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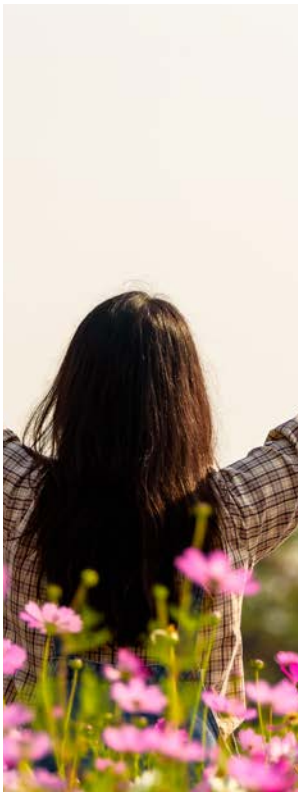

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Mental health meets **nutraceuticals:** Why ingredients matter

Hello, my name is Devon Gholam. I'm somewhat of an expert on all things ingredients for functional foods and nutraceuticals. And underneath this witty, intelligent exterior, I'm often a hot mess.

I've battled depression and anxiety for my entire adult life. When it started circa 2021, I was terrified to tell a friend what I was going through, only to discover I wasn't alone. Over the next two decades, I slowly became more vocal about my struggles, because I realized I could help others not feel alone, like my friend did for me.

Fast forward to today. I'm comfortable enough in my own skin to openly talk about my struggles. How fortunate I am to be part of an industry where we truly can make an impact on the world around us. And we live in a time where we have a plethora of ingredients that can help people live their best lives from the inside out.

We have botanicals and mushrooms to help alleviate stress and promote relaxation. We have antioxidants of multiple varieties to help the body combat oxidative stress, which is tied to mental health. Thanks to products like adaptogens, nootropics and all the biotics that play into the gut-brain axis, formulators like me have a limitless toolbox of options to create supplements that can affect true change in a person's life.

Of course, not all ingredients are created equal. Formulators must be in tune with the clinical evidence and ingredient science behind their innovations. Meanwhile, more companies are realizing the importance of robust clinical trials to substantiate claims and prove their products work.

What a time to be alive, to realize the power we have in the supplement industry to impact the lives of others. We must hold each other accountable to a high standard yet make time to care for one another as we all navigate this thing called life. So go out there, be kind, and do good things — I'll be cheering you on!

Devon Gholam

Devon Gholam is VP of science and innovation at Step Change Innovations.

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‘Psychobiotics’ flourish in wake of broadening gut-brain axis research

by Rachel French

Research exploring the gut-brain axis has evolved, shifting from establishing whether the pathway existed, to now focusing on how this connection works. Meanwhile, natural products — including those within the emerging “psychobiotics” category — are leveraging this powerful channel to provide targeted, scientifically validated brain support.

Petrine Stokkebye, commercial lead for mental health at global biosolutions company Novonesis, explained, “Today, we know not only that our brain influences the gut, but also that the microbes in our gut can influence how we think and feel.” She further described the gut-brain axis as a “bi-directional communication system” between the brain and the gut.

This systematic connection, according to researchers, links the enteric and central nervous systems, allowing the brain to influence the intestines, and the gut to influence such functions of the brain as mood and cognition. Numerous routes connect the brain and gut, including the autonomic nervous system, the hypothalamic-pituitary-adrenal (HPA) axis, and the nerves within the gastrointestinal (GI) tract.

Serotonin, for instance, activates nerve endings in the gut that are directly connected to the central nervous system. Serotonin is a neurotransmitter that affects functions like mood, sleep and digestion. One study indicated 95% of total body serotonin is provided by the gut.

“Scientists are no longer just looking at whether the gut and brain are linked — they’re now figuring out exactly how that connection works,” Stokkebye said. Some areas of focus for gut-brain axis research include stress, sleep quality, energy levels and emotions, she added.

Ralf Jäger, managing member at consultancy Increnovo LLC, and scientific advisor to nutraceutical firm Pharmachem Innovations, described research on the gut-brain axis as “rapidly advancing,” moving beyond observational studies to mechanistic and clinical investigations.

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"Early work established correlations between gut microbiota and mental health, but recent studies are uncovering specific microbial pathways involved in neurotransmitter production, immune modulation and vagus nerve signaling — and linking all of this to improved sleep," he said.

Advances in multiomics technologies like metagenomics, metabolomics and transcriptomics are lending further insights into host-microbe interactions, Jäger continued. Multiomics integrates data from "omics" technologies to develop a more complete understanding of biological systems. For instance, metagenomics is the study of all genetic material in a specific environment. Similarly, metabolomics is the study of metabolites, while transcriptomics studies the complete set of RNA (ribonucleic acid) transcripts produced by the genome under specific circumstances.

