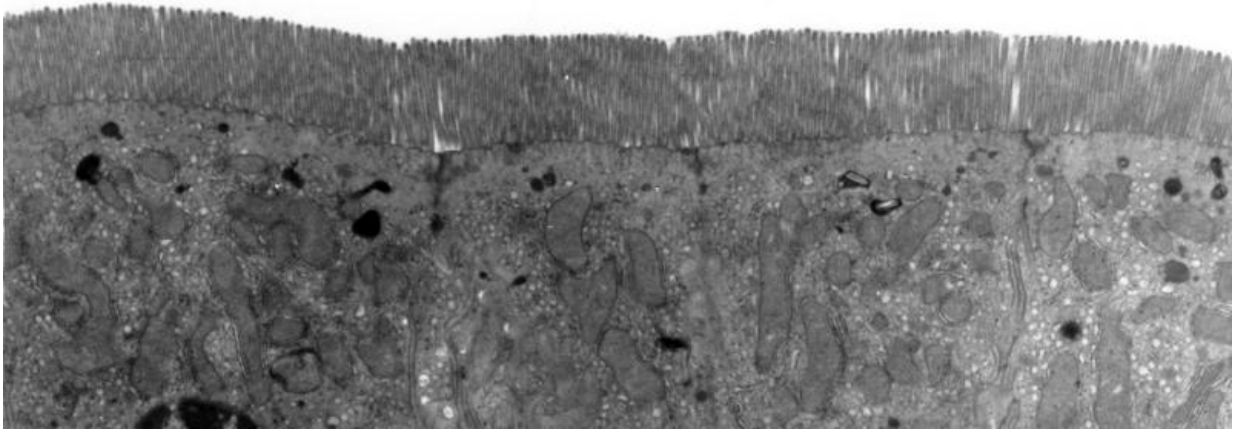


How our gut changes across the life course

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Epithelial lining of the gut. Credit: Institute of Food Research and University of Siena

Scientists and clinicians on the Norwich Research Park have carried out the first detailed study of how our intestinal tract changes as we age, and how this determines our overall health.

As well as digesting food, the [gut](#) plays a central role in programming our [immune system](#), and provides an effective barrier to bacteria that could make us ill. In particular, immune cells that line the gut work to maintain the integrity of the barrier, as well as maintaining a balance that provides a healthy environment for beneficial bacteria, but reacts to combat invasion by pathogenic microbes.

It's known that our immune system declines with age, not only making us more susceptible to infections, but also increasing our risk of other diseases, including cancer. But until now, we haven't known how changes to the gut barrier's structure and function contribute to this.

To address this, Professor Claudio Nicoletti from the Institute of Food Research and Professor Alastair Watson from IFR and the University of East Anglia's Norwich Medical School in collaboration with scientists at the University of Siena, Italy studied samples taken from healthy volunteers. They compared samples from people of different ages who visited the University Hospital, Siena and the Norfolk and Norwich University Hospital, undergoing routine endoscopy examinations. IFR is strategically funded by the Biotechnology and Biological Sciences Research Council (BBSRC).

They found that the aging gut had a characteristic increase in one specific immune system regulator called interleukin 6 (IL-6). Cells of the immune system release IL-6 to trigger inflammation. Chronic low-grade inflammation is seen to increase as we age.

"Inflammation is increasingly being seen as a key event behind ageing, and our results suggest a pivotal role for the gut in this 'inflammaging' " process said Prof. Nicoletti.

"It is vital we develop ways of controlling inflammaging as a way of preventing bowel cancer, inflammatory bowel disease, heart disease, diabetes and depression" added Professor Watson.

Further experiments showed that the increased levels of IL-6 directly lead to making the gut barrier 'leaky' to small, soluble molecules, although no physical differences in its structure were seen. And the scientists also showed that aging is associated with a reduced immune response to microbes, which might contribute to our increased

susceptibility to infection as we age.

The next steps are to work out what triggers these changes in gut permeability, immune response and IL-6. We know that the profile of microbes that colonise our guts changes as we age, and that these interact with the [gut lining](#), as well as the cells of the immune system, including the cells that release IL-6.

"Over the next few years in Norwich we shall be working on ways to prevent this breakdown of the barrier in the intestine and prevent many of the diseases of old age."

"Understanding the triggers will help us better understand what caused the changes observed in this study, and find ways of preventing them," said Prof. Nicoletti. "If the [gut bacteria](#) are implicated in this, it opens up the possibility that we can manipulate these through probiotics, as a way of keeping us healthy as we get older."

More information: Age-associated modifications of intestinal permeability and innate immunity in the human small intestine, A. L. Man, Bertelli, E. et al *Clinical Science* [DOI: 10.1042/CS20150046](https://doi.org/10.1042/CS20150046)

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