine system — even if you are perfectly healthy. In fact, even young adults with no chronic conditions have shown elevated FGF23 levels within hours of a single phosphate load.

- **Phosphate raises your risk of a heart attack —** When your phosphate levels are constantly elevated, it causes your smooth artery walls to harden and become rigid — putting you at risk of cardiovascular problems. A 2024 meta-analysis showed that people in the highest phosphate quartile had a 44% greater risk of cardiovascular death compared to those with lower phosphate levels.[10]

For a more detailed explanation on how phosphate in soda wreaks havoc on your health, I recommend reading my article "**Why Phosphate-Loaded Sodas Hammer Your Metabolism Harder Than Sugar**."

Indeed, sugar and phosphate form a double assault on your body, which is why soda is absolutely one of the most damaging products on the market today. Together, these two ingredients create a fast and sustained metabolic storm that undermines your health from multiple angles at once.

## How to Stop the Damage and Restore Your Gut and Metabolic Health

If you've been drinking soda regularly, you're causing immense damage to your gut, immune system, and metabolism. But as the previous study notes, your body can recover — by removing soda from your lifestyle, you can reverse the damage and help your body repair itself. Here are several strategies I recommend:

1. **Cut out soda completely, both regular and diet —** Sugar-sweetened drinks alter your gut bacteria and immune defenses in days, while phosphoric acid spikes harmful phosphate levels in under an hour. Even diet sodas with artificial sweeteners disrupt

your gut's microbial balance. Remove all forms of soda from your routine — don't just switch to diet versions — so your gut microbes will reset and your phosphate levels will stabilize.

2. **Replace soda with gut-friendly, mineral-safe drinks —** Your body thrives when you give it hydration without chemical interference. Choose water, plain water with a squeeze of citrus, or herbal teas. If you're craving flavor, add slices of lemon, fresh berries, or cucumber to your water. Try coconut water as well, which has a naturally sweet flavor but without the toxic additives.

3. **Be aware of hidden phosphate in other processed foods —** Packaged snacks, processed meats, or fast food are overloading your body with more inorganic phosphate than you realize. Check ingredient labels for "phosphoric acid," "sodium phosphate," or "polyphosphate" — and skip those products.

4. **Feed your gut with real, whole foods —** Your gut bacteria thrive on fiber from vegetables, fruits, and legumes — the kind of foods that naturally slow digestion and feed beneficial microbes. If you are already eating whole foods, focus on variety to keep your microbiome resilient.

   However, remember to heal your gut first. Otherwise, the bad bacteria will only ferment the fiber you eat, causing them to produce endotoxins that affect your cellular function. Instead, make sure you're supplying it with 200 to 250 grams of carbohydrates a day from healthy, unprocessed sources. Once your gut is healed, reintroduce fiber in your meals.

5. **Support your body's repair systems with key nutrients —** Phosphate overload and gut disruption both drain your stores of important nutrients like magnesium, vitamin D, and calcium. Prioritize foods rich in these, such as leafy greens, sardines, and pasture-raised eggs. By restoring these nutrient levels, you help strengthen your bones, keep your arteries flexible, and rebalance the hormonal signals that soda has been disrupting.

# Frequently Asked Questions (FAQs) About Soda and Gut Health

**Q: How does soda affect my gut health?**

**A:** The sugar in soda triggers DNA "flips" in beneficial gut bacteria within days, altering immune signals, weakening your gut barrier, and allowing toxins and harmful microbes easier access to your body.

**Q: Are diet sodas safer for my microbiome?**

**A:** No. Artificial sweeteners like sucralose, saccharin, and aspartame disrupt the balance of your gut bacteria, reduce diversity, and increase inflammatory microbes, harming immunity and metabolism even without sugar.

**Q: Why is phosphate in soda so harmful?**

**A:** The phosphoric acid in soda is inorganic and unbound, meaning it's absorbed almost 100% into your bloodstream within an hour, spiking hormones that damage arteries, weaken bones, and strain your kidneys.

**Q: Can my gut and metabolism recover if I stop drinking soda?**

**A:** Yes. Research shows that removing soda allows bacterial DNA activity, immune markers, and gut barrier strength to return to normal within days, reversing much of the damage.

**Q: What steps can I take to undo the damage from soda?**

**A:** Cut out all soda, choose healthy drinks like water or herbal tea, avoid phosphate-loaded processed foods, eat fiber-rich whole foods to feed good bacteria, and replenish nutrients like magnesium, vitamin D, and calcium.

## Sources and References


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