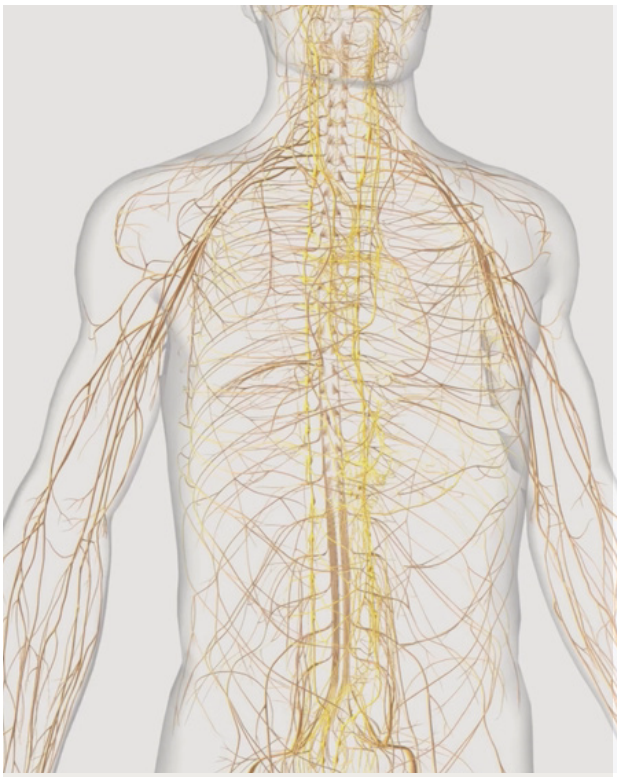
The emerging 'psychobiotics' category

Highlighting advancements in the understanding of the gut-brain axis are studies affirming the effects of various prebiotics and probiotics on such areas of brain health as mood and stress.

Steven Riley, head of marketing at biotech firm Clasado Biosciences, said prebiotics offer "a great deal of promise" via their role in supporting beneficial microbes in the gut.

"Prebiotics selectively nourish the good bacteria in your gut — and those bacteria play a bigger role in brain health than most people realize," he explained. "They indirectly influence the production of important neurotransmitters like serotonin and gamma-aminobutyric acid (GABA), which can affect mood, stress, anxiety and even sleep."

In addition, prebiotics may support gut barrier integrity and reduce inflammation by nourishing good bacteria like *Bifidobacteria*, Riley added.



The vagus nerve

is the longest of the body's 12 cranial nerves and is responsible for relaying information between the brain and various organs, including the gastrointestinal (GI) tract and heart.

Key to the parasympathetic nervous system, the vagus nerve regulates various involuntary bodily functions, like digestion and heart rate. It supports the gut-brain axis by facilitating communication between the GI tract and the brain.

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> The vast potential for **probiotics to positively impact brain health** has prompted an emerging category, called **'psychobiotics.'**

Clasado Bioscience's Bimuno GOS (galactooligosaccharide) prebiotic helps increase levels of beneficial bacteria in the gut, especially *Bifidobacteria*, he said. In clinical trials, the prebiotic promoted the gut-brain axis, "which involves support of brain function, and management of stress-associated biomarkers," Riley explained.

One study in 45 healthy subjects found daily supplementation with Bimuno GOS for three weeks significantly lowered salivary cortisol awakening response, compared to placebo. Testing using a computerized task battery also showed an increase in the processing of positive versus negative attentional vigilance, compared to placebo. Researchers concluded the findings were consistent with previous findings of "endocrine and anxiolytic effects of microbiota proliferation."

Probiotics, too, are increasingly studied for their potential to impact the brain via modulation of gut microbiota. In fact, the vast potential for probiotics to positively impact brain health has prompted an emerging category, called "psychobiotics."

Stokkebye said the term is gaining ground with research communities, industry players and consumers, adding, "This adaptation is driven both by the increase in research on the gut-brain axis, as well as the growing advocacy for mental wellness – with public figures and consumers sharing their experiences to break the stigma around mental wellness."

The psychobiotics term is thought to have been introduced in 2013 by Ted Dinan, M.D., Ph.D., professor of psychiatry at University College Cork in Ireland, and John Cryan, Ph.D., professor and chair of the department

By 2035, the global psychobiotic supplements market is projected to reach **$212.82 million**, representing a compound annual growth rate (CAGR) of **3.5%**.

–FMI

of anatomy and neuroscience at University College Cork. The researchers defined psychobiotics as a "class of probiotics" that "when ingested in adequate amounts, produces a health benefit in patients suffering from psychiatric illness."

Per Karine Lasfargue, product manager at probiotic provider Lallemand Health Solutions, the field of psychobiotics has "grown rapidly, with thousands of studies now exploring how psychobiotics may modulate neurotransmitter production (e.g., serotonin, GABA), prevent neuroinflammation, regulate the hypothalamic-pituitary-adrenal (HPA) axis, support gut barrier integrity, or also reduce inflammatory response induced by stress."

She added that not all probiotics qualify as psychobiotics — "only those with scientifically validated mental health benefits."

Lasfargue said the term "psychobiotics" is gaining "significant traction," driven by growing awareness of the gut-brain connection. She cited a proprietary June 2024 digestive health survey by FMCG Gurus showing more than half of the global population was aware of a link between the gut/digestive system and mood/happiness.

