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New Study Shows a Specific Gut Bacteria Linked to Alzheimer's

Analysis by Dr. Joseph Mercola | October 26, 2023

STORY AT-A-GLANCE

- Specific gut bacteria are linked to Alzheimer's disease, potentially triggering neuroinflammatory processes via the microbiota-gut-brain axis
- An analysis revealed 10 microbiota genera with a significant link to Alzheimer's, four of which were associated with apolipoprotein E (APOE), a gene that may raise Alzheimer's risk
- Among them was the proinflammatory genus Collinsella, which is not only linked to Alzheimer's but also Type 2 diabetes, atherosclerosis and rheumatoid arthritis
- Collinsella may increase Alzheimer's risk by increasing the expression of inflammatory cytokines as well as increasing gut permeability
- Certain members of the Firmicutes phylum were protective against Alzheimer's, as they metabolized butyrate from carbohydrates; butyrate is anti-inflammatory, reduces gut permeability and activates the secretion of brain-derived neurotrophic factor (BDNF), reduced levels of which have been linked to Alzheimer's

Despite 6 million U.S. adults living with Alzheimer's — with numbers expected to reach 13 million by 2050[1] — its cause remains elusive. The gut, including its unique makeup up microbial inhabitants, may play an important role, however.

An analysis published in Scientific Reports[2] even uncovered specific gut bacteria that may be linked to Alzheimer's disease, potentially triggering neuroinflammatory

processes via the microbiota-gut-brain axis.

Certain Gut Bacteria May Promote Alzheimer's

An imbalance in gut microbiota has previously been linked with neurodegenerative diseases, including Alzheimer's.[3] Certain microbes may secrete toxins and short-chain fatty acids (SCFAs) that make the gut more permeable or alter immune function. It's also been found that people with Alzheimer's may have less diversity in their gut bacteria, promoting disease.

As such, researchers wrote in Scientific Reports, "Uncovering the genetic basis of microbial abundance and its effect on AD [Alzheimer's disease] could suggest lifestyle changes that may reduce an individual's risk for the disease."[4] The team used data from the largest genome-wide association study of gut microbiota, analyzing records of 119 bacterial genera.

Initially, 20 gut microbiota genera stood out for their potential link to Alzheimer's. A more refined search then revealed 10 genera with a significant link to Alzheimer's, four of which were associated with apolipoprotein E (APOE), a gene that may raise Alzheimer's risk.

Among them was the proinflammatory genus Collinsella, which not only is linked to Alzheimer's but also Type 2 diabetes, atherosclerosis and rheumatoid arthritis.[5] According to the study:[6]

> *"Overall, the host genetic factors influencing the abundance of ten genera are significantly associated with AD, suggesting that these genera may serve as biomarkers and targets for AD treatment and intervention. Our results highlight that proinflammatory gut microbiota might promote AD development through interaction with APOE."*

Gut Microbes Interact With Your Nervous System

There are more than 100 trillion microbial cells in your body, 95% of which are in your gut.[7] Gut microbes interact with your central nervous system via the microbiota-gut-brain axis, which involves neural, immune, endocrine and metabolic pathways.[8]

Certain gut bacteria may release lipopolysaccharide (LPS) and amyloids, which contribute to inflammation in the brain that may drive Alzheimer's. LPSs are dead bacteria or, more specifically, the cell walls of dead bacteria. Your immune system treats them as living bacteria and mounts immune defenses against the perceived invaders.

LPSs have been found in amyloid plaques in the brains of Alzheimer's patients.[9] By promoting proinflammatory cytokines, bacteria may also play a role in damaging the integrity of the microbiota-gut-brain axis and the blood-brain barrier.[10]

Of the 10 gut microbiota genera uncovered with a significant link to Alzheimer's, six were negatively associated with Alzheimer's, meaning that they were less common in people with Alzheimer's than in those without the disease and may therefore have a protective effect.

