


# Gut microbiome and aging – Unlocking new frontiers in healthy longevity

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## **As the population ages, research into preserving healthy longevity is gaining pace. Christian Brechot highlights the role of the gut microbiome – a complex community of microorganisms within us – in influencing health as we age**

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Humanity is facing what some call a ‘silver tsunami’: never before have so many people lived to such advanced ages. By 2050, more than 1.6 billion people worldwide will be over 65.

In the US alone, older adults will make up nearly a quarter of the population. Longevity is a gift, but it also comes with its own set of challenges: rising healthcare needs, loss of independence, and diseases associated with aging. The big question is: Can we live longer and healthier?

### **Meet your inner ecosystem**

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The answer may lie inside us. Each of us carries a vast community of trillions of bacteria, viruses, and fungi – our gut microbiome. These tiny allies digest food, train our immune system, and even produce chemicals that affect our brain and heart. But like any ecosystem, the microbiome changes with time. In youth, it’s diverse and balanced. With age, it can shift toward dysbiosis – a state where harmful microbes gain the upper hand. Scientists are discovering that this imbalance may drive many conditions associated with ageing, including memory loss, muscle weakness, and heart disease.

### **How microbes shape the journey of aging**

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**Alzheimer’s disease:** Studies at the University of South Florida (USF) and Wake Forest University show that an imbalanced gut can worsen brain inflammation and the buildup of toxic proteins linked to Alzheimer’s. In animal models, probiotics and dietary changes helped restore memory and brain function – hopeful signs as these findings move into human trials.

**Muscle loss (sarcopenia):** Losing muscle strength is one of aging’s most disabling effects. USF researchers found that certain probiotics reduced inflammation and improved muscle health in aging animals. These insights may one day lead to simple [microbiome-based solutions to keep older adults strong and independent](#).

Heart health: Gut microbes produce compounds that can either harm or protect the heart. One, called TMAO, raises cardiovascular risk; another, butyrate, supports heart and gut health. Research shows that adjusting one's diet or adding probiotics can lower TMAO and boost butyrate, potentially guarding against heart disease.

## **Pioneering work at the USF Microbiomes Institute**

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At the USF Microbiomes Institute, scientists are rethinking aging itself. They propose that aging doesn't suddenly 'switch on' late in life – it begins even before birth, as small changes accumulate over decades. And because our microbiome is there from the very start, it may hold the key to understanding how aging unfolds.

By studying how microbes shape the immune system, metabolism, and even memory across a lifetime, the Institute aims to design strategies that reset and protect our inner ecosystem, keeping us healthier for longer.

## **The MiaGB Consortium: Mapping microbes across a lifetime**

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One of the most ambitious projects, led by Dr Hariom Yadav, is the Microbiome in Aging Gut and Brain (MiaGB) Consortium. This multi-university collaborative consortium project is part of the USF Microbiomes Institute, which is paving the way to determine the risk of age-related cognitive decline and dementia based on the microbiome of our oral cavity and gut.

With support from the Florida Department of Health and NIH, the team has collected [microbiome samples](#) from over 500 older adults. This treasure trove of data helps answer big questions:

- Which microbial changes predict memory loss, weakened muscles, or fragile immunity?
- Can we identify 'microbial signatures' that forecast disease before symptoms begin?
- How can we use these insights to design therapies that slow or even reverse aging processes?

## **From discovery to real-world solutions**

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Aging isn't just about years – it's about resilience. However, one of the hidden culprits is 'leaky gut', where the intestinal barrier becomes weakened, allowing harmful molecules to enter the bloodstream. This sparks a slow, chronic inflammation, often referred to as 'inflammaging.'

To tackle this, Dr Yadav's team developed PoZibio®, a heat-treated 'postbiotic' that strengthens the gut wall and lowers inflammation. Early studies indicate that it can improve health and longevity, and it's already being incorporated into real-world use. This represents a powerful example of how microbiome research can transition from the laboratory bench to the bedside.

## A healthier future within reach

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The microbiome is rewriting what we know about the aging process. Once seen as an inevitable decline, aging may increasingly become a process we can guide by nurturing our microbial allies.

The work at USF and beyond shows that by protecting and restoring the microbiome, we may preserve memory, mobility, and vitality well into our later years. As research advances, the vision of not just adding years to life, but life to years, is coming into focus.

The USF Microbiomes Institute is an initiative to merge and integrate interdisciplinary researchers and departments from the University of South Florida (USF), USF Health, Tampa General Hospital (TGH), and Moffitt Cancer Center, with a special working focus on microbiome studies in soil, water, plant, animals, food, and human health and aging.

The Institute aims to bring together various departments and colleges, spanning engineering to business, and create opportunities for transdisciplinary projects that incorporate new approaches to microbiome studies. We are composed of several working groups, such as Education and Training, Data Analysis, Infrastructures, Core Facilities, and Scientific programs. We integrate academics with industry, promoting partnerships with colleges and departments to share experiences and enhance the research and knowledge in the microbiome field.

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