Looking at psychobiotics specifically, she pointed to market research from Future Market Insights. In 2025, the global psychobiotic supplements market was valued at approximately $150.87 million. By 2035, it's projected to reach $212.82 million, representing a compound annual growth rate (CAGR) of 3.5%. North America currently holds the largest market share and is anticipated to remain among the top players.

The flagship psychobiotic of Lallemand's Rosell Institute for Microbiome and Probiotics is Cerebiome, a psychobiotic composed of two strains: *Lactobacillus helveticus* Rosell-52 and *Bifidobacterium longum* Rosell-175. Per Lasfargue, the ingredient is supported by a number of animal and human studies that show its ability to positively influence the gut-brain axis via a range of mechanisms.

In humans, Cerebiome improved depression symptoms in a study of 110 subjects with low to moderate depression. Researchers found supplementation with the probiotic combination

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of *B. longum* and *L. helveticus* for eight weeks significantly improved levels of brain-derived neurotrophic factor (BDNF) compared to placebo or supplementation with a prebiotic, which was inversely correlated with depression severity, as compared to placebo.

Cerebiome also helped maintain healthy cortisol levels — a key hormone linked to stress — and alleviated psychological distress in healthy humans who took the probiotic combination for 30 days in a clinical study.

Novonesis, too, offers a psychobiotic with researched brain-health benefits. Featuring the *Bifidobacterium longum* 1714 strain, internal Novonesis data showed its ProbioBrain produces tryptophan, which positively affects the neuroprotective pathway, Stokkebye explained. Tryptophan is a key building block for making serotonin and melatonin.

"In addition, its distinct exopolysaccharide (EPS), a unique strain-specific coating, may stimulate immune activities that support neuroprotective pathways associated with improved sleep quality and resilience to stress," she added. In a recent study of 89 adults with impaired sleep quality, *B. longum* 1714 demonstrated faster improvement in sleep quality at four weeks of supplementation, compared to placebo. At eight weeks of supplementation, social functioning and energy/vitality significantly improved, compared to placebo.

Ingredient manufacturer Probiotical's BIFIZEN is a formulation consisting of 1 billion CFU (colony-forming units) each of *Lactobacillus fermentum* LF16 (DSM 26956), *Lactobacillus rhamnosus* LR06 (DSM 21981), *Lactobacillus plantarum* LP01 (LMG P-21021) and *Bifidobacterium longum* BL04 (DSM 23233).

Pharmachem has a long-standing strategic partnership with Probiotical, per Jäger.

BIFIZEN is supported by numerous studies demonstrating its benefits on mood and sleep, including a study published in 2019 of 38 healthy participants who were administered a daily dose of BIFIZEN or placebo for six weeks. Daily ingestion of the probiotic significantly improved sleep quality and reduced reports of depression, anger and fatigue, compared to the start of the study.

Gut-brain market boosted by brain health demands

Consumers have long accepted that a connection exists between the gut and the brain, a concept underscored by widely used phrases like "gut feeling" and "butterflies" in the stomach.

According to Lasfargue, the "dynamic communication" between the gut and the brain "becomes particularly intense during periods of stress, whether due to significant life events, challenging exams, job changes or pivotal meetings, leading to gut discomfort."

Per Jäger, many people are familiar with this general connection between gut health and

mental well-being, but "fewer understand the scientific concept of the gut–brain axis and its underlying mechanisms."

Importantly, a lack of understanding of the gut-brain axis doesn't mean less demand for brain-boosting products.

"Consumers may not always recognize the term 'gut-brain axis,' but they are actively seeking products that improve mood, reduce anxiety and promote restful sleep – especially if backed by clinical evidence," Jäger explained. In fact, he said consumer interest in products that support mental wellness, stress resilience and sleep has "surged," driving demand for mood-supporting probiotics and other supplements marketed for gut-brain benefits.

What's more, Stokkebye said consumers are seeking "new solutions" to address issues like stress and anxiety, and they want solutions that are natural, safe and won't create physical or behavioral reliance.

Gut-brain products could be that solution, especially considering increasing consumer awareness that the gut and overall health are related. "Consumers understand that mental wellness is interconnected and multifaceted," she said. "They are conscious of how their gut is impacted by lifestyle habits and mental wellness and vice versa." ■

Rachel French joined Informa's Health & Nutrition Network in 2013. Her career in the natural products industry started with a food and beverage focus before transitioning into her role as managing editor of SupplySide Supplement Journal (formerly Natural Products Insider), where she covered the dietary supplement industry.

