Study suggests 2 vitamin B deficiencies may play a role in Parkinson's disease

Written by Katharine Lang on June 24, 2024 — Fact checked by Jill Seladi-Schulman, Ph.D.

Scientists have found a link between gut bacteria, vitamin B synthesis, and Parkinson's disease, VICTOR TORRES/Stocksy

- **Parkinson's disease is a neurodegenerative disorder characterized by tremors and a loss of coordination that usually affects people over the age of 60.**
- **A new study compared the gut microbiota of people with Parkinson's disease in five countries.**
- **Researchers found that although people from each country had different gut bacteria, all those with Parkinson's had fewer bacteria that make vitamins B2 (riboflavin) and B7 (biotin).**
- **The researchers suggest that this could contribute to**

Parkinson's disease is the fastest growing neurodegenerative disorder worldwide, with the World Health Organization estimating that more than 8.5 million people were living with the disorder in 2019. Since 1990, the number people with Parkinson's has more than doubled worldwide.

The risk of developing Parkinson's increases with age, and men are 50% more likely to develop it than women. Other risk factors include genetics, exposure to environmental toxins, and past traumatic brain injury.

Symptoms occur when nerve cells in the basal ganglia, an area of the brain that controls movement, are damaged and die, so stop producing the neurotransmitter dopamine. This leads to tremors, muscle stiffness, slow movement, impaired balance and coordination, emotional changes, and gastrointestinal symptoms.

Studies have suggested that an imbalance in gut microbiota may contribute to the development of Parkinson's disease.

Now, a study in five countries that analyzed the microbiota of people

B2) and biotin (vitamin B7).

The study, led by scientists at Nagoya University Graduate School of Medicine in Japan, is published in the journal npj Parkinson's Disease.

Michael S. Okun, M.D., executive director of the Fixel Institute for Neurological Diseases, chair of neurology at the University of Florida, and the national medical director for the Parkinson's Foundation, who was not involved in the study, told *Medical News Today*:

"It is interesting that fecal biosyntheses of riboflavin and biotin were both found to be decreased in this small study of folks with Parkinson's disease and also the finding that there may be differences depending on where you live and what you eat."

Vitamin B2 and B7 deficiency and Parkinson's

The researchers used fecal analysis to investigate the genomes of gut bacteria in 94 people with Parkinson's disease and 73 controls in Japan. Using shotgun sequencing — a technique that analyses all the genetic material in a sample — they recorded bacterial genomes. They then compared their results with data from studies in the USA, Germany, China, and Taiwan.

They found differences in the gut microbiota by country and between people with Parkinson's disease and those without.

Regardless of the species of bacteria in the gut microbiota, people with Parkinson's disease had markedly decreased bacterial genes for biosynthesis of the B vitamins riboflavin and biotin.

Both riboflavin (B2) and biotin (B7) are essential for metabolizing carbohydrates, fats, and proteins into glucose for energy, enhance the functioning of the immune system, and have anti-inflammatory properties.

Microbiome changes could increase neuroinflammation

Neuroinflammation is a key feature of Parkinson's disease, and the researchers suggest that a lack of riboflavin and biotin could contribute to neuroinflammation. However, Tim Sampson, Ph.D., assistant professor, Department of Cell Biology, Emory University School of Medicine, who

“I think it is important to point out that this study did not measure biotin or riboflavin in stool or circulation. Simply, the authors found that the bacterial genes responsible for the synthesis of these molecules were decreased.”

“So, it isn’t known from this study whether there is a deficiency that is associated with these microbiomes that have less predicted synthesis,” he added.

The researchers found that a reduction in the genes for B2 and B7 was strongly linked to a decrease in fecal short-chain fatty acids and polyamines in Parkinson’s disease. Both substances are involved in the production of the mucus layer of the intestine.

If the intestine’s mucus barrier is decreased, the intestine becomes more permeable, allowing toxins to enter the bloodstream. The researchers suggest that this could increase neuroinflammation.

Sampson explained how these changes might contribute to Parkinson’s disease symptoms:

“We have a growing appreciation that people with [Parkinson’s] have increased inflammation, and some of this may be contributed to by the intestinal environment. While these vitamins are associated with beneficial immune responses, we do not know if their absence is contributing to inflammation in [Parkinson’s].”

“Similarly for the polyamines. There are some data that support an idea that the intestine is more permeable during [Parkinson’s]. This could cause bacterial products to be released into circulation and stimulate immune responses and inflammation, which may contribute to aspects of the disease,” he told *MNT*.

More evidence of gut's role in Parkinson's disease

> "The authors of this study postulate on the role of increased intestinal permeability and the potential effects of pesticides, herbicides, and other toxins important to Parkinson's, however there remain many more questions than answers in this area of research."
> — Michael Okun

This study highlights the relationship between the gut microbiome, metabolism, and the nervous system, but the findings are not sufficient to suggest changes in clinical practice, such as B2 and B7 supplements, as Sampson pointed out.

"I think these data are much too premature to warrant therapeutic interventions. They highlight one of the many ways that the gut microbiome *might* be contributing to [Parkinson's]."

"But these are metabolic predictions from the genes encoded by the microbiome. They [the researchers] did not measure that the microbiomes are directly involved in these processes or that they affect the levels of these metabolites themselves," he added.

Okun told *MNT* that vitamin supplementation can be useful during treatment for Parkinson's disease, but that supplements should be taken only on medical advice:

"The most common treatment for Parkinson's disease is levodopa and we know that levodopa leads to increases in circulating homocysteine levels. This is why many experts recommend taking a single multivitamin a day because if you are on levodopa you likely need to replace vitamins B12, B6 and folic acid."

"Replacing vitamins can also lead to unintended adverse effects so this should be done under the guidance of a healthcare professional. There is no specific current recommendations for replacement vitamins B2 and B7 in Parkinson's disease," he added.

However, Sampson welcomed that the research as adding to evidence of the role of the microbiome in Parkinson's disease:

"These data do provide some testable hypotheses and add to the growing knowledge that the gut microbiome can contribute to aspects of PD."

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