MedicalXpress

Body weight heavily influenced by microbes in the gut, finds twin study

November 6 2014

Our genetic makeup influences whether we are fat or thin by shaping which types of microbes thrive in our body, according to a study by researchers at King's College London and Cornell University.

By studying pairs of twins at King's Department of Twin Research, researchers identified a specific, little known bacterial family that is highly heritable and more common in individuals with low body weight. This microbe also protected against weight gain when transplanted into mice.

The results, published today in the journal *Cell*, could pave the way for personalised probiotic therapies that are optimised to reduce the risk of obesity-related diseases based on an individual's genetic make-up.

Previous research has linked both genetic variation and the composition of gut microbes to metabolic disease and obesity. Despite these shared effects, the relationship between human genetic variation and the diversity of gut microbes was presumed to be negligible.

In the study, funded by National Institutes of Health (NIH), researchers sequenced the genes of microbes found in more than 1,000 fecal samples from 416 pairs of twins. The abundances of specific types of microbes were found to be more similar in identical twins, who share 100 per cent of their genes, than in non-identical twins, who share on average only half of the genes that vary between people. These findings demonstrate that genes influence the composition of gut microbes.

The type of bacteria whose abundance was most heavily influenced by host genetics was a recently identified family called 'Christensenellaceae'. Members of this health-promoting bacterial family were more abundant in individuals with a low body weight than in obese individuals. Moreover, mice that were treated with this microbe gained less weight than untreated mice, suggesting that increasing the amounts of this microbe may help to prevent or reduce obesity.

Professor Tim Spector, Head of the Department of Twin Research and Genetic Epidemiology at King's College London, said: 'Our findings show that specific groups of microbes living in our gut could be protective against obesity – and that their abundance is influenced by our genes. The human microbiome represents an exciting new target for dietary changes and treatments aimed at combating obesity.

'Twins have been incredibly valuable in uncovering these links – but we now want to promote the use of microbiome testing more widely in the UK through the British Gut Project. This is a crowd-sourcing experiment that allows anyone with an interest in their diet and health to have their personal microbes tested genetically using a simple postal kit and a small donation via our website. We want thousands to join up so we can continue to make major discoveries about the links between our gut and our health.'

Ruth Ley, Associate Professor at Cornell University in the United States, said: 'Up until now, variation in the abundances of gut microbes has been explained by diet, the environment, lifestyle, and health. This is the first study to firmly establish that certain types of gut microbes are heritable—that their variation across a population is in part due to host genotype variation, not just environmental influences. These results will also help us find new predictors of disease and aid prevention.'

More information: *Cell*, Goodrich et al.: "Human genetics shape the

gut microbiome." www.cell.com/cell/abstract/S0092-8674(14)01241-0

Provided by King's College London