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A perfect 10: The science behind esports supplements

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*Lin et al. "Transgenic Canola Oil Improved Blood Omega-3 Profiles: A Randomized, Placebo-Controlled Trial in Healthy Adults" Frontiers in Nutrition. 2022

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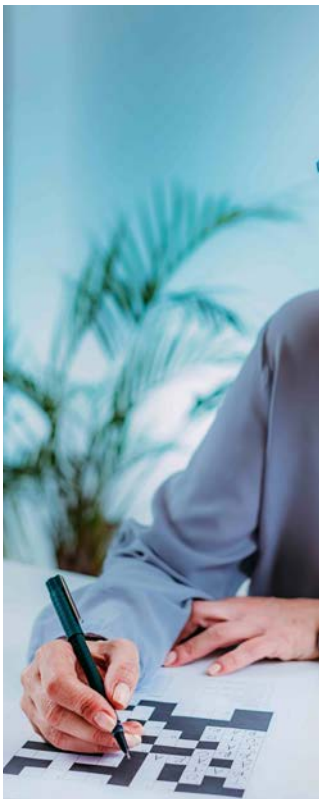

The brain supplement market is dividing – **and that's a good thing**

Brands are doubling down on both long-term brain health and acute cognitive payoff. But is innovation outpacing concerns over effectiveness or legality?

by Nick Collias

Nootropic supplements are no longer only for aging populations or gamers. They're for everyone. Today's brain-health supplement market is expanding rapidly on two fronts: One prioritizes long-term nutritional strategies rooted in science, while the other races to deliver fast, sensory impact through gummies, shots and even nicotine-style pouches.

Experts say both directions reflect the evolving role of cognition in everyday wellness, whether it's powering through a workday, optimizing childhood development or preserving mental sharpness across the lifespan. From prenatal docosahexaenoic acid (DHA) to TikTok-famous "focus pouches," the brain health space isn't just growing, it's splitting. But in some cases, that leaves up in the air some big questions about ingredient delivery – and even legality.

Nutritional neuroscience on the rise

Brain health is no longer just about clearing mental fog or surviving the afternoon slump. Increasingly, cognitive wellness is becoming a central focus of long-term nutritional strategies, ushering in what many experts are calling a golden era for *nutritional neuroscience.*

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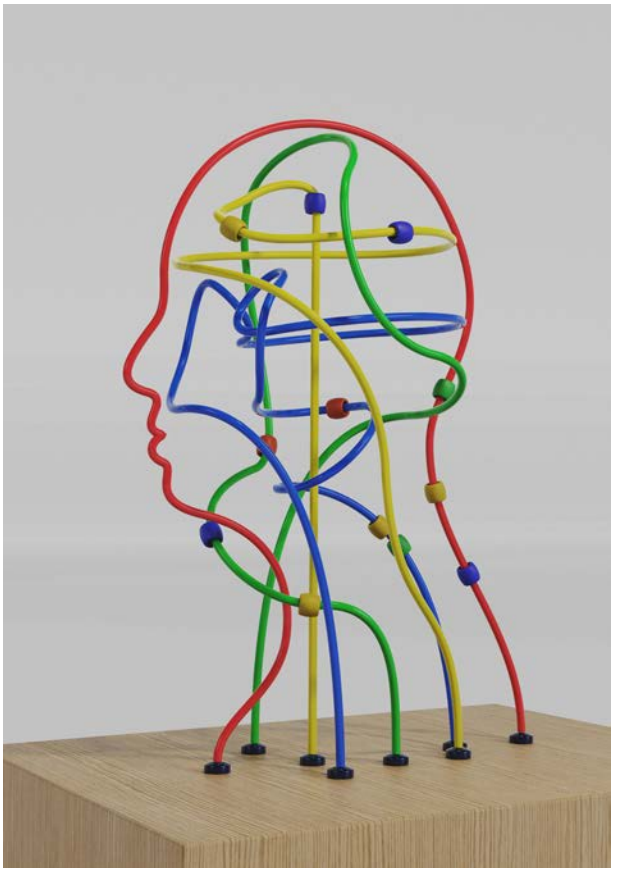
Nootropic supplements are no longer only for aging populations or gamers. **They're for everyone.**



Scott Dicker, director of market insights at data tech firm SPINS, said, "Cognitive health used to be seen mostly as an issue of aging. Now we know it's top-of-mind across generations: for performance at work, focus at school or preserving mental agility into older age."

This evolution is shaping both clinical research and commercial strategy. Doug Kalman, Ph.D., RD, and co-founder of the International Society of Sports Nutrition, said that nutritional neuroscience is quickly moving from niche to mainstream. "We now see this covered in journals, trade magazines and conferences all the time," he said. "It's also being integrated into psychiatric and medical care. That tells me it's only going to keep growing, both in research and in real-world application."

Nutritional psychiatry and early-life brain development are also getting renewed attention, Kalman added. "There are very specific nutrients — like DHA, iron, B12, folate, carotenoids — that affect how the brain develops in the third trimester. That's foundational brain health."

From prenatal nutrition to memory protection, the framing of cognitive wellness into life cycles is pushing formulators and consumers alike to think beyond short-term energy and toward daily routines that support the brain for the long haul.

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The hottest supplement trends in 2024 – video

The supplement sectors best positioned for future success are included in this must-watch.


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Nutritional neuroscience ingredients to watch

Carotenoids: Brain-supporting antioxidants

"There's growing evidence that people with cognitive decline have significantly lower levels of carotenoids in their brains," Doug Kalman, Ph.D., RD, said. A clinical associate professor at Nova Southeastern University, Kalman continued, "Compounds like lutein and zeaxanthin support both vision and cognition, and their density in the macula even correlates with brain DHA [docosahexaenoic acid] levels."

