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Akkermansia, the Gut Microbe Drawing Research Attention for Health and Wellness

Analysis by Dr. Joseph Mercola | August 03, 2026

STORY AT-A-GLANCE

- Akkermansia muciniphila has been associated with improved metabolic markers and immune function in research, with studies exploring its role in obesity and Type 2 diabetes
- Research suggests Akkermansia may support intestinal barrier function, which has been studied in relation to inflammatory bowel disease and colorectal cancer risk
- Research has explored Akkermansia's relationship with the gut-brain axis and conditions such as anxiety and Alzheimer's disease, primarily in preclinical models
- Akkermansia has also been studied for its potential role in stress-related research
- Akkermansia supplementation has been studied in two forms (live and pasteurized) in published human trials. The pasteurized form was associated with greater improvements in metabolic markers in a small proof-of-concept study, though larger trials are needed

Metabolic disease is a global epidemic that has become a significant public health problem. Conditions like obesity and Type 2 diabetes are spreading rapidly across populations worldwide, affecting millions and straining health care systems.[1] If left unchecked, these diseases can lead to severe complications, including heart disease, stroke, and premature death.

Gut microbiota plays a crucial role in maintaining your health by regulating your body's metabolism. Among these microorganisms, Akkermansia muciniphila stands out as a key player. Research suggests Akkermansia plays a role in metabolic and immune functions and may support gut health.[2] Low levels of this bacterium have also been linked to an increased risk of a variety of diseases, including intestinal inflammatory diseases and certain parasitic infections.[3]

Current research highlights the importance of Akkermansia in managing a wide variety of these conditions. For instance, studies published inFrontiers in Immunology and Frontiers in Microbiomes have shown that alterations in Akkermansia abundance are associated with the severity of metabolic disorders and immune-related diseases.[4,5]

Additionally, research in Critical Reviews in Microbiology and Microbiome Research Reports has explored its role in gut health and its potential as a therapeutic target in ongoing research.[6,7,8]

Exploring the Benefits of Akkermansia Muciniphila

Low levels of Akkermansia are associated with metabolic diseases such as obesity and Type 2 diabetes. Conventional treatments for these conditions typically involve medications that can have deleterious side effects. For instance, drugs like metformin, commonly prescribed for diabetes, may cause gastrointestinal issues and vitamin B12 deficiency.

- **Weight-loss medications like Ozempic are also associated with serious side effects —** These include pancreatitis, bowel obstruction, stomach paralysis, and even death. The problem is that these conventional treatments address symptoms rather than the root causes. Researchers are now exploring holistic strategies, and one angle they're looking into is Akkermansia supplementation, which may play a role in supporting metabolic health.

- **The underlying causes of metabolic diseases are multifaceted —** They often stem from a combination of genetic predisposition, poor dietary habits, sedentary lifestyles, and environmental factors. High intake of ultraprocessed foods loaded with refined sugar and polyunsaturated fats (PUFs), coupled with low physical activity, lead to obesity, which is a major risk factor for Type 2 diabetes.

  Chronic inflammation and insulin resistance — measured by markers such as homeostatic model assessment of insulin resistance (HOMA-IR) — also play crucial roles in the development of these conditions.

Research Explores Akkermansia's Role in Supporting Metabolic Health

A 2024 Chinese review published in Frontiers in Immunology explored the potential of Akkermansia muciniphila as a probiotic for metabolic conditions and overall human health.[9] The researchers investigated how it affects gut microbiota, immune function, and various metabolic processes that are relevant in conditions like obesity, Type 2 diabetes, cardiovascular disease, and fatty liver disease.[10]*

- **Akkermansia makes up about 1% to 4% of the total intestinal microbiota in the human gut —** Analyzing data from numerous experiments, the researchers reported a consistent pattern: individuals with lower levels of Akkermansia in their gut microbiota were more likely to have severe metabolic conditions.

  Human and animal studies have also reported improvements in metabolic markers in subjects who received Akkermansia, though the published human trials are small, proof-of-concept studies.

  In a Nature Medicine 2019 proof-of-concept trial involving 32 overweight/obese volunteers, participants receiving pasteurized Akkermansia for three months showed reductions in body weight, fat mass, and hip circumference compared to placebo, and improved insulin sensitivity.[11]*

- **Akkermansia has also been associated with enhanced gut barrier function —** This means it may help reduce the passage of harmful substances into the bloodstream, thereby reducing inflammation. Continuing this line of thought, inflammation is recognized as a contributor to insulin resistance, and researchers are exploring whether Akkermansia's anti-inflammatory effects may influence Type 2 diabetes-related markers.