The remaining four were positively associated with Alzheimer's, meaning they were more abundant in those with Alzheimer's disease, making them a risk factor for the condition. Specifically:[11]

- Bacteria protective against Alzheimer's included Firmicutes phylum (Eubacterium nodatum group, Eisenbergiella and Eubacterium fissicatena group) as well as from Actinobacteria (Adlercreutzia, Gordonibacter) and Bacteroidetes (Prevotella9)
- Bacteria associated with Alzheimer's included Firmicutes (Lachnospira and Veillonella), Actinobacteria (Collinsella) and Bacteroidetes (Bacteroides)

Gut Bacteria Can Be Protective or Pathogenic

Collinsella appeared as a risk factor for Alzheimer's in both phases of the study and has previously been found exist in abundance in mice and people with Alzheimer's disease.

It's likely that Collinsella may increase Alzheimer's risk by increasing the expression of inflammatory cytokines as well as increasing gut permeability.[12]

As for the protective bacteria, certain members of the Firmicutes phylum metabolize butyrate from carbohydrates. Butyrate activates the secretion of brain-derived neurotrophic factor (BDNF),[13] reduced levels of which have been linked to Alzheimer's disease. Further, the team explained:[14]

> *"Butyrate is a major SCFA metabolite in the colon that might be a critical mediator of the colonic inflammatory response. Alongside its anti-inflammatory properties, butyrate is also essential in maintaining tight junctions that prevent dysbiotic gut permeability."*

Despite their beneficial effects in regard to butyrate, however, Eubacterium nodatum and Eisenbergiella have previously been associated with neurodegenerative diseases, showing the complexity of gut microbiota interactions in the body.

"This suggests that oral and gut populations of the same microbial taxa may have different etiologies with the same disease … we are the first to report a protective association between genetically-predicted Eisenbergiella, Eubacterium nodatum group, and Eubacterium fissicatena group abundance with AD," the researchers noted.[15]

Gut Bacteria Linked to Amyloid Deposits in the Brain

Alzheimer's is characterized by an accumulation of beta-amyloid plaques and neurofibrillary tangles in the brain. There's debate over whether amyloid beta is a symptom of Alzheimer's, rather than a cause, and could potentially have a protective role in the disease process.[16]

However, a team of Swiss and Italian researchers found a connection between imbalanced gut microbiota and the development of amyloid plaques in the brain.[17] The researchers used PET imaging to measure amyloid deposition in their brains, then measured markers of inflammation and proteins produced by intestinal bacteria, such as LPSs and SCFAs, in their blood.

High blood levels of LPSs and the SCFAs acetate and valerate were associated with large amyloid deposits in the brain, while butyrate appeared to have a protective effect; high levels of butyrate were associated with less amyloid.

Probiotics and Fasting Protect Brain Health

Given the strong associations between gut health and Alzheimer's, it's possible that a "bacterial cocktail" could be given early on to help slow disease progression or prevent it altogether.[18] Not only do animal studies suggest that probiotics, along with exercise, may decrease the progression of Alzheimer's disease by altering the microbiome,[19] but a number of studies found probiotics represent a viable therapeutic option:[20]

"Currently available studies showed that probiotic administration conferred neuroprotective benefits and could attenuate cognitive deficits and modulate gut microbiota dysbiosis, which may be related to oxidative and inflammatory pathways … Thus, probiotics seem to be an attractive approach to combat AD, which deserves to be further studied by well-designed large-scale clinical studies."

Changes in the gut may also help explain why fasting may be beneficial for neurodegenerative diseases. Fasting activates autophagy, which is your body's way of taking out the trash, and will also trigger the regeneration of stem cells. In our 2017 interview, Dr. Steven Gundry explained that this also may have a direct connection with LPSs, and giving your gut a rest from these proinflammatory proteins via fasting may be healing:

> *"We have an amazing repair system that goes to work when you're fasting. Not the least of which is [letting] your gut rest. It's probably one of the smartest things that any of us can do — putting the wall of your gut at rest, not having to absorb nutrients, not having to deal with the constant inflow of lectins or toxins.*
>
> *But I think more importantly, it gives [your body] a chance to finally do some serious cleaning of your brain … Alzheimer's and Parkinson's have a unifying cause, and that is the brain is defending itself against perceived threat, a lot of*

which are LPSs. If you put your gut at rest and don't have LPSs coming into your system, and the longer you can maintain that, realistically, the better off you are.