Found in colorful fruits and vegetables, these antioxidant xanthophylls accumulate in the brain over time. Their role is critical during prenatal and early-childhood development, but also in maintaining cognitive function later in life. "People don't realize that all of those red, orange and green vegetables can be a cognitive health strategy," Kalman added.

Plant-based omega-3s: Filling the supply gap

Despite global recommendations of 500 mg/day of eicosapentaenoic acid (EPA) and DHA, average intake is closer to 120 mg — and the World Health Organization (WHO) estimates 80% of people aren't getting enough. Further complicating the situation, Katrina Benedicto of crop technologies company NuFarm claimed the global supply chain is at capacity with marine sources. That's why Nutriterra, made from genetically optimized canola, is such a breakthrough: She said it's the first land-based source of DHA-rich long-chain omega-3s.

According to the company, this innovation replicates the enzymatic pathway used by microalgae and embeds it directly into the seed, making sustainable production possible at scale. "The brain is mostly fat, and 10% to 20% of it is specifically DHA," Benedicto explained. "Our goal is to make sure more people get what they need without putting additional pressure on the oceans."

– Nick Collias

Continued from p. 16

Gummies and shots have been the major drivers of **50% growth** in the "calm and mood" category this year.

—SPINS

Quick fix, big questions: Creative formats with legal concerns

Nootropics are ground zero for what the NBJ 2025 Supplement Business Report calls "the format wars," where brands and formulators race to find new ways to package familiar ingredients, hoping to give users a more tangible sensation and feel smarter, faster.

Why is this category so ripe for format shift? Scott Dicker from market research firm SPINS said it's an unavoidable association for nootropics and mood. "If you're promoting something as 'brain-boosting' or (promoting) relaxation, consumer expectation is different than a pill, where a consumer understands, 'I might have to take this for a month or two before it benefits me; I'm not expecting to, quote unquote, feel it.'"

Dicker said this divide has created a huge opportunity for products that provide an acute sensation. This impetus is driving formula innovation in formats like gummies and shots, which he said have been the major drivers of 50% growth in the "calm and mood" category this year. The NBJ report authors are similarly bullish on gummies, predicting that, "By the end of the decade, if not earlier, gummies, all on their own, will be bigger than pills."

But the push for acute sensation is also reaching into new — and legally murky — formats, like nicotine-style "pouches" containing supplement ingredients. These are often positioned somewhere between nicotine alternatives and brain-optimizing nootropics, with taglines like "The Good-For-You Pouches" or "Nature's Adderall." A rash of brands recently exploded across online direct-to-consumer (DTC) channels like Instagram and TikTok. (A word to the wise: click on one pouch ad, and your feed may never be the same.)

The ingredient decks are familiar: L-theanine, citicoline, functional mushrooms and (of course) caffeine. But the novelty lies in the format. And that may be what gets them in trouble.

Kalman said he's deeply skeptical of their legal footing. "They don't appear to

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be compliant dietary supplements," he explained. "According to DSHEA (the Dietary Supplement Health and Education Act of 1994), dietary supplements must be 'orally ingested.' But with these pouches, some of the ingredients are absorbed through the buccal membrane, not swallowed directly. And FDA has already sent warning letters saying buccal delivery doesn't qualify."

That's not just legal semantics. It also raises questions about efficacy. "I can answer that pretty confidently: There's been zero to very little published data on buccal absorption for most of these compounds," Kalman said. "Outside of caffeine, I'm not aware of strong evidence for theanine, citicoline or others. If you're trying to deliver 500 to 1,000 milligrams of actives through a membrane in the mouth before someone swallows their saliva, you're probably delivering a fraction of what you'd get from a capsule."

For now, FDA appears to be watching, but not acting aggressively, possibly because adverse events are either rare or underreported. "Nobody's taken it to court yet," Kalman added. "But there have been multiple FDA warning letters saying clearly: buccal is not dietary." ■

CogniBen: Synergistic brain fuel

TriNutra's patented formulation, CogniBen, combines *Ginkgo biloba*, phenylethylamine (PEA) and a low dose of caffeine. TriNutra CEO Morris Zelkha shared, "We optimize the ratio between actives to create an immediate effect within 30 to 45 minutes. You'd need significantly higher doses of these compounds on their own to see the same benefit." Clinical results indicated a 43% improvement in ADHD-RS-IV scores (used to measure against diagnostic criteria for attention-deficit/hyperactivity disorder), and CogniBen is now being integrated into capsules, gummies and even dissolvable strips.

Nick Collias is a writer and editor with over a decade of experience working in the health and fitness industry. From 2016 to 2021, he was the host of the Bodybuilding.com Podcast, and he has worked for the last 20 years as a longform print and online journalist, as well as a book author, ghostwriter and editor.

Science-backed supplement ingredients that might be in the next **chill pill**

by Denis Faye

Stressed out lately? Join the club. According to the American Psychiatric Association's 2024 annual mental health poll, 43% of U.S. adults claimed they feel more anxiety than last year, up from the 37% that felt more anxious in 2023, and 32% in 2022.