  In addition, animal research has reported that Akkermansia may attenuate Western diet-induced atherosclerosis (in mouse models), prompting interest in its relationship to cardiovascular health.*

**These findings are from research conducted in clinical settings. Results may not apply to all individuals.*

Mechanisms of Action

According to the authors, the proposed mechanisms of action vary by condition.[12] In animal models of obesity, pasteurized Akkermansia has been reported to reduce carbohydrate absorption and increase energy excretion through feces, and to inhibit adipocyte (fat cell) formation. In Type 2 diabetes models, Akkermansia has been observed to stimulate **GLP-1** secretion and influence insulin production.

GLP-1 is a hormone naturally produced in your intestines that plays a crucial role in blood sugar regulation and appetite control. When released after eating, it stimulates insulin production from the pancreas while suppressing glucagon, helps slow down stomach emptying to promote feelings of fullness, and acts on the appetite centers in your brain to reduce hunger.

It also supports the growth of insulin-producing beta cells in your pancreas and has been associated with cardiovascular benefits in research settings.

In animal models of fatty liver disease, Akkermansia has been reported to support hepatic (liver) fat metabolism. Researchers observed an increase in L-aspartate, which is associated with a metabolic chain reaction that may help reduce hepatic fat storage.

Dosages Used in Metabolic Studies

The following dosages are from animal (mouse) studies and are presented for research context only. They range from 100 million to 200 million colony forming units (CFUs) depending on the condition:†

1. **Type 2 diabetes —** 200 million CFUs per day (2×10^8 CFU/0.2 mL) administered for four weeks in mice on high-fat diets with researchers observing reduced blood glucose levels.[13]

2. **Cardiovascular disease —** 200 million CFUs (2×10^8 CFU/180 μL) in mouse models examining cardiovascular outcomes through effects on gut microbiota and immune function.[14]

3. **Fatty liver disease —** 100 million CFUs per day (1×10^8 CFU/mL) administered for six weeks in mice on high-fat/cholesterol diets, with reported reductions in liver steatosis, inflammation, and injury reported.[15]

†These findings are from laboratory or animal research and may not directly apply to human health.

In human trials, dosages up to 10 billion CFUs have been studied. As mentioned earlier, a three-month proof-of-concept clinical trial tested Akkermansia supplementation in 32 overweight and obese volunteers, using either live Akkermansia (10 billion CFU/day) or pasteurized Akkermansia (30 billion total fluorescent units (TFU)/day).[16]

- **Both forms were safe and well-tolerated —** Digging deeper into the data, the pasteurized form was associated with greater improvements in insulin sensitivity, insulinemia, total cholesterol, body weight, fat mass, and hip circumference

compared to placebo. The pasteurized form was also associated with decreased white blood cell counts and inflammation markers like LPS. Larger trials are needed though to confirm these findings.

- **Additional evidence reporting the safety profile of Akkermansia —** In another 12-week proof-of-concept study of overweight and obese subjects with insulin resistance and metabolic syndrome, administration of Akkermansia (at doses of 1 or 10 billion CFU, either live or pasteurized) was associated with distinct changes in fasting plasma metabolites compared to the control group.[17]

  Here, researchers observed several outcomes: improvements in blood lipid markers, glycemic indicators including HOMA-IR-measured insulin resistance, hepatic enzyme levels, and endotoxemia markers. They also noted promising trends in obesity-related body measurements.

Probiotic Potency Explained: CFU, AFU, and TFU

When evaluating the potency of probiotics, there are three units of measurement you need to be aware of: colony forming units (CFU), active fluorescent units (AFU), and total fluorescent units (TFU).

- **Colony forming units (CFU) —** This is the most widely recognized and utilized metric for quantifying the number of viable bacteria or fungal cells in a probiotic product. One CFU represents a single microorganism capable of dividing and forming a colony under specific laboratory conditions. This measure is important because the activity of probiotics is associated with the number of live microorganisms that reach your gut.

  Probiotic manufacturers typically list CFU counts on product labels, indicating the number of live organisms per serving. Higher CFU counts are often marketed as more potent, though the optimal CFU level can vary depending on the specific strains and the health context.

Consumers are also advised to check that the CFU amount listed on the label is specified as the CFU level at the end of shelf life (its expiration date).[18] As noted by The Probiotics Institute,[19] "The amount of probiotic (CFU) present on the 'manufacturing date' is not as important as the amount present at the 'end of shelf life.'"

