MERCOLA
Take Control of Your Health

How Your Gut Signals Fullness — and What Happens When That System Breaks Down

Analysis by Dr. Joseph Mercola | April 16, 2026

STORY AT-A-GLANCE

- Your gut naturally regulates hunger and metabolism through a hormone called GLP-1
- GLP-1 is made by L-cells in your gut lining — and those cells run on butyrate. Without enough butyrate, GLP-1 production drops and your appetite system breaks down
- Restoring butyrate is the key to fixing hunger, metabolism, and fat storage — without drugs. This is how your body was designed to regulate weight: from the inside out
- Healing starts with calming the gut using simple carbs like white rice and fruit, then slowly reintroducing fermentable fibers such as resistant starch. Eliminating seed oils, reducing stress, and getting morning sunlight are also key to restoring your gut's ability to make butyrate and support GLP-1 naturally
- My new book, "Weight Loss Cure; Melt Fat Naturally With Your Own GLP-1," provides a step-by-step plan to rebuild butyrate production, restore natural GLP-1 signaling, and correct the root drivers of weight gain

If you feel hungry again soon after eating, crave snacks between meals, or experience an energy crash an hour or two after food, your appetite system has lost its timing. You may eat enough calories yet still feel unsatisfied. Blood sugar rises and falls too quickly. Hunger signals arrive early and stay loud. This pattern does not reflect weak discipline or poor food choices. It signals a breakdown in how your gut communicates fullness and fuel status to the rest of your body.

When it comes to weight loss, there's a hidden system in your body that works quietly behind the scenes — not in your muscles or fat cells, but deep in your gut lining. It's a hormone system powered by butyrate, a short-chain fatty acid (SCFA) that your gut bacteria make when you eat fiber. Butyrate fuels L-cells — specialized sensors in your gut lining that release a hormone known as GLP-1, short for glucagon-like peptide-1 — in response to fermentation, signaling that you've eaten enough.

GLP-1 plays a central role in appetite control, blood sugar balance, and fat storage.[1,2] It's released within minutes after you eat and acts like a broadcast signal, telling multiple organs that fuel has arrived and intake can slow.

You may have heard of GLP-1 in the context of medications like Ozempic and Wegovy, which mimic this natural hormone. But when your body makes its own GLP-1 the way it's supposed to, you already have a built-in weight regulation system — no injections, no prescriptions needed.

To turn that system back on, you need to restore butyrate. Everything else — stable energy, fewer cravings, easier fat loss — flows from there. This is the central premise of my new book, "**Weight Loss Cure; Melt Fat Naturally With Your Own GLP-1**."

Butyrate Fuels the Cells That Control Hunger

Butyrate is made in your colon when beneficial bacteria ferment certain types of fiber. It's best known as the main energy source for colonocytes — the cells lining your large intestine — but its role doesn't stop there. Butyrate also fuels L-cells, which sit along your intestinal wall and act as your body's metabolic messengers.

When butyrate reaches them, it triggers the release of GLP-1. GLP-1 is the hormone that tells your brain you've eaten enough, slows the movement of food through your stomach, stabilizes blood sugar, and reduces the desire to snack between meals. In short, butyrate powers the hormone that helps regulate your appetite.[3,4]

When this system works as designed, appetite regulates itself — and fat loss follows without conscious restriction. You eat less, not because you're forcing yourself to, but because you're full. You stop craving sugar. Your energy feels steady. Your metabolism stops pushing calories into fat cells and starts using them for energy again. But when your gut doesn't make enough butyrate, that entire system is blunted.

Beyond serving as fuel, butyrate helps maintain a low-oxygen environment in the colon. When colon cells receive adequate energy from butyrate, they consume oxygen efficiently, keeping the gut environment anaerobic. This low-oxygen state is essential because most butyrate-producing bacteria cannot survive when oxygen levels rise.

Seed Oils Undermine Butyrate

A primary driver of insufficient butyrate production is the modern diet. Seed oils high in linoleic acid (LA), processed grains, and a lack of fermentable fiber — all of these starve your gut bacteria of the raw materials they need to make butyrate. On top of that, environmental toxins, antibiotics, and chronic stress damage the gut lining and wipe out the very microbes that produce it.

