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Pasteurised intestinal bacterium reduces effects of obesity and diabetes

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A purified membrane protein from Akkermansia muciniphila or the pasteurized bacterium improves metabolism in obese and diabetic mice. Hubert Plovier, Amandine Everard, Céline Druart et al. Advance Online Publication on Nature Medicine's on 28 November 2016. Credit: Wageningen University

The intestinal bacterium Akkermansia proves to offer enduring benefits for the intestines of overweight mice and diabetic animals. In experiments, the strengthening effects of this bacterium on the intestinal barrier remained even after pasteurisation. This is the conclusion drawn

by researchers of the Louvain Drug Research Institute of the University of Leuven in collaboration with researchers of the Wageningen University & Research and the University of Helsinki in *Nature Medicine* on 28 November. Their results help to pave the way for treatments against diabetes and obesity, but also against cardiovascular diseases and gastroenteritis.

In experiments with obese mice, the Leuven research groups led by Patrice Cani and the Wageningen and Helsinki groups led by Willem M. De Vos were able to stop the progression of obesity and diabetes type 2 in mice. To this end, the mice were given a special treatment with the intestinal bacterium Akkermansia muciniphila discovered in Wageningen.

The Leuven group established that the living form of Akkermansia reduces the effects of obesity and diabetes. Jointly the teams were able to establish that even after pasteurisation – heating above 70 degrees Celsius – Akkermansia still stopped the diseases' progress in mice. Pasteurisation was performed in an attempt to make the bacterium inactive, but without destroying it or its characteristics. However, in its inactive state the bacterium continued to effectively combat the diseases. "This came as a complete surprise," says Willem de Vos. "Even more surprising was the fact that the bacterium was partially more active after pasteurisation: not only reducing obesity and diabetes, but preventing these diseases from developing in the first place."

Obesity and diabetes

Akkermansia's effectiveness derives primarily from its inhibiting effect on intestinal inflammation, such as colitis or chronic irritable bowel syndrome.

The intestinal bacterium is currently being tested in Brussels on its

applicability for patients suffering from obesity and diabetes. The results are still expected, but the first clinical trial on the safety of administering the intestinal bacterium in inactivated form is positive.

The team discovered that the unexpected effect of the pasteurised Akkermansia bacterium is due to a protein in the external membrane of the bacterium, which was investigated in the Wageningen team by Dr Noora Ottman and Dr Clara Belzer. This protein – Amuc_1100* – remained functional after heating. Pasteurisation did inactivate the bacterium as a whole, but not the functional membrane protein that turns out to be responsible for the beneficial effect in mice. Isolating this protein makes it possible to develop a drug in concentrated form that could also be used in therapies against intestinal inflammation as a result of stress, alcoholism, liver disease and cancer.

The researchers have applied for a number of patents on their findings. In addition, a spin-off company is being developed to scale up production of both the Akkermansia bacterium and the protein.

More information: Hubert Plovier et al. A purified membrane protein from Akkermansia muciniphila or the pasteurized bacterium improves metabolism in obese and diabetic mice, *Nature Medicine* (2016). DOI: 10.1038/nm.4236

Provided by Wageningen University

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