GlobeScan reported that 35% of Gen Z globally experiences stress "most" or "all of the time." For Millennials, that's 29%. Gen X, 25%. Baby Boomers clock in at a semi-relaxed 16%.

Whether looking at individuals or generations, people are experiencing increasing levels of anxiety.

Consumers have many strategies for coping with stress — from exercise, diet and therapy to blow-out weekends in Las Vegas. Trisha Sugarek MacDonald, Ph.D., market development manager at ingredient provider Akay Bioactives, explained, "Stress is a very real and complex issue, and there are multiple ways to manage it. Personally, I believe it's important to first identify the type of stress you're experiencing and address it through lifestyle changes when possible. Everyone processes stress differently, so the strategies that work best will vary."

Dietary supplements are one strategy gaining increased attention. According to Future Market Insights research, the stress relief supplement market reached $576.8 million in 2023. In 2025, it's headed to $635.2.

Scott Dicker, senior director of market insights at data analyst SPINS, said, "Mood support supplements in the conventional

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Formulate Mood, Stress & Sleep—with OmniActive.

Today's consumers are looking for more than "stress relief." They want better sleep, focus, and mood support—and they want it from ingredients backed by science.

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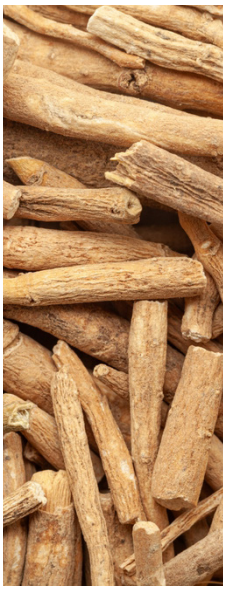
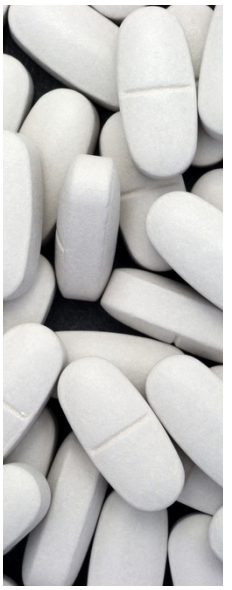




The top mood support supplement ingredients are **ashwagandha** [*Withania somnifera*], **magnesium** and **L-theanine**.

—SPINS

channel, year to date, are up 21%. In the natural channel year to date, they're up 19%. The top ingredients are ashwagandha [*Withania somnifera*], magnesium and L-theanine."

A growing body of scientific evidence supports the use of complementary and alternative treatments for stress management, MacDonald added. "Many people benefit from botanicals, minerals, amino acids, vitamin D and omega-3 fatty acids, each with distinct mechanisms of action. Choosing the right option depends on an individual's lifestyle, body chemistry and personal response," she said.

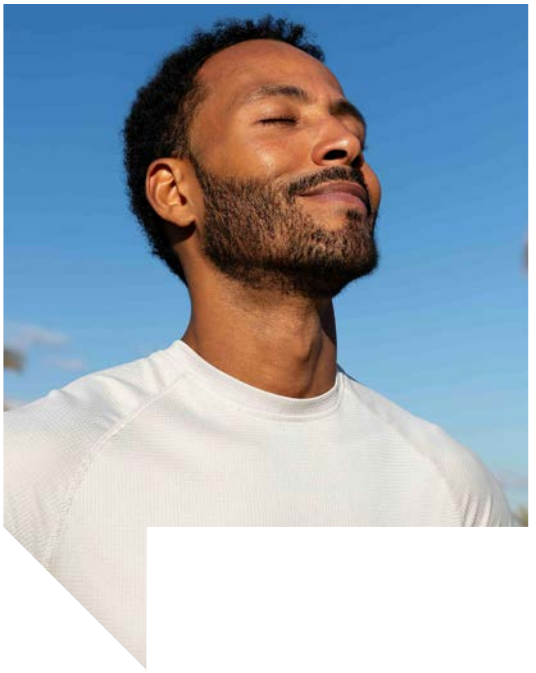
Neurotransmitter modulators: Going right to the source

Neurotransmitters are chemical messengers between nerve cells and other cells. As part of the nervous system, they help control all kinds of functions in the body, including heart rate, blood pressure, muscle movement, hormone regulation, sleep and stress response. Gamma-aminobutyric acid (GABA), serotonin and dopamine are all neurotransmitters that regulate stress and anxiety.

With this in mind, neurotransmitter-modulating supplements and ingredients attempt to influence these substances directly. Or, in the case of GABA, the substance itself can be consumed.

"GABA is an inhibitory neurotransmitter that plays a key role in mood regulation by dampening physiological responses to stress," MacDonald said. "It helps prevent neurons from overfiring, maintaining the balance between neuronal excitation and inhibition."