LA disrupts butyrate production through several converging effects. It increases oxidative stress and low-grade inflammation in the gut lining, which raises local oxygen levels in the colon. That shift favors oxygen-tolerant microbes while suppressing the strictly anaerobic bacteria responsible for producing butyrate. Over time, this altered environment reduces fermentation efficiency, weakens the gut barrier, and further amplifies inflammation — creating a cycle that steadily drives butyrate levels down.

When that happens, your L-cells lose their fuel, and GLP-1 release drops. As a result, your stomach empties too quickly, your blood sugar swings out of control, and your brain doesn't get the signal to stop eating. Hunger kicks in faster. Cravings increase. Fat storage ramps up. Your metabolism hasn't failed — it's just running without the fuel it needs.

How GLP-1 Regulates Hunger and Metabolism

GLP-1 is one of the most important hormones in your digestive and metabolic system. It's secreted after meals and acts on multiple organs to keep energy balance in check:

- **In your brain**, it reduces appetite and increases feelings of fullness
- **In your stomach**, it slows emptying so you stay full longer
- **In your pancreas**, it increases insulin release and reduces glucagon, helping manage blood sugar
- **In your fat tissue**, it improves insulin sensitivity and supports fat burning. By improving insulin sensitivity and slowing nutrient delivery, GLP-1 shifts energy away from fat storage and toward immediate use, increasing the likelihood that calories get burned rather than stored

GLP-1 is your body's natural appetite regulator, and it's designed to activate every time you eat. GLP-1 receptor agonist drugs like semaglutide (Ozempic, Wegovy) copy these effects, but they come with a long list of potential side effects, as they override your body's natural rhythm.

GLP-1 medications replace a missing signal by forcing the receptor to stay active. Restoring butyrate does something fundamentally different. It amplifies your body's own signaling by supplying the fuel L-cells need to release GLP-1 in the right amounts, at the right time, in response to food. One approach overrides physiology. The other rebuilds it.

You don't need to hijack the system. You just need to restore the environment that lets it work — by feeding the cells that make GLP-1 what they need: butyrate. Once you restore GLP-1 signaling through adequate butyrate, the effects do not stop with appetite control. The same fuel that helps L-cells regulate hunger also supports gut integrity, immune balance, and brain signaling. These downstream benefits reflect the wider role butyrate plays in maintaining metabolic stability throughout your body.

Butyrate also stimulates the release of peptide YY (PYY), another satiety hormone produced by L-cells. PYY works alongside GLP-1 to slow digestion and reinforce fullness after meals, helping hunger stay suppressed between eating periods.

Butyrate's Broader Benefits

Rebuilding your GLP-1 signaling through butyrate doesn't just affect appetite. It also strengthens the systems that support stable metabolism long term. Importantly, it:

- **Reinforces gut barrier integrity —** Butyrate provides up to 70% of the energy colon cells need. With enough fuel, these cells form a tight barrier that keeps irritants and pathogens out of your bloodstream. When that barrier breaks down — often due to low butyrate — inflammation ramps up, immune reactivity increases, and blood sugar control suffers.[5]

- **Reduces systemic inflammation —** Butyrate suppresses nuclear factor kappa B (NF-κB), a master inflammatory switch that, when overactive, worsens insulin resistance and metabolic dysfunction.

  Butyrate also inhibits the NLRP3 inflammasome, another key driver of inflammation that responds to cellular stress and injury,[6] while boosting the production of interleukin-10 (IL-10), a powerful anti-inflammatory cytokine that tells immune cells to stand down.[7] Moreover, studies show that butyrate reduces circulating C-reactive protein (CRP), a marker of systemic inflammation that's elevated in a wide range of chronic diseases.[8]

- **Supports brain health —** Butyrate supports the gut-brain axis by reducing neuroinflammation and preserving the physical integrity of the blood-brain barrier. This barrier is a specialized structure that keeps harmful substances in the bloodstream from reaching the brain.