- **Active fluorescent units (AFU) —** This unit is a less conventional and not widely standardized measure in the context of probiotics, with the exception of Akkermansia. While CFU shows the number of bacteria that are alive, AFU refers to the total number of bacteria present, both dead and alive. It is primarily a unit used to measure enzymatic activity.

  For instance, AFU could be used to evaluate the activity levels of specific enzymes produced by probiotics, which contribute to their function, such as breaking down lactose or producing vitamins. In some specialized applications, AFU is also used to assess the metabolic activity or functional potency of probiotic strains beyond mere viability.

  Most companies that sell Akkermansia probiotics use AFU instead of CFU, and there's a scientific reason for that. Akkermansia is a strict anaerobe and as such it plate-counts poorly under standard probiotic quality control conditions. Many viable-but-non-culturable (VBNC) cells aren't captured by CFU even though they're metabolically active.

  Flow cytometry (AFU) was developed in part to address this conundrum. It labels cells with fluorescent dyes that distinguish intact membranes (live) from compromised ones, and counts each cell as it passes through a laser. In short, flow cytometry captures VBNC cells that plate counts miss.

- **Total fluorescent units (TFU) —** This unit measures the total bacterial mass including both live and dead cells through fluorescent labeling, and is typically used only for pasteurized products. Like AFU, TFU values are higher than CFU counts for the same sample since they include both viable and non-viable cells.

The primary difference between CFU, AFU, and TFU lies in what they measure: CFU quantifies the number of live microorganisms; AFU assesses the functional activity of those microorganisms; and TFU measures the total bacterial mass, regardless of their functional activity. While CFU is an indicator of the potential for colonization and survival of probiotics in the gut, AFU could offer additional insights into the functional capabilities of the probiotic strains.

Akkermansia's Role in Brain Function

Akkermansia has also been studied for its interactions with brain function through the gut-brain axis. A comprehensive review published in the journal Critical Reviews in Microbiology explored the bacterium's relationship with various neuropsychiatric conditions, documenting distinct patterns of abundance across different disorders.[20] For example, research has reported reduced levels of Akkermansia in depression, anxiety, Alzheimer's disease, substance use disorders, and ALS.

In Alzheimer's disease research, patients tended to have reduced levels of Akkermansia, and supplementation has been studied across multiple preclinical models. For example, in Alzheimer's mouse models, researchers observed reduced Aβ40 and Aβ42 levels — isoforms of amyloid beta peptide implicated in the disease — in the cerebral cortex, along with improvements in spatial learning and memory.

The supplementation also influenced brain measures at a cellular level in mouse studies, reducing microgliosis — the activation and proliferation of microglia (the brain's immune cells) in response to injury or inflammation. Akkermansia also lowered inflammatory cytokines in the hippocampus, supporting oxidative metabolic activity, and restoring mitochondrial enzyme function.

How Akkermansia Can Support Brain Health

According to the Critical Reviews in Microbiology paper,[21] research suggests Akkermansia may influence brain function through three proposed mechanisms:

- **It may help protect the intestinal barrier —** Akkermansia does this by increasing mucus-producing goblet cells, enhancing tight-junction proteins, and regulating endocannabinoid system molecules and GLP-1/GLP-2. These actions are thought to collectively reduce intestinal permeability and strengthen barrier function.

- **Akkermansia aids in producing important metabolites —** These include short-chain fatty acids (specifically propionate, acetate, and isovaleric acid) and may influence amino acid metabolism that affects neurotransmitters like GABA and serotonin. It has also been linked to hormones, dopamine, and brain-derived neurotrophic factor (BDNF) levels. Research has reported correlations between Akkermansia abundance and Alzheimer's disease biomarkers through these metabolic pathways.

- **Akkermansia appears to modulate the immune system by reducing inflammatory infiltration and proinflammatory cytokines (TNF-α, IL1α, IL6, IL12A) —** At the same time, it increases anti-inflammatory macrophages and regulatory T cells. It also upregulates IL-10 expression, which in turn reduces transcription of pro-inflammatory cytokines.

  In terms of brain-specific immune effects, there is also limited evidence suggesting it may help prevent high-fat diet-induced microgliosis in the hippocampus.

However, the paper emphasizes that while these mechanisms show promise, many aspects remain unclear. Most hypotheses about Akkermansia's effects on brain function are based on its documented impacts on intestinal barrier protection, immune modulation, and metabolite production rather than direct evidence. Additional research, particularly human studies, is needed to fully understand its therapeutic potential for neuropsychiatric disorders.

