Designer probiotics could reduce obesity

Specially designed probiotics can modulate the physiology of host fat cells say scientists writing in *Microbiology.* The findings could lead to specialised probiotics that have a role in the prevention or treatment of conditions such as obesity.

Scientists from the Alimentary Pharmabiotic Centre (APC) at University College Cork and Teagasc, in Cork, Ireland engineered a strain of *Lactobacillus* to produce a version of a molecule called conjugated linoleic acid (CLA). When this engineered bacterial strain was fed to mice, the researchers found that the composition of the mice's fat tissue was significantly altered, demonstrating that ingesting live bacteria can influence metabolism at remote sites in the body.

CLA is a fatty acid that is produced in different versions by different bacteria. One type, called *t*10, *c*12 CLA, has been shown to be associated with decreased body fat in humans and other animals. *t*10, *c*12 CLA also has the ability to inhibit the growth of colon cancer cells and induce their death. However, this type of CLA is only produced by certain types of bacteria including *Propionibacterium acnes* – a skin bacterium that can cause acne.

In this study, an enzyme-encoding gene from *P. acnes* was transferred to the *Lactobacillus* strain allowing it to produce *t*10, *c*12 CLA. *Lactobacillus* strains are common inhabitants of the normal gut flora and are often found in probiotic products. The researchers found that the level of *t*10, *c*12 CLA in the mice's fat tissue quadrupled when they were fed this recombinant probiotic. Thus, this study demonstrates that gut microbes have an impact on host metabolism, and in particular fat composition.

Dr Catherine Stanton, from Teagasc who led the study explained the significance of the results. "CLA has already been shown to alleviate non-alcoholic fatty liver disease that often accompanies obesity. Therefore, increasing levels of CLA in the liver by ingestion of a probiotic strain is of therapeutic relevance," she said. "Furthermore, fat is not an inert layer around our bodies, it is active and proinflammatory and is a risk factor for many diseases, including cancers. The work shows that there is potential to influence this through diet-microbe-host interactions in the gut."

The same group of researchers previously found that microbially produced CLA was able to reduce the viability of colon cancer cells by 92%. "It is possible that a CLA-producing probiotic may also be able to keep colon cancer cells in check. All our findings to date demonstrate that the metabolism of gut bacteria can modulate host cell activity in ways that are beneficial to the host," explained Dr Stanton. "We need to further investigate the effects of CLA-producing bacteria on human metabolism, but our work so far certainly opens up new possibilities for the use of probiotics for improvement of human health."

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Note for Editors

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3. Dr Stanton's paper, "Recombinant lactobacilli expressing linoleic acid isomerase can modulate the fatty acid composition of host adipose tissue in mice" will be published in *Microbiology* and will appear online ahead of print on 23 December. The original paper is available on request.

4. The Society for General Microbiology is the largest microbiology society in Europe, and has 5000 members worldwide. The Society provides a common meeting ground for scientists working in research and in fields with applications in microbiology including medicine, veterinary medicine, pharmaceuticals, industry, agriculture, food, the environment and education.

5. The Society publishes four distinguished journals of international repute: *International Journal of Systematic and Evolutionary Microbiology*, *Journal of General Virology*, *Microbiology* and *Journal of Medical Microbiology* (all monthly). The journals contain high-quality research papers and topical review articles. The online versions are published with the assistance of HighWire Press, with many added features and functions to aid the reader, and can be accessed via www.sgm.ac.uk/pubs.