

Does a bug in our gut make us fat?

The obese have higher levels of bacteria that free up more calories.

By Thomas H. Maugh II
Times Staff Writer

December 21, 2006

Obese people have higher levels of unusually efficient bacteria in their guts than lean people do, offering a possible explanation for why they get fat, researchers reported today.

Humans need bacteria in their guts to help convert otherwise indigestible foods into a form that is digestible, and the bacteria in obese people are better at the process, a team from Washington University in St. Louis reported in two papers published in the journal Nature.

In effect, obese people obtain more energy than lean people do from the same amount of food, and those extra calories are deposited on their waists.

The same disparity was found in mice, and giving lean mice the bacteria from fat animals caused them to gain weight, the researchers said.

If the findings hold up, they could lead to new ways to induce weight loss or to prevent weight gain from happening in the first place.

"This is a potentially revolutionary idea that could change our views of what causes obesity and how we depend on the bacteria that inhabit our gut," wrote Matej Bajzer and Randy J. Seeley of the University of Cincinnati in an accompanying editorial. "But a great deal remains poorly understood."

Experts cautioned that it was too soon to manipulate gut bacteria in the hopes of becoming slimmer.

The proliferation of the efficient bacteria may be the result of obesity and not its cause, said Dr. Richard Atkinson of the Obetech Obesity Research Center in Richmond, Va., who was not involved in the research.

"If they are right, this could really be a significant advance," he said. "But I am not sure they are interpreting their data right. Correlation is not causation."

Neurobiologist Hans-Rudolf Berthoud of Louisiana State University's Pennington Biomedical Research Center in Baton Rouge, who was not involved in the research, agreed.

"This doesn't show that the bacteria cause obesity, absolutely not," he said.

More likely, he said, is that hormonal changes in the gut caused by weight loss alter the distribution of bacteria.

"I am a strong believer that the obesity crisis is caused by the rapid changes in environment and lifestyle," Berthoud said. "This is another excuse you give people to get obese, and that is really the wrong signal to send."

An estimated 65% of American adults are overweight, and half of those are considered obese. The

proportion of children who are overweight has gone from 7% to 15% over the last 20 years, and the proportion of overweight adolescents has risen from 5% to almost 16%.

Most experts attribute those increases to growing consumption of fast food and less exercise. And scientists have been stymied in finding an easy way to slim down waistlines.

Human intestines contain trillions of bacteria, perhaps 10 of them for every cell in the body. Almost 90% of the bacteria fall into two major divisions, or phyla: the Firmicutes and the Bacteroidetes.

Dr. Jeffrey Gordon and his colleagues at Washington University had previously shown that obese mice had a higher proportion of Firmicutes and correspondingly smaller proportion of Bacteroidetes than their lean littermates.

In one of the two papers, Gordon and graduate student Peter Turnbaugh analyzed the genes in the two phyla of bacteria. They concluded the Firmicutes were more efficient at digesting food that the body can't, such as the complex sugars in grains, fruits and vegetables, breaking them down into simple sugars that can be used by the body.

They then took young mice that had been raised in a sterile environment and transferred in bacterial communities from either obese or lean adult mice.

The mice that received the bacteria from obese adults gained significantly more weight than those that received bacteria from the lean animals.

In the second study, Gordon and microbial ecologist Ruth Ley studied 12 obese people who lost weight over the course of a year.

They reported that the proportions of bacteria in their digestive system — initially similar to that of the obese mice — changed as the subjects lost weight, with the number of Firmicutes decreasing and the number of Bacteroidetes increasing.

The results raise many questions, Gordon said: "Are some adults predisposed to obesity because they start out with fewer Bacteroidetes and more Firmicutes in their guts? Can we intentionally manipulate our gut microbial communities in safe and beneficial ways to regulate energy balance?"

Atkinson questioned whether the small difference in efficiency between the two types of bacteria was sufficient to explain weight gain.

Gordon thinks they are.

"The differences don't have to be great, but over the course of a year, the effects can add up," he said.

The two studies were funded by the National Institutes of Health and the W.M. Keck Foundation.