**These findings are from laboratory or animal research and may not directly apply to human health.*

Akkermansia in Intestinal-Related Diseases

Akkermansia is also being researched for its role in supporting intestinal health, with implications for certain intestinal conditions, according to a 2024 Microbiome Research Reports review.[22] As in the other studies discussed, one of the standout findings was that Akkermansia is associated with improved gut barrier function.

- **The gut barrier acts like a protective wall lining your intestines —** This can help prevent harmful substances from leaking into your bloodstream. Research suggests that strengthening it may reduce inflammation and support resistance to certain infections — factors that are relevant in inflammatory bowel disease (IBD) research.[23]

  According to the cited paper, Akkermansia operates through several interconnected mechanisms. In terms of microbiota regulation, it produces short-chain fatty acids like acetate and propionate while supporting the growth of beneficial butyrate-producing bacteria. Researchers have also reported that it reshapes the gut microbial community by inhibiting harmful bacteria like Salmonella pullorum while promoting beneficial species.

- **Research associates Akkermansia with enhanced barrier function through multiple pathways —** For starters, it increases the expression of tight junction proteins and supports both mucus production and antimicrobial peptide expression. It also stimulates intestinal barrier protein production and upregulates specific proteins that maintain the structural integrity of the intestinal barrier.

- **Immune system modulation is another proposed mechanism —** As mentioned in the previous section, Akkermansia has been reported to reduce pro-inflammatory cytokines and increasing anti-inflammatory cytokines. It also has effects on T cell responses, particularly cytotoxic T lymphocytes (CTLs), and influences both dendritic cell and macrophage function.

  These relationships are important. By influencing T cells (which fight infections and cancer), dendritic cells (which help identify threats), and macrophages (which eliminate harmful substances), Akkermansia is thought to help maintain balanced

immune responses. This modulation may affect how well your body responds to threats while supporting against excessive inflammation that could damage healthy tissue.

Akkermansia May Have a Unique Role in Stress Management

Last but not least, Akkermansia supplementation has been studied in the context of stress-related conditions. A scientific review published in the September 2024 issue of Microbiome Research Reports investigated how Akkermansia interacts with the body to support mental health and assessed its activity in stress management.[24]

Although the research did not specify a particular study population, it provides insights into the potential applications of this bacterium.

As noted in this paper, animal research suggests that Akkermansia may reduce stress-related behaviors through several proposed mechanisms involving the microbiota-gut-brain axis, including the upregulation of BDNF. For context, BDNF is a protein that supports the survival and growth of neurons in the brain, essential for learning and memory.

Higher levels of BDNF have been associated with reduced symptoms of depression and improved cognitive function in research. Through its connection with BDNF, Akkermansia may support neuronal health and stress resilience, according to current published data.

Akkermansia also produces extracellular vesicles (EVs) that can interact with the host gut epithelium and may have biological activity comparable to whole bacterial cells. EVs are tiny particles released by cells that can transfer proteins and genetic material to other cells, and the EVs produced by Akkermansia have been observed in research to induce central nervous system-linked effects.

Here's a summary of four studies examining Akkermansia effects on different neurological and stress conditions in mouse models,†† and the dosages used:[25]

- **Depression with colitis —** 1 billion CFUs per mL (1×10^9 CFU/mL) via fecal microbiota transplantation after antibiotic treatment in mice with chronic restraint stress and colitis. Researchers observed improvements in behavioral tests measuring depression-like symptoms (open field, tail suspension, and forced swim tests).

- **Chronic stress effects —** 500 million CFUs per mL (5×10^8 CFU/mL) orally for three weeks in stressed mice. Results showed improved behavioral test scores, reduced stress hormone levels, increased dopamine and BDNF, and changes in gut microbiota.

- **Depression with alcohol exposure —** 2.5 billion CFUs per 200 μL (2.5×10^9 CFU/200 μL) orally for five weeks in mice exposed to chronic stress and alcohol. Improvements were observed in body weight, depression-like behavior, and sucrose preference.

- **Antibiotic-induced depression —** Mice treated with antibiotics were given 1.5 billion CFUs per 200 μL (1.5×10^9 CFU/200 μL) daily for two weeks. Results showed reduction in depression-like behaviors caused by the antibiotic treatment.

††These findings are from laboratory or animal research and may not directly apply to human health.