While consuming a neurotransmitter to influence neurotransmitters seems like a no-brainer (so to speak), there have been concerns that oral GABA may have difficulty crossing the blood-brain barrier. That said, there's research showing that GABA supplementation can be effective for stress, particularly in short-term situations. One



Participants who supplemented with **GABA** experienced **increased relaxation** and **diminished anxiety.**

notable study deliberately stressed acrophobic subjects by sending them across a 300-meter suspension bridge, then tested how their brains responded via EEG (electroencephalogram).

Participants who supplemented with GABA experienced increased relaxation and diminished anxiety more than those who took a placebo or L-theanine.

Aditya Kulkarni, Ph.D., associate director of the global business department at biotechnology company Pharma Foods International, said direct supplementation with GABA can be an efficient approach, as it delivers the desired concentration at the desired time. "GABA-modulating phytomedicines may not offer the same advantages due to the additional metabolic steps required, which can lead to variable levels of GABA and potentially ineffective amounts," he explained.

However, L-theanine still deserves consideration. This amino acid, found in green tea (*Camellia sinensis*), increases GABA, dopamine and serotonin via a number of mechanisms. Research has demonstrated its efficacy, including one study in which subjects did mental arithmetic against the clock. Supplementation of L-theanine was shown to have anti-stress effects in participants, including reducing heart rate.

Another popular ingredient, magnesium, also modulates GABA — but it does a couple of other things as well. It blocks overactivation of NMDA (N-methyl-D-aspartate) receptors, which respond to glutamate, the brain's primary excitatory neurotransmitter (meaning it doesn't allow stress-inducing chemicals to get into the brain). Also, magnesium helps regulate the HPA (hypothalamic-pituitary-adrenal) axis, which is the body's central stress-response system. By stabilizing this system and lowering excess amounts of the stress hormone cortisol, magnesium supports a calmer stress response.

5-HTP (5-hydroxytryptophan) is a precursor to serotonin. It's been linked to improved mood in people with mood disorders when combined with another serotonin precursor, tryptophan, also known as the "post-turkey Thanksgiving nap" amino acid, according to a preprinted systematic review.

Given the role B-complex vitamins play with brain function, energy metabolism and neurotransmitter synthesis, they also fall into this group. One systematic review found B vitamin supplementation to benefit both healthy and at-risk populations when it comes to stress, although not depression or anxiety. Another study on vitamin B6 found that high doses reduced self-reported anxiety due to the nutrient's role in the synthesis of GABA.

Finally, omega-3 fatty acids — particularly EPA (eicosapentaenoic

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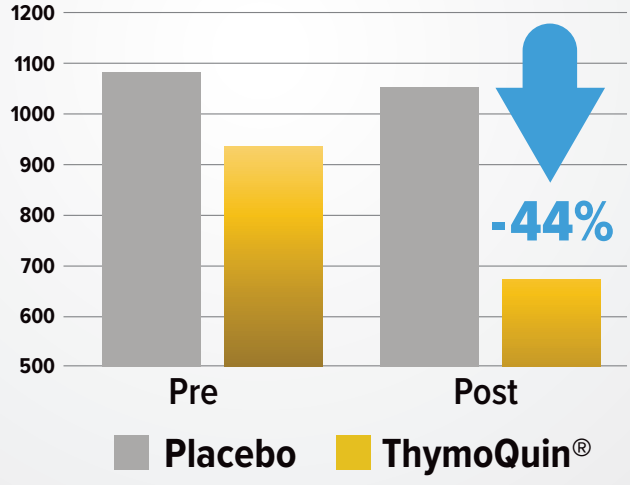

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acid) and DHA (docosahexaenoic acid) — can be considered *indirect* neurotransmitter modulators, given the many roles they play in brain health, including their anti-inflammatory properties. Brain inflammation is linked to impaired neurotransmitter signaling, particularly when it comes to mood and stress regulation.

One meta-analysis found that omega-3 supplementation may reduce clinical anxiety symptoms.

Adaptogens: A time-honored approach

Adaptogens are another group of stress/anxiety supplements getting increased attention. They're natural substances — often herbs or fungi — intended to help the body adapt to stress and restore balance. Rooted in ayurvedic and traditional Chinese medicine (TCM), they gained controversial scientific traction in the 1960s when Soviet researchers, studying herbs like *Rhodiola rosea*, used them to boost performance and resilience in Olympic athletes, cosmonauts and soldiers.

Recently, adaptogens are gaining popularity and credibility thanks to a growing base of clinical research, consumer demand for natural stress support, and the increased availability of accessible formats. "The introduction of adaptogens in the gummy format a few years ago really mainstreamed a lot of it," SPINS' Dicker said.

Leading the pack is ashwagandha, which was estimated by Grand View Research to have a $670.57 million global market in 2023. While the scientific understanding of this botanical (as well as other adaptogens) may not be as advanced as neurotransmitter modulators, it has been shown to affect stress hormones. A systematic review showed ashwagandha to reduce perceived stress and anxiety, as well as serum cortisol levels, compared to placebo.

