

# Brain enzyme may play key role in controlling appetite and weight gain

December 12 2008

---



Researchers at Albert Einstein College of Medicine of Yeshiva University have found that overactivity of a brain enzyme may play a role in preventing weight gain and obesity. The findings were reported in *Cell Metabolism*.

To understand what drives hunger and causes metabolic disease, many scientists have focused on the hypothalamus, an almond-sized structure located deep within the brain that controls body temperature, hunger