MedicalXpress

Obesity may be linked to microorganisms living in the gut, study says

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How much a person eats may be only one of many factors that determines weight gain. A recent Cedars-Sinai study suggests that a breath test profile of microorganisms inhabiting the gut may be able to tell doctors how susceptible a person is to developing obesity.

The study, published online Thursday by The Endocrine Society's *Journal of Clinical Endocrinology & Metabolism*, shows that people whose breath has high concentrations of both hydrogen and methane gasses are more likely to have a higher body mass index and higher percentage of body fat.

"This is the first large-scale human study to show an association between gas production and body weight – and this could prove to be another important factor in understanding one of the many causes of obesity", said lead author Ruchi Mathur, MD, director of the Diabetes Outpatient Treatment and Education Center in the Division of Endocrinology at Cedars-Sinai.

The study, which will also appear in JCEM's April 2013 issue, analyzed the breath content of 792 people. Based on the breath tests, four patterns emerged. The subjects either had normal breath content, higher concentrations of methane, higher levels of hydrogen, or higher levels of both gases. Those who tested positive for high concentrations of both gases had significantly higher body mass indexes and higher percentages of body fat.

The presence of methane is associated with a microorganism called *Methanobrevibacter smithii*. This organism is responsible for the majority of methane production in the human host.

"Usually, the microorganisms living in the digestive tract benefit us by helping convert food into energy. However, when this particular organism– *M. smithii* – becomes overabundant, it may alter this balance in a way that causes someone to be more likely to gain weight," Mathur said.

These organisms scavenge hydrogen from other microbes and use it to produce methane – which is eventually exhaled by the host. Researchers theorize this interaction helps neighboring hydrogen-producing bacteria thrive and extract nutrients from food more efficiently. Over time, this may contribute to weight gain.

"Essentially, it could allow a person to harvest more calories from their food," Mathur said.

In an ongoing study funded by the American Diabetes Association, Mathur is working to confirm the link between *M. smithii*, obesity and pre-diabetic conditions by determining how efficiently people digest food before and after eliminating the microorganism with a targeted dose of antibiotic. Participants who have evidence of methane on their breath are given a standard diet over three days, undergo an oral glucose challenge, and swallow a "smart pill" to track how fast the food moves through their bodies. In addition, their stool is collected and sent for calorie analysis allowing researchers to determine how many calories are being harvested during digestion. Participants then repeat the same tests after taking the antibiotic regimen to see if elimination of the organism results in measureable changes.

"This should let us know just how energy balance is affected by *M.*

smthii," Mathur said, "We're only beginning to understand the incredibly complex communities that live inside of us. If we can understand how they affect our metabolism, we may be able to work with these microscopic communities to positively impact our health."

More information: The article, "Methane and Hydrogen Positivity on Breath Test is Associated with Greater Body Mass Index and Body Fat," appears in the April 2013 issue of *JCEM*.

Provided by Cedars-Sinai Medical Center