As Jason Fung would say, intermittent fasting is great; doing a modified calorie-restricted diet is great, but it technically is so much easier to just stop eating … The second level of my modified food pyramid is 'Don't eat anything.'"

Gut's Link to Parkinson's Disease Grows Stronger

It's interesting that Gundry points out the unifying cause between Alzheimer's and Parkinson's, as they may both begin in the gut. The "gut first" hypothesis states that Parkinson's disease is the result of abnormal, misfolded proteins in the gastrointestinal tract.

"According to the hypothesis, the inciting agent — this misfolded protein — starts in the nerves of the gut wall and ascends to the brain, causing those pathological changes that lead to Parkinson's," Dr. Pankaj J. Pasricha, chair of internal medicine at the Mayo Clinic, told The Washington Post.[21]

Pasricha and colleagues found that four gastrointestinal issues — constipation, difficulty swallowing, delayed stomach emptying and irritable bowel syndrome — are associated with Parkinson's disease and might be predictive of diagnosis.[22]

Gut-related symptoms often begin years before typical symptoms of Parkinson's like tremors and stiffness, but 2003 research by German neuroanatomist Heiko Braak first suggested that Parkinson's disease may originate in the gastrointestinal tract.[23]

Then, in 2019, researchers injected misfolded alpha-synuclein into the guts of healthy mice, then tracked it to see where it ended up.[24] Alpha-synuclein is a type of protein naturally found in the human body. When the proteins are misfolded, they may clump together and cause damage to nerve cells that lead to areas of dead brain matter called Lewy bodies.[25]

These areas of dead brain cells lead to Parkinson's disease symptoms such as problems with movement and speech.[26] After one month, alpha-synuclein had turned up in the brainstems of the mice, while after three months it had traveled to the brain's amygdala and midbrain. Within seven and 10 months, it had turned up in even more regions of the brain.

Next, the researchers injected the misfolded proteins into the guts of mice that had a severed vagus nerve. After seven months, no signs of cell death were present in the mice brains, and it appeared that the proteins were not able to advance to the brain. The study also evaluated behavioral changes in the groups of mice, such as their ability to build nests.

After seven months, mice with intact vagus nerves that received the misfolded proteins in their gut built smaller, messier nests, a sign of problems with motor control. Mice that did not receive the injection, and mice that received the injection but had a severed vagus nerve, scored consistently higher on nest-building activities.[27]

Problems with memory and anxiety also appeared in the intact vagus nerve mice that received the misfolded proteins in their guts, which were not seen in the other groups of mice.[28] If Parkinson's does, indeed, begin in the gut, it paves the way for early treatment and potential prevention, similar to Alzheimer's.

How to Build a Healthier Gut

While much remains to be discovered about the role of your gut in diseases like Alzheimer's and Parkinson's, you can take steps today to nourish your body's microbiota.

Fiber is "the single most important component of the diet to feed the microbiome," Gloria Dominguez-Bello, president of The Microbiota Vault, says,[29] but it's largely absent in ultraprocessed foods that make up the majority of Americans' diets. Chemicals in the food supply, such as the herbicide glyphosate, also disrupt microbes.[30]

Consumption of whole foods is linked to higher gut microbiota diversity,[31] as is consuming herbs and spices like cinnamon, oregano, ginger, black pepper and cayenne

pepper.[32] In one study, diversity of gut bacteria increased after four weeks of consuming herbs and spices, in three-fourths teaspoon or 1.5 teaspoon daily doses.[33]

Consuming fermented foods is another solid strategy for optimizing the health of your gut microbiome. A study assigned 36 adults to consume a diet high in fermented foods or high-fiber foods for 10 weeks. Those consuming fermented foods had an increase in microbiome diversity as well as decreases in markers of inflammation.[34]

The issue is that many Americans do not consume these healthy whole foods on a regular basis, instead consuming processed junk foods devoid of fiber and nutrients and packed with additives.

Artificial sweeteners have also been found to alter gut bacteria in adverse ways.[35] You'll also want to avoid antibiotics unless absolutely necessary and, if you do use them, reseed your gut with beneficial bacteria by eating fermented foods or taking a high-quality probiotic supplement.

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