It also acts on microglia, the brain's resident immune cells, helping to suppress their overactivation. Chronic microglial activation has been implicated in anxiety, depression, and neurodegenerative diseases like Parkinson's and Alzheimer's.

Additionally, butyrate influences the production of neurotransmitters such as serotonin and gamma-aminobutyric acid (GABA), which help regulate mood, stress, and sleep. Animal studies suggest that increasing butyrate levels may improve symptoms of anxiety and support recovery from chronic stress and inflammation that affect the central nervous system.[9]

- **Regulates immune activity —** Your immune system needs to strike a delicate balance — stay alert to real threats without overreacting to harmless stimuli. Butyrate plays an important role in maintaining this balance. When produced in sufficient amounts, it influences the behavior of immune cells, encouraging the growth of regulatory T cells (Tregs) that promote tolerance and suppress overactive responses.[10,11]

- **Lowers colorectal cancer risk —** In the colon, butyrate promotes apoptosis (cell self-destruction) in precancerous and cancerous cells, helping reduce the risk of colorectal cancer. It also supports healthy cell turnover and differentiation, both of which are necessary to prevent abnormal growths in the intestinal lining.[12]

These benefits do not appear through supplementation alone or isolated food choices. They emerge when your gut environment supports steady butyrate production day after day. That requires a deliberate sequence: calm the gut first, rebuild tolerance next, and only then expand fermentation. The steps below follow that biological order.

How to Support Your Gut's GLP-1 System

Think of this process as restoring terrain before planting seeds rather than forcing growth in damaged soil. Your gut microbiome plays a key role in how your body processes carbohydrates and regulates blood sugar levels. By taking targeted steps to

enhance your gut health, you can restore and support the bacteria in your gut that produce butyrate and other SCFAs. Just keep in mind that your microbiome is as unique as your fingerprint.

What works for one person may differ for another, so patience and personalization are key. That said, here are a few foundational basics that will benefit most people:

1. **Start with gut terrain repair —** If you're bloated, constipated, or sensitive to high-fiber foods, you need to calm inflammation before you feed the microbiome. That means:

    - Avoiding fermentable fibers at first. When your gut is out of balance, high-fiber foods — even the "healthy" ones — can work against you. Foods like beans, lentils, oats and raw greens ferment quickly when the wrong bacteria are in control. This creates gas, pressure and inflammation, and worsens gut lining damage.

    - Eliminating seed oils (such as soybean, corn, canola, sunflower). The linoleic acid in seed oils damages the exact gut microbes you're trying to support. If your diet includes fried foods, processed snacks, or sauces made with soybean, corn, sunflower, or canola oil, you're suffocating your good gut bacteria.

      Replace those fats with ghee, grass fed butter or tallow — fats your body actually knows how to use. The goal is to shift your internal terrain so your gut bacteria thrive again.

    - Using simple carbs like white rice and ripe fruit to stabilize energy without feeding bad bacteria.

2. **Reintroduce fiber in phases —** Move on to fiber reintroduction only after you meet this criterion: You tolerate three consecutive days of white rice or ripe fruit with no bloating, abdominal pain, excess gas, or bowel urgency. At that point, introduce one

resistant starch source at a time, starting with 1/2 cup cooked-and-cooled white potato once daily.

Once you can consume 1/2 cup cooked-and-cooled potato daily for seven consecutive days with no increase in gas, bloating, stool looseness, or abdominal discomfort, advance to inulin-rich foods such as garlic, onions and leeks. These fibers bypass digestion in your small intestine and head straight to your colon, where they fuel beneficial bacteria that make butyrate.

Keep in mind that progress is oftentimes slow and non-linear. That is completely normal, and not a cause for concern. Just keep going; eventually your gut will normalize.

3. **Support with optional tools —** Once your gut begins to stabilize, these targeted tools can help accelerate butyrate production and improve results:

    - **Akkermansia postbiotics (Phase 1) —** Postbiotics are non-living bacterial components that still deliver biological signals. Pasteurized forms of Akkermansia muciniphila contain Amuc_1100, a protein shown to tighten the gut barrier and reduce inflammation. Look for postbiotic formulas with enteric coating or microencapsulation to ensure they survive stomach acid and reach the colon intact.

