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Prebiotics Influence Gut Bacteria That Raise Brain GABA Levels

Analysis by Dr. Joseph Mercola | May 05, 2026

STORY AT-A-GLANCE

- Low GABA levels are linked to anxiety, poor sleep, memory issues, and neurological conditions like epilepsy and Alzheimer's, but boosting GABA through your gut microbiome offers a natural solution
- A study in NPJ Science of Food found that prebiotics like fructooligosaccharides (FOS) and Aspergillus-derived enzymes significantly increased brain GABA and homocarnosine, a compound that protects and stabilizes brain function
- Specific gut bacteria such as Akkermansia and Parabacteroides were directly linked to higher GABA production, while strains like Blautia and Roseburia were associated with lower levels and gut imbalance
- If your gut is inflamed, even healthy fibers worsen symptoms — so it's essential to start with low-fermentation carbs and reintroduce prebiotics slowly once digestion improves
- Strategies like fermented foods, GABA supplements, and natural progesterone further enhance GABA activity and support calm, clear, and stable brain function

Anxiety, depression, epilepsy, and even Alzheimer's disease share a surprising common thread: low levels of a calming brain chemical called GABA. Short for gamma-aminobutyric acid, GABA works as your brain's main "brake pedal," slowing down excessive firing and bringing your nervous system back to a calm, stable state.

When this neurotransmitter is out of balance, symptoms include racing thoughts, poor sleep, panic attacks, memory problems, and even seizures. Many people think of GABA as a brain chemical made exclusively in the brain. But a growing number of studies reveal that your gut microbiome plays a powerful role in how much GABA your brain actually produces.

In fact, research published in NPJ Science of Food shows that specific types of prebiotics — not just probiotics — raise GABA levels in your gut and, more importantly, in your brain.[1] That matters because GABA doesn't just help you relax — it helps regulate everything from mood to cognition to immune responses.

If your gut microbiome isn't supporting enough GABA production, you may find yourself locked in a pattern of chronic tension, emotional instability, or cognitive fog. You might be eating well and sleeping enough, yet still feel like something is off.

The root cause could be in your microbiome — and the fix could be as simple as restoring the right bacterial balance. Let's take a closer look at how this study uncovered the gut-brain connection driving GABA production, and why it might change how you approach mental health from the inside out.

Prebiotics Alter Gut Bacteria to Boost GABA in Your Brain

In the NPJ Science of Food study, researchers investigated whether fructooligosaccharides (FOS), a well-known prebiotic, and enzymes derived from the fungus Aspergillus could increase levels of GABA and homocarnosine — a compound found mainly in the brain that's made from GABA and helps keep your brain cells healthy and your mind sharp.[2] While probiotics have been shown to increase gut and brain GABA, researchers wanted to know whether prebiotics could do the same — and how they might do it.

- **The study used adolescent mice and looked at brain and gut outcomes —** The researchers fed adolescent mice either FOS, Aspergillus lipase, or Aspergillus protease for four weeks. Then, they measured GABA and homocarnosine levels in

the gut, blood, and brain. They also analyzed the microbiome of the gut to find out which bacterial changes might explain the shifts in neurotransmitter levels.

- **FOS and enzymes raised brain GABA levels in multiple regions —** All three treatments — FOS, lipase, and protease — increased GABA levels in the brain, particularly in the cortex and hippocampus, two regions associated with memory, stress, and emotional balance. FOS also raised GABA in the hypothalamus, a key regulator of hormones and autonomic nervous system activity.

- **Homocarnosine, a GABA-based brain peptide, also increased —** Alongside higher GABA levels, the researchers observed significantly increased homocarnosine in the hippocampus of all treatment groups. Homocarnosine plays an important role in neurological function. The increase in both compounds points to deeper shifts in brain chemistry linked to microbial activity in the gut.

- **GABA didn't rise in the bloodstream, hinting at a non-blood-based communication route —** Interestingly, none of the treatments raised GABA in the blood. This suggests that gut-produced GABA could be signaling to the brain through other routes, likely through the vagus nerve or via hormonal pathways, rather than circulating in the bloodstream.

Beneficial Bacteria Increased Along with GABA

After treatment, the gut microbiome shifted in measurable ways. FOS and enzymes increased beneficial species like Parabacteroides, Akkermansia, Muribaculum, and Hungatella. These specific bacteria showed strong positive correlations with higher GABA and homocarnosine in the brain. They are now considered possible "helper species" in this gut-brain communication network.

