

# New clues to age-old illnesses emerge in the gut

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A healthy diet supports people's gut microbiome and, in turn, their mental and physical health. Credit: CC0 via Unsplash

Links between the human intestine and diseases such as arthritis are increasingly coming to light and signal that healthy diets can help control

illnesses. Health in body and mind indeed may well be rooted in the gut.

The trillions of bacteria, archaea, fungi and viruses in the [human body](#)—collectively called the [microbiome](#)—vary enormously from person to person. What's more, the differences can have a big impact on physical and mental health.

## Deciphering chatter

Understanding more about the links between the microbiome and chronic illnesses such as diabetes, [inflammatory bowel disease](#) and obesity is a top European goal, promising new ways to tackle age-old ailments.

"One really needs to look at the system in all of its complexity, as it exists in nature, rather than just study single strains or even a few microbes in a dish," said Paul Wilmes, a microbial ecology professor at the University of Luxembourg.

Through their diet, humans feed a mostly benign zoo of microbes in the gut. In turn, this microbiome affects people's health by churning out a steady stream of molecules, some of which influence and help regulate the immune system.

Wilmes leads a research project that has received EU funding to investigate differences between healthy and sick people. The five-year [ExpoBiome](#) initiative, which runs through October 2025, is identifying [communities of bacteria](#) and fungi involved in disease processes.

Parkinson's disease and [rheumatoid arthritis](#) are the focal points.

The gut microbiome is the largest and most important microbial community of the human body.

This community is in constant, complex cross-talk with cells such as those in the liver and brain. The interactions which include previously unknown microbial molecules, reveal surprising links with familiar illnesses.

## **Parkinson's puzzle**

Parkinson's disease, for example, is a disorder of the nervous system that causes uncontrollable shaking and difficulties with balance and coordination.

While Parkinson's is regarded as a brain disorder, there can be early signs in the gut that something is wrong, according to Wilmes.

"The molecular hallmarks of the disease appear early on in gut nerve cells, well before the classical symptoms involving movement problems appear," he said.

Wilmes said it's possible molecules made by gut bacteria kick off a cascade that eventually spreads to the brain or exacerbate the disease, perhaps by increasing inflammation.

On the other hand, changes to the microbiome could be a consequence of Parkinson's disease rather than the cause.

In either case, the research being carried out could allow doctors to diagnose the disease earlier in some patients or intervene before symptoms become more severe.

## **Healthy versus sick**

Wilmes, who started his career studying microbes in the environment

before being drawn to those in the human body, is now comparing microbiome samples taken from healthy people and sick ones.

"A combination of diet and taking antibiotics might play a role in shifting our gut microbial community towards the cluster of organisms that we see, for example, in Parkinson's disease," he said.

Wilmes is also studying the impact of the gut on rheumatoid arthritis, an autoimmune and inflammatory disease in which the immune system attacks a patient's joints.

Exactly how these microorganisms play a role in the disease is a mystery that he is keen to solve.

"It might be that a molecule or a mixture of molecules from the microbiome triggers the initial inflammatory response that then goes haywire," Wilmes said.

## **Intestinal ID**

One-third of microorganisms in the intestines—the [gut microbiota](#)—is common to most people, while two-thirds are specific to each person, according to the European Molecular Biology Laboratory.

In other words, the microbiota in the human intestine is like an individual identity card.

In future, the hope is that patients will routinely have their microbiome decoded when they visit a doctor's office or a hospital.

"There are thousands of clinical trials going on to try to establish a link between the microbiome and a number of different diseases," said Walid Hanna, chief executive officer of a Belgian start-up called Perseus

Biomics.

The work requires sequencing the DNA to work out which microbial strains are present.

Hanna and his team are part of a two-year project—[Perseus MAP](#)—that received EU funding for 24 months through September 2023 to analyze the microbiome of patients in a way that is cheaper and faster than existing technologies.

Their strategy reduces the quantity of DNA that needs to be decoded by labeling sequences with fluorescent markers and by using an automated microscope to compare the generated light patterns with a database of some 15,000 microbial species.

This will make it possible to decode DNA from a patient's stool or cell sample within 72 hours.

"A lot of sequencing technologies today take weeks to get results back on the microbiome of patients," said Hanna, who has two decades of experience in the medical-technology sector.

The ultimate goal is a printer-size device able to deliver results quickly to researchers, pharmaceutical companies, personalized nutrition businesses or hospitals.

The new profiling system, DynaMAP, is due to be released towards the end of 2024, according to Hanna.

The Perseus MAP technology will make microbiome profiling much more accessible and could allow medical experts to spot the beginnings of a chronic disease before it progresses.

## Diet lessons

What people eat affects the types of microbes in the gut.

That means gut-microbiome troubles can be addressed through not only drugs but also nutrition, according to Wilmes of ExpoBiome.

A diet high in processed foods or refined sugars tends to favor fast-growing gut microorganisms, which are often implicated in causing disease.

"The vast majority of the organisms that are beneficial to us are typically slow-growing," Wilmes said.

Foods that are preferable because they appeal to slow-growing bugs include the Mediterranean diet, a plant-based cuisine that centers on cereals, vegetables, fruits and olive oil and is rich in antioxidants, fiber and vitamins.

In the case of rheumatoid arthritis, drastic changes in eating habits such as fasting can reset the microbiome in patients and cause the disease to go into remission.

By analyzing the DNA sequences in a patient's [gut microbiome](#), Wilmes is learning more about the types of microbes present in diseases including Parkinson's and rheumatoid arthritis.

The work will help determine which molecules are involved either in triggering the disease or in protecting against it, enabling better diagnoses and treatments.

"We need to work out what is a healthy cocktail of molecules in our gut and how we can prevent shifts which trigger diseases," Wilmes said.

**More information:**

- [ExpoBiome](#)
- [Perseus MAP](#)

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