      Without that protection, less than 5% of Amuc_1100 reaches your colon. You could try megadosing to compensate, but that's expensive and inefficient. Prioritize coated formats to support your gut barrier more effectively.

    - **Live Akkermansia (Phase 2) —** Begin Phase 2 probiotics only after all of the following occur:

        - Bloating remains minimal or absent
        - Stool form stays consistent for at least 7 days
        - Fiber tolerance expands without symptom return

In this stage, introduce live probiotic Akkermansia alongside gentle prebiotics — like small amounts of resistant starch — to support the growth of butyrate-producing strains and reestablish a healthy, oxygen-sensitive microbial environment.

- **Fermented foods —** Traditionally fermented foods can boost microbial diversity and support butyrate-producing strains. Go slowly. Start with small amounts to test tolerance, especially if your gut is sensitive. Examples are given in the next section.

- **Gut testing —** A stool analysis can reveal which bacteria are present, whether your gut is inflamed, and how well you're producing short-chain fatty acids like butyrate. This can guide food choices and supplementation more precisely.

- **Resistant starch —** Found naturally in cooked-and-cooled potatoes, green bananas, and legumes — or as supplemental powders — resistant starch bypasses digestion in the small intestine and becomes prime fuel for butyrate-producing bacteria in the colon.

4. **Adjust your environment —** Your gut doesn't just respond to what you eat. It's tuned into your entire lifestyle. These daily habits help create the internal rhythm your microbiome needs to thrive:

    - **Sleep —** Align your sleep-wake cycle with natural light exposure. Aim for 7 to 9 hours of high-quality sleep and get morning sun to anchor your circadian rhythm. This helps regulate gut motility and microbial repair.

      Why it matters: Consistent, circadian-aligned sleep regulates gut motility, microbial repair, and GLP-1 timing, allowing butyrate-producing bacteria to recover and function efficiently.

    - **Stress —** Chronic stress alters your microbiome and shuts down butyrate production. Use daily tools like breathwork, walking outdoors, and nervous system regulation practices to calm your hypothalamic-pituitary-adrenal (HPA)

axis and support microbial balance.

Why it matters: Chronic stress suppresses vagal tone and alters gut signaling, which reduces fermentation efficiency and directly lowers butyrate production.

- **Fasting window —** Stop eating at least three hours before bed. This gives your migrating motor complex (MMC) — your gut's internal clean-up crew — time to sweep out bacteria and food debris overnight, reducing fermentation and inflammation.

  Why it matters: Overnight fasting activates the migrating motor complex, clearing excess bacteria and debris so fermentation stays balanced rather than inflammatory.

Foods That Enhance Butyrate Production

The most effective way to increase butyrate is to provide the raw materials your gut bacteria need to make it. Key producers like Faecalibacterium prausnitzii, Roseburia, and Eubacterium rely on specific dietary inputs to thrive. However, not all fibers ferment the same way, and not every gut can handle them equally. Once you're ready to reintroduce fiber, as explained in the previous section, you can start adding in:

- **Prebiotic-rich foods —** Prebiotics are nondigestible food components that selectively feed beneficial gut bacteria, such as:[13]
  - Garlic
  - Onions
  - Asparagus
  - Chicory root
  - Jerusalem artichokes
  - Green bananas
  - Turnip greens

    - Broccoli
    - Carrots
    - Cooked oats
    - Seaweed and microalgae
    - Legumes (soaked or pressure-cooked peas, lentils, and beans)

- **Fermented foods —** Fermented foods don't produce butyrate themselves, but they help shape the terrain that makes it possible. By delivering live organisms and metabolic byproducts, they strengthen your gut lining and help crowd out problematic strains. These include:
    - Sauerkraut
    - Kimchi
    - Kefir
    - Plain, full-fat yogurt
    - Fermented pickles

  Introduce these into your diet slowly and in small amounts. Their microbial density makes them highly active, so monitor how you respond to each one individually.

