

# Gut bacteria may alter ageing process

The latest study saw Prof Pettersson and his team from Singapore, the UK and Australia transplant gut microbes from old mice (24 months old) into young, germ-free mice (six weeks old). After eight weeks, the young mice had increased intestinal growth and production of neurons in the brain, known as neurogenesis.

The team showed that the increased neurogenesis was due to an enrichment of gut microbes that produce a specific short chain fatty acid, called butyrate. The researchers then showed that giving butyrate on its own to the young germ-free mice had the same adult neurogenesis effects.

Butyrate is produced through microbial fermentation of dietary fibres in the lower intestinal tract and stimulates production of a pro-longevity hormone [/endocrinology], called FGF21, which plays an important role in regulating the body's energy and metabolism. As we age, butyrate production is reduced.

“We’ve found that microbes collected from an old mouse have the capacity to support neural growth in a younger mouse,” Prof Pettersson, from NTU’s [Lee Kong Chian School of Medicine](#)

[\[http://www.lkcmedicine.ntu.edu.sg/Pages/Home.aspx\]](http://www.lkcmedicine.ntu.edu.sg/Pages/Home.aspx). “This is a surprising and very interesting observation, especially we can mimic the neuro-stimulatory effect by using butyrate alone.

“These results will lead us to explore whether butyrate might support repair and rebuilding in situations like stroke, spinal damage and to attenuate accelerated ageing and cognitive decline.”

The team also explored the effects of gut microbe transplants from old to young mice on the functions of the digestive system.

With age, the viability of small intestinal cells is reduced; this is associated with reduced mucus production, which makes intestinal cells more vulnerable to damage and cell death. However, the addition of butyrate helps to better regulate the intestinal barrier function and reduce the risk of inflammation. The team found that mice receiving microbes from the old donor gained increases in length and width of the intestinal villi – the wall of the small intestine. In addition, both the small intestine and colon were longer in the old mice than the young germ-free mice.

The discovery shows that gut microbes can compensate and support an ageing body through positive stimulation. This points to a new potential method for tackling the negative effects of ageing by imitating the enrichment and activation of butyrate.

“We can conceive of future human studies where we would test the ability of food products with butyrate to support healthy ageing and adult neurogenesis,” Prof Pettersson said.

“In Singapore, with its strong food culture, exploring the use of food to ‘heal’ ourselves would be an intriguing next step, and the results could be important in Singapore’s quest to support healthy ageing for their silver generation.”

Commenting on the research, Dr Dario Riccardo Valenzano from the [Max Planck Institute for Biology of Ageing](#) [\[https://www.age.mpg.de/\]](https://www.age.mpg.de/) said the discovery is a milestone in research on microbiome.

“These results are exciting and raise several new open questions for both biology of ageing and microbiome research, including whether there is an active acquisition of butyrate producing microbes during mice life and whether extreme ageing leads to a loss of this fundamental microbial community, which may be eventually responsible for dysbiosis and age-related dysfunctions,” he said.

Professor Brian Kennedy, Director of the [Centre for Healthy Aging](https://www.lsi.nus.edu.sg/corp/centre-for-healthy-aging/) [\[https://www.lsi.nus.edu.sg/corp/centre-for-healthy-aging/\]](https://www.lsi.nus.edu.sg/corp/centre-for-healthy-aging/) at the [National University of Singapore](http://www.nus.edu.sg/) [\[http://www.nus.edu.sg/\]](http://www.nus.edu.sg/), added, “It is intriguing that the microbiome of an aged animal can promote youthful phenotypes in a young recipient. This suggests that the microbiota with ageing have been modified to compensate for the accumulating deficits of the host and leads to the question of whether the microbiome from a young animal would have greater or fewer effects on a young host.

“The findings move forward our understanding of the relationship between the microbiome and its host during ageing and set the stage for the development of microbiome-related interventions to promote healthy longevity.”