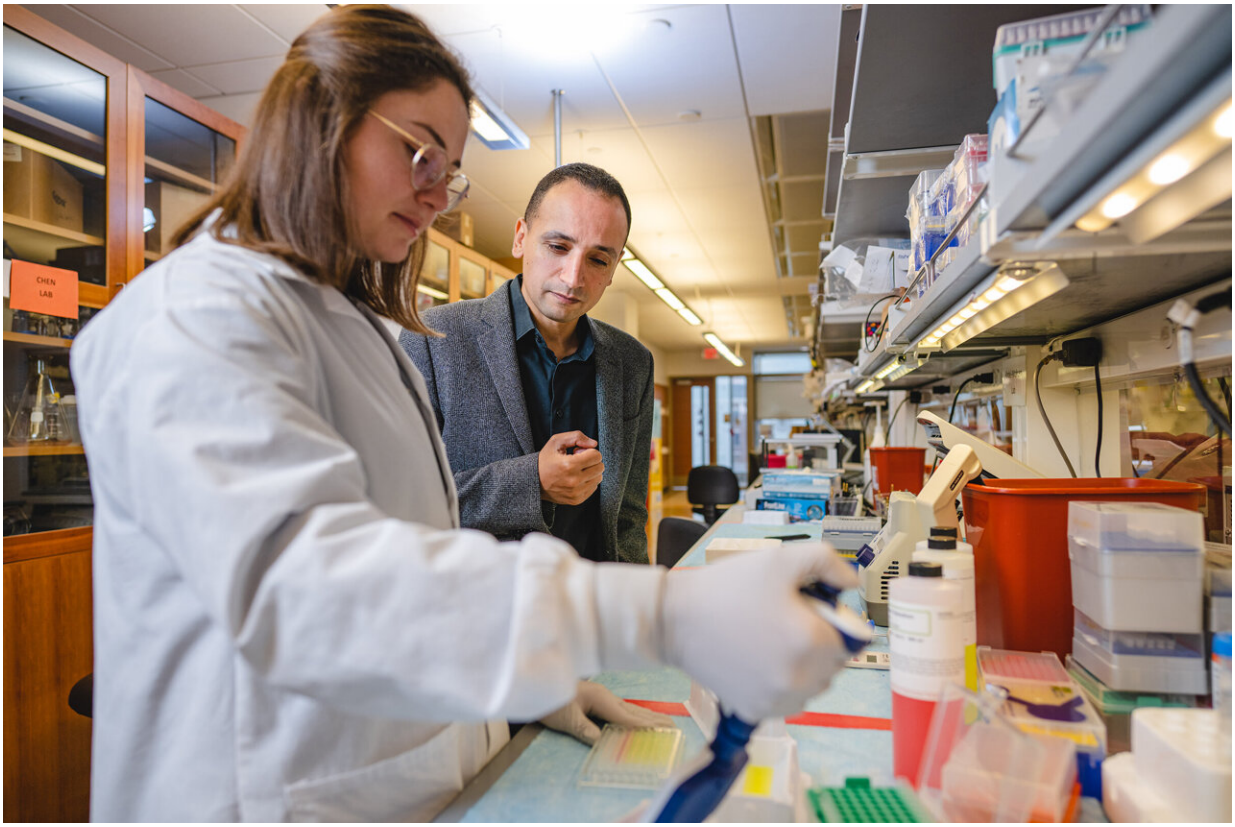
Scientists discover link between leaky gut and accelerated biological aging

February 22 2024



Wistar Institute's Dr. Mohamed Abdel-Mohsen in the lab. Credit: The Wistar Institute

The Wistar Institute's associate professor Mohamed Abdel-Mohsen, Ph.D., has demonstrated, with his lab and collaborators, a connection

between viral damage to the gut and premature biological aging.

The group found that this pro-aging connection can contribute to both gut permeability and premature systemic and intestinal tissue aging in people living with chronic HIV infection, and their discovery is detailed in a paper titled, "Distinct Intestinal Microbial Signatures Linked to Accelerated Systemic and Intestinal Biological Aging," published in the journal *Microbiome*.

When people's bodies age faster than their chronological years—a condition known as accelerated biological aging—they become more vulnerable to serious health issues usually seen in older adults, including cancers, heart diseases, brain disorders, severe infections, and reduced vaccine effectiveness. Dr. Abdel-Mohsen investigates what drives this rapid aging and how to create ways to slow down biological aging and improve health.

A prime suspect in this aging puzzle is the gut microbiome and its potential leakage into the bloodstream. The Abdel-Mohsen lab investigates how gut leakage can impact the immune system and lead to chronic inflammation, which may accelerate aging.

To delve into this question, Dr. Abdel-Mohsen and colleagues analyzed samples from people living with chronic HIV infection. Living with chronic HIV infection is known to potentially accelerate or accentuate biological age, which makes it an excellent model to investigate mechanisms of accelerated biological age in people living with chronic conditions.

In particular, the investigative team analyzed colon, ileum, stool, and blood samples from people living with chronic HIV infection and well-matched controls. Their analysis revealed a significant connection between disrupted gut microbiomes, increased intestinal permeability

(leaky gut), and faster biological aging.

Notably, they observed a connection between accelerated biological aging and the microbiomes of both the colon and ileum, but not the fecal microbiome. This suggests that the location of the microbiome significantly impacts its effects and highlights the importance of sampling intestinal tissues to accurately understand the connection between the microbiome and age.

Biological age can be measured through several advanced methods like telomere length analysis and "epigenetic clocks," such as the Hannum and Horvath clocks, which evaluate age based on DNA methylation patterns. DNA methylation, which involves methyl groups attaching to nucleotides in DNA, varies with age, and these epigenetic clocks use certain variations in methylation to estimate biological age.

The team's application of several advanced methods to measure biological age to blood and intestinal tissue samples is the first analysis of its kind in people living with HIV, and their examination of the link between the microbiome and intestinal biological age in this population is a novel exploration of chronic HIV's aging effects in the microbiome.

The work of Dr. Abdel-Mohsen and his team highlights specific bacteria and their by-products as potential accelerators of aging. These findings open new avenues for developing strategies to mitigate these bacteria and their byproducts, which could potentially enhance the duration of good health in the lives of people living with chronic conditions like chronic infections.

"More investigation is needed to fully understand the underlying causes and potential impacts of our findings," said Dr. Abdel-Mohsen.

"Moreover, there's a crucial need to create strategies to prevent intestinal

dysbiosis and gut leakiness and to determine how these strategies could affect an individual's biological age. Our work is just the beginning of an exciting journey into enhancing health and longevity."

More information: Shalini Singh et al, Distinct intestinal microbial signatures linked to accelerated systemic and intestinal biological aging, *Microbiome* (2024). DOI: 10.1186/s40168-024-01758-4

Provided by The Wistar Institute