- **Direct food sources of butyrate —** Full-fat dairy products naturally contain small amounts of butyric acid, which supports colon cell energy and barrier strength. Good sources include:
    - Grass fed butter
    - Ghee
    - Aged cheeses like Parmesan
    - Whole milk, cream, or yogurt

Signs Your Gut Is Making More Butyrate

The following improvements reflect rising butyrate levels and gut healing in real time:

- **Bowel movements become regular and well-formed —** A sign of improved colonic motility and mucosal integrity.
- **Fiber tolerance improves —** Less bloating, gas, or discomfort after meals rich in fermentable fiber.
- **Hunger fades between meals —** As GLP-1 and PYY production increases, satiety naturally extends.
- **Mood feels more stable and stress less overwhelming —** Butyrate supports BDNF and modulates the HPA axis.
- **You lose fat without trying to eat less —** Improved metabolic signaling leads to spontaneous caloric reduction.
- **Reduced post-meal blood sugar spikes —** A measurable effect tied to improved insulin sensitivity and GLP-1 response.
- **Lower fasting insulin and triglycerides (if tested) —** Both improve with SCFA restoration and microbiome balance.
- **Fewer cravings for processed carbs and snacks —** Satiety hormones rise while inflammation-driven hunger decreases.
- **Less urgency or discomfort with bowel movements —** Improved stool consistency reflects stronger gut barrier and reduced inflammation.
- **Improved breath or reduction in sulfur/gas odors —** Indicates better fermentation profile in the colon (fewer sulfur-releasing or proteolytic bacteria).

Track Your Progress: How to Know It's Working

To track your recovery, keep a simple symptom journal for the first four to six weeks. Each day, jot down quick notes on these four markers:

- **Bloating —** None, mild, moderate, or severe
- **Energy —** Steady, sluggish, or crashing
- **Mood —** Calm, tense, irritable, anxious
- **Bowel quality —** Bristol stool scale (types 3 to 4 are ideal), frequency, urgency, discomfort

Even just a few words per day can help you see patterns clearly, especially when deciding when to add new foods or supplements. Once you begin reintroducing fermentable fiber, use a 1 to 10 scale each week to rate how well you're tolerating it. If you're not at a 7 or above, pause before advancing to the next phase.

- **1** = severe gas, bloating, or pain
- **5** = some symptoms, improving
- **10** = no symptoms, excellent digestion

If you want objective data, run these labs at baseline and again around week 8. These markers, while optional, offer biochemical confirmation that your butyrate–GLP-1 axis is restoring normal metabolic function.

- **Fasting insulin —** Falling levels suggest better GLP-1 signaling
- **Triglycerides —** Often improve as inflammation and insulin resistance drop
- **Post-meal glucose —** Ideally stays under 120 mg/dL at the 1-hour mark

Timeline: What to Expect as Your Gut Rebuilds

Your gut already knows how to help you lose weight — by producing butyrate, which fuels the cells that make GLP-1. This is how human metabolism was designed to function. Restore that system, and your cravings shrink, your blood sugar stabilizes, your inflammation calms down, and your body starts releasing excess weight naturally.

These shifts are clear signs that your body's metabolic software is running the way it was meant to. Your gut doesn't need to be perfect to start producing butyrate. But there's a rhythm to recovery, and markers to know it's working.

Not everyone experiences fat loss on the same timeline. In some people, metabolic improvements — such as steadier energy, improved blood sugar control, and reduced inflammation — appear weeks before any change on the scale. These early shifts signal that GLP-1 signaling and microbial balance are restoring, even if weight changes lag behind.

Phase	What Happens	Timeframe	Measurable Indicators
Terrain repair	Gas, bloating, and sensitivity begin to calm	1 to 3 weeks	Less urgency, firmer stools, more predictable digestion
Fiber reintroduction	Butyrate-producing strains begin to increase	2 to 4 weeks	Better tolerance of resistant starch, mood uplift
GLP-1 response	Appetite regulates, energy improves, cravings decrease	4 to 8 weeks	Fewer between-meal snacks, better AM energy

Phase	What Happens	Timeframe	Measurable Indicators
Metabolic reset	Satiety increases, fat loss begins, blood sugar stabilizes	6 to 12 weeks	Tighter waistline, reduced post-meal glucose swings

When Do You Need to Supplement?