- **Other bacterial strains dropped — and that's a good thing —** Bacteria negatively linked to GABA and homocarnosine, including Blautia, Roseburia, and Eubacterium coprostanoligenes, were reduced in abundance after FOS and enzyme intake. These

species are often elevated in gut dysbiosis and may interfere with healthy neurotransmitter production.

- **FOS had the strongest effect on gut environment —** While all three supplements increased brain GABA, FOS triggered the most pronounced changes in gut microbial composition and diversity. It significantly boosted the relative abundance of Bacteroidota and Verrucomicrobiota — microbial phyla linked to metabolic health — and decreased Firmicutes, a group often associated with inflammation when out of balance.

- **Aspergillus enzymes also acted like prebiotics by reshaping the gut microbiome —** Though not traditional fibers, the fungal enzymes used in the study showed prebiotic-like behavior. They likely worked by helping to break down undigested macronutrients in the large intestine, releasing nutrients that fed GABA-supportive bacteria.

- **Bacterial shifts were linked directly to neurotransmitter levels —** Using correlation analysis, researchers found that specific bacterial populations — especially Akkermansia, Parabacteroides, and Flavonifractor — were strongly linked to higher GABA and homocarnosine levels. Meanwhile, species like Colidextribacter and Acetatifactor were tied to lower levels. These patterns help pinpoint which microbes play a supportive versus suppressive role in GABA metabolism.

How to Restore GABA Balance by Healing Your Gut

If your mental energy feels unstable — too wired during the day, too restless at night — your GABA levels may be out of sync. And that imbalance often starts in your gut. When your microbiome is damaged, even "healthy" foods like prebiotics worsen symptoms. But when your gut is stable, the right prebiotics become powerful tools for restoring calm and focus by increasing brain GABA. The key is knowing when and how to use them. Here are five steps to help you get there:

1. **Don't jump into prebiotics if your gut is inflamed —** If you feel gassy, bloated, or irregular after eating, your gut lining is likely irritated and your microbiome out of balance. This is not the time to load up on garlic, onions, or leeks. These ferment too fast and feed bacteria that increase harmful endotoxin, making symptoms worse. Instead, go with metabolically safe carbs like white rice and fruit, which nourish you without feeding the wrong bacteria.

2. **Wait until symptoms stabilize before adding fermentable carbs —** Most people rush into fiber thinking it's always a good thing. But when your gut barrier is compromised, even resistant starches and "gut-friendly" fibers do more harm than good. Once you're having regular bowel movements with no bloating, that's your green light to start reintroducing prebiotics slowly and with purpose.

3. **Support GABA with food-based prebiotics — at the right time —** When your digestion is stronger, begin introducing prebiotic foods that specifically support GABA-producing bacteria. These include FOS-rich choices like bananas, asparagus, garlic, and leeks. The goal isn't to flood your system but to gently nudge the right species, like Akkermansia, into balance. A quarter of a cooked leek or a few slices of ripe banana might be all you need to get started.

4. **Reinforce brain GABA with fermented foods and targeted supplements —** Once you've got microbial stability, start layering in direct GABA support. Fermented foods like kimchi, kefir, and miso contain small but meaningful amounts of GABA. If your stress is high or your sleep is poor, consider a high-quality GABA supplement.

5. **Use natural progesterone to amplify GABA's calming effects —** Natural progesterone enhances GABA signaling in the brain and has a direct calming effect on your nervous system. Unlike synthetic progestins, natural progesterone is a hormone your body already recognizes and responds to.

How to Use Progesterone

Before you consider using progesterone, it is important to understand that it is not a magic bullet, and that you get the most benefit by implementing a Bioenergetic diet approach that allows you to effectively burn glucose as your primary fuel without backing up electrons in your mitochondria that reduces your energy production. My book, "Your Guide to Cellular Health: Unlocking the Science of Longevity and Joy," covers this process in great detail.

Once you have dialed in your diet, an effective strategy that can help counteract estrogen excess is to take transmucosal progesterone (i.e., applied to your gums, not oral or transdermal), which is a natural estrogen antagonist. Progesterone is one of only three hormones I believe many adults can benefit from. (The other two are DHEA and pregnenolone.)

I do not recommend transdermal progesterone, as your skin expresses high levels of 5-alpha reductase enzyme, which causes a significant portion of the progesterone you're taking to be irreversibly converted primarily into allopregnanolone and cannot be converted back into progesterone.

Ideal Way to Administer Progesterone

Please note that when progesterone is used transmucosally on your gums as I advise, the FDA believes that somehow converts it into a drug and prohibits any company from advising that on its label. This is why companies promote their progesterone products as "topical."