Two companies have done promising, yet-to-be published research on ashwagandha. Akay Bioactives showed its AshwaBest

ashwagandha decreased perceived stress while increasing both total and free testosterone. MacDonald noted, "Men's health has gained renewed attention, particularly as chronic stress and sleep deprivation have become more common in today's demanding world. These factors negatively impact hormonal balance, affecting physical, emotional, cognitive and sexual well-being."

While neurotransmitter modulators like GABA, 5-HTP and magnesium work by directly influencing brain chemistry, adaptogens typically act on the hormonal system to help regulate cortisol and build long-term stress resilience.

Abhijeet Morde, divisional VP of clinical research at bioactive ingredient provider OmniActive, said, "We focus on clinically studied ingredients which support stress/anxiety through more reliable, upstream mechanisms — meaning these ingredients target the root causes rather than addressing

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There's a **big opportunity** for a beverage that has more of an **acute relaxation feeling**.

just the outcome or symptom. Our goal is to support natural resilience, grounded in scientific evidence."

The company's internal research showed its Zenroot ashwagandha to decrease stress and anxiety while improving mood and sleep quality.

Other popular adaptogens include holy basil (*Ocimum tenuiflorum*, also known as tulsi); schisandra (*Schisandra chinensis*); ginseng (*Panax ginseng*); rhodiola; and medicinal mushrooms, including lion's mane (*Hericium erinaceus*), reishi (*Ganoderma lucidum*), cordyceps (*Cordyceps sinensis*) and chaga (*Inonotus obliquus*).

Botanicals: Scientific solutions, naturally

Adaptogens aren't the only supplements that address stress and anxiety naturally. Herbs and herbal extracts that have been around for centuries are finding new life as scientific research catches up with grandma's medicinal garden. In many cases, the phytonutrients in these herbs interact with GABA, giving rise to terms like GABAergic herbs or GABA-modulating phytomedicines.

Elisabetta Frattini, senior research scientist at botanical extract specialist Indena, said, "Many botanicals traditionally acknowledged as anxiety, depression and sleep-aid remedies have been investigated and tested for their potential action on the GABA pathway; among those are chamomile [*Matricaria chamomilla*], lemon balm [*Melissa officinalis*] and valerian [*Valeriana officinalis*]."

"Chamomile contains apigenin, a flavonoid that has been shown to bind to the benzodiazepine site of GABA-A receptors, acting as a mild positive allosteric modulator," she continued, explaining how apigenin boosts GABA's calming effect by making its receptors more responsive.

A phytonutrient compound in valerian root called valerenic acid has a similar impact.

On the other hand, compounds in lemon balm increase GABA levels by slowing its breakdown. "Lemon balm is rich in hydroxycinnamic acids, compounds like rosmarinic acid," Frattini said, "which is known to inhibit GABA transaminase, thus potentially increasing GABA availability in the synaptic space."

Other GABAergic herbs include pennywort (*Centella asiatica*, also known as gotu kola), kava (*Piper methysticum*), hops (*Humulus lupulus*), skullcap (*Scutellaria lateriflora*), *Ginkgo biloba* and passionflower (*Passiflora incarnata*). Adaptogens like Indian ginseng and ashwagandha also fall into this grouping. Herbal extracts getting attention include saffron (*Crocus sativus*), curcumin (*Curcuma longa*, from turmeric) and black cumin seed (*Nigella sativa*).

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Probiotics: The gut-brain axis

Probiotics are covered elsewhere in this magazine, but they deserve a quick mention here. The idea of psychobiotics — probiotics that offer mental health benefits — is relatively new, so the research is in early stages. One recent paper suggested that GABA "may be a potent mediator of the gut–brain axis," meaning GABA is among several neurotransmitters that gut bacteria can produce, and this gut-made GABA may help send relaxing signals to the brain.

Research into strains like *Lactobacillus rhamnosus* and *Bifidobacterium longum* has shown promise in reducing anxiety and stress in early human trials.

Stress snacking 2.0

Formats such as gummies and chewables brought new interest not just to ashwagandha but to the entire stress and anxiety supplement space. On top of that, many of the ingredients listed here can also support food and beverage applications. Pharma Foods International's PharmaGABA is specifically billed as a functional food ingredient.

According to Dicker, when functional ingredients make the move into the food world, they often start with beverages. SPINS research shows that mood support beverages are up 65% in the conventional space this year, 23% in the natural space.

Ironically, the fact that consumers are cutting back on alcohol both benefits and hinders the mood support beverage space. On one hand, people are looking for other options to take the edge off. On the other hand, it's hard to match the immediate gratification one gets from a shot, a cold beer or a glass of rosé. "A lot of these supplement ingredients don't give that acute relaxation feeling that people expect from a beverage," Dicker said. "There's a big opportunity for a beverage that has more of an acute relaxation feeling."

Not a lot of movement has been seen yet in the market around the stress/anxiety functional food space. Dicker explained that these developments typically occur after beverages in the category are more established. But it's on the way. "Chocolate's probably the first one that you'll see," he predicted, "so that you don't feel bad about stress eating because this is actually going to reduce your stress." ■

Denis Faye is a nutrition communications consultant and committed competitive athlete who splits his time between writing, riding, running and raising his family. Occasionally, he sleeps.