Even with the best diet and lifestyle, there are situations where your gut may not produce enough butyrate on its own. Short-term supplementation can help when:

- Your gut has been dysbiotic for years
- You're recovering from antibiotics or illness
- You're managing chronic inflammation or stress
- You're unable to tolerate fermentable foods yet

However, it's important to note that most butyrate supplements release too early in the digestive tract, dissolving in the small intestine before reaching the colon. To get its benefits, you need to choose a formula designed for targeted delivery throughout the entire colon. To optimize benefits, look for butyrate supplements that offer:

- Colon-targeted release
- Delayed dissolution
- Multi-region delivery

Final Thoughts

Weight loss is not about fighting your body — it's about fueling the system it already built. Your gut holds the switch for hunger, fullness, blood sugar, and energy balance. Butyrate flips that switch by nourishing the cells that make GLP-1. This isn't a shortcut. It's not a hack. It's the return of a system that worked for thousands of years before processed food, seed oils, and gut-disrupting toxins broke it.

Feed the system, fuel the cells, and let your metabolism do what it was designed to do. Weight change follows metabolic repair, not the other way around.

You can start putting these strategies into practice right now with my new book, "**Weight Loss Cure; Melt Fat Naturally With Your Own GLP-1**," which provides a step-by-step plan to rebuild butyrate production, restore natural GLP-1 signaling, and correct the root drivers of weight gain.

We're also preparing a butyrate-support product designed to complement these foundational strategies. **You can join the waitlist now**, and when it becomes available, you'll receive a $5 off coupon by email.

Frequently Asked Questions (FAQs)

Q: What is butyrate, and why does it matter for weight?

A: Butyrate is a short-chain fatty acid produced when your gut bacteria ferment fiber. It powers the cells in your colon — including the L-cells that produce GLP-1, the hormone that helps regulate hunger, fullness, and fat storage. Without butyrate, GLP-1 can't do its job.

Q: How does GLP-1 help you lose weight?

A: GLP-1 slows down digestion, reduces appetite, and improves how your body uses insulin. It tells your brain you're full and curbs cravings. Restoring your natural GLP-1 signaling helps you eat less without trying — and that leads to fat loss over time.

Q: What are the best foods to support butyrate production?

A: Start with gentle carbs like cooked and cooled rice, peeled sweet potatoes, and ripe fruit. As your gut improves, add prebiotic-rich foods like garlic, asparagus, green bananas, and soaked legumes. Fermented foods and full-fat dairy also help.

Q: Why do seed oils interfere with butyrate production?

A: Seed oils are high in linoleic acid (LA), which disrupts gut microbes and promotes inflammation. This damages your colon lining and encourages the growth of microbes that don't produce butyrate — or worse, microbes that cause bloating, gas, and metabolic dysfunction.

Q: Can I take a supplement instead of changing my diet?

A: Supplements can help temporarily, especially if your gut is very compromised. But to restore long-term butyrate production, you need to rebuild your microbial terrain. Diet and lifestyle are what make the changes stick.

Sources and References

- [1, 3] Diabetes. 2009 Apr 14;58(7):1509-1517
- [2, 4] Advances in Nutrition Volume 9, Issue 1, January 2018, Pages 21-29
- [5] Clinical Nutrition Volume 42, Issue 2, February 2023, Pages 61-75
- [6] Cell Rep. 2024 Sep 24;43(9):114736
- [7, 10] Biomedicine & Pharmacotherapy Volume 163, July 2023, 114763
- [8, 11] Biomedicines. 2024 Aug 5;12(8):1760

- [9] Nutrients 2025, 17(8), 1305
- [12] Int J Oncol. 2024 Feb 29;64(4):44
- [13] Rupa Health, May 31, 2024