However, please understand that it is perfectly legal for any physician to recommend an off-label indication for a drug to their patient. In this case, progesterone is a natural hormone and not a drug and is very safe even in high doses. This is unlike synthetic progesterone called progestins that are used by drug companies, but frequently, and incorrectly, referred.

Dr. Ray Peat has done the seminal work in progesterone and probably was the world's greatest expert on progesterone. He wrote his Ph.D. on estrogen in 1982 and spent most of his professional career documenting the need to counteract the dangers of excess estrogen with low-LA diets and transmucosal progesterone supplementation.

He determined that most solvents do not dissolve progesterone well and discovered that vitamin E is the best solvent to optimally provide progesterone in your tissue. Vitamin E also protects you against damage from LA. You just need to be very careful about which vitamin E you use as most supplemental vitamin E on the market is worse than worthless and will cause you harm not benefit.

It is imperative to avoid using any synthetic vitamin E (alpha tocopherol acetate — the acetate indicates that it's synthetic). Natural vitamin E will be labeled "d alpha tocopherol." This is the pure D isomer, which is what your body can use.

There are also other vitamin E isomers, and you want the complete spectrum of tocopherols and tocotrienols, specifically the beta, gamma, and delta types, in the effective D isomer. As an example of an ideal vitamin E, you can look at the label on our vitamin E in our store. You can use any brand that has a similar label.

You can purchase pharmaceutical grade bioidentical progesterone as Progesterone Powder, Bioidentical Micronized Powder, 10 grams for about $40 on many online stores like Amazon. That is nearly a year's supply, depending on the dose you choose.

However, you will need to purchase some small stainless steel measuring spoons as you will need a 1/64 tsp, which is 25 mg and a 1/32 tsp, which is 50 mg. A normal dose is typically 25 to 50 mg and is taken 30 to 60 minutes before bed, as it has an anti-cortisol function and will increase GABA levels for a good night's sleep.

If you are a menstruating woman, you should take the progesterone during the luteal phase or the last half of your cycle, which can be determined by starting 10 days after the first day of your period and stopping the progesterone when your period starts.

If you are a male or non-menstruating woman, you can take the progesterone every day for four to six months and then cycle off for one week. The best time of day to take progesterone is 30 to 60 minutes before bed as it has an anti-cortisol function and will increase GABA levels for a good night's sleep.

This is what I have been personally doing for over a year with very good results. I am a physician so do not have any problems doing this. If you aren't a physician, you should consult one before using this therapy, as transmucosal progesterone therapy requires a doctor's prescription.

FAQs About Prebiotics and GABA

Q: How does your gut microbiome affect GABA levels in your brain?

A: Your gut bacteria play a key role in producing GABA, your brain's main calming neurotransmitter. Certain beneficial microbes, like Akkermansia and Parabacteroides, help increase GABA and its brain-specific partner, homocarnosine. When these microbes are supported with the right prebiotics, GABA levels in brain regions linked to memory, stress, and mood regulation go up, helping to reduce anxiety, improve sleep, and support cognitive clarity.

Q: What are the best prebiotics for boosting brain GABA?

A: Fructooligosaccharides (FOS), found in foods like garlic, onions, leeks, bananas, and asparagus, support GABA-producing microbes. Enzymes derived from Aspergillus fungi, specifically protease and lipase, also act like prebiotics by reshaping the gut microbiome and feeding the right bacteria without the fermentability that triggers gas or bloating.

Q: Should you take prebiotics if your gut is inflamed or compromised?

A: Not yet. If you're bloated, constipated, or have loose stools, your gut isn't ready for high-prebiotic foods. In this state, prebiotics feed the wrong microbes and increase inflammation. It's better to start with metabolically supportive carbs like white rice and fruit, then slowly introduce prebiotics once your digestion is stable.

Q: What natural strategies help increase GABA besides prebiotics?

A: Fermented foods like kimchi, kefir, and miso provide small amounts of GABA directly. Supplements offer more targeted support if your levels are depleted. Natural progesterone also enhances GABA's calming effects in your brain, helping reduce the wired-but-tired feeling that often comes with hormone imbalance or chronic stress.

Q: What does homocarnosine do, and why is it important?

A: Homocarnosine is a brain-specific compound made from GABA and histidine. It helps protect neurons, stabilize brain chemistry, and support clear thinking. The same prebiotics that increase brain GABA also raise homocarnosine levels, making them doubly important for improving neurological health through your gut-brain axis.

Sources and References

- [1, 2] NPJ Science of Food April 3, 2025