How Research Suggests You Can Support Akkermansia Levels

One area researchers have studied is whether dietary patterns can shift Akkermansia abundance. As reported in Frontiers of Immunology:[26]

> *"Supplementation with prebiotics, fructo-oligosaccharides, FODMAP (fermentable Oligo-, Di- and Mono-saccharides and Polyols — which includes fructose, lactose, oligosaccharides, polyols, and sugar alcohols (polyols, such as sorbitol, mannitol, xylitol, and maltitol)), and dietary polyphenols may*

increase the abundance of Akkermansia in healthy humans or animals. In addition, prebiotics can reverse the reduction of Akkermansia abundance due to high-sugar or high-fat diets."

Pasteurized Akkermansia postbiotics and live Akkermansia supplements are another area of research and clinical use. Based on the published evidence (see Nature Medicine 2019 and Gut Microbes 2021 cited earlier), research has used live Akkermansia at 1 billion to 10 billion CFUs per day in human studies, with the pasteurized form showing greater associated benefit in the published proof-of-concept trial. That said, I recommend a two-phase approach:

- **Phase 1 (Pasteurized Akkermansia postbiotics) —** Postbiotics are non-living bacterial components that still deliver biological signals. Pasteurized forms of Akkermansia muciniphila contain Amuc_1100, a protein associated with tightening the gut barrier and reducing inflammation in research.

  Look for postbiotic formulas with enteric coating or microencapsulation so the active components survive stomach acid and reach the colon intact. Without that protection, very little Amuc_1100 reaches the colon, and megadosing to compensate is expensive and inefficient — coated formats are more practical.

- **Phase 2 (Live Akkermansia) —** Introduce live probiotic Akkermansia only after all of the following: bloating remains minimal or absent; stool form stays consistent for at least seven days; fiber tolerance expands without symptom return. At this stage, live Akkermansia may be introduced alongside gentle prebiotics — like small amounts of resistant starch — to support the growth of butyrate-producing strains.

In closing, growing evidence suggests Akkermansia muciniphila may have implications for multiple aspects of health.

Keep in mind that the research findings are not universal, and individual responses may likely vary. My team is developing an affordable test to analyze your gut microbiome, with specific focus on Akkermansia. With that baseline, your health care practitioner will

be able to make better-informed recommendations about whether Akkermansia augmentation might be appropriate for your specific condition.***

****Talk to your health care provider about whether this testing is appropriate for you.*

FAQs About Akkermansia Muciniphila

Q: What is Akkermansia muciniphila, and why is it important for gut health?

A: Akkermansia muciniphila is a bacterial species that resides in the mucus layer of the human intestinal tract, where research suggests it plays a role in supporting the gut barrier. It typically makes up roughly 1% to 4% of the gut microbiota. Studies have associated higher levels of Akkermansia with various markers of metabolic and intestinal health, though most direct mechanistic evidence comes from animal models, and larger human studies are still emerging.

Q: What does the research say about pasteurized versus live Akkermansia?

A: In a 2019 proof-of-concept human trial published in Nature Medicine that involved 32 overweight or obese adults for three months, pasteurized Akkermansia was associated with greater improvements in insulin sensitivity and several metabolic markers compared to live Akkermansia or placebo.

You can follow a two-phase approach: starting with pasteurized Akkermansia postbiotics (which retain the Amuc_1100 protein associated with gut barrier function) before introducing live Akkermansia once gut tolerance is established. Larger trials are still needed to confirm these findings.

Q: What dietary approaches may support Akkermansia levels?

A: Diets high in refined sugar and seed-oil-derived polyunsaturated fats have been associated with reduced Akkermansia levels in research. For most adults working to restore gut function, the first-step approach is white rice and whole fruits rather than high-fiber or extensive prebiotic interventions, because fiber can increase endotoxin load in a compromised gut. As always, dietary changes need to be made with attention to individual tolerance and in consultation with a qualified health care provider.

Q: Is Akkermansia supplementation safe?

A: In the published human trials to date (see Nature Medicine 2019 and Gut Microbes 2021 in the article), both live and pasteurized Akkermansia were reported as safe and well-tolerated over the three-month study periods. However, these were proof-of-concept studies with small participant numbers, and longer-term safety data are still emerging. Talk to your health care provider before beginning any new supplement, particularly if you have a medical condition or take medications.

Q: How does Akkermansia interact with the gut-brain axis?

A: Research has explored several proposed mechanisms by which Akkermansia may influence brain function — including supporting the intestinal barrier, producing short-chain fatty acids, and modulating immune signaling that interacts with the central nervous system.

Studies have observed associations between Akkermansia levels and markers in conditions such as depression, anxiety, and Alzheimer's, though most direct mechanistic evidence comes from mouse models. Larger human studies are needed.

This article is for informational purposes only and does not constitute medical advice. Consult a qualified health care provider before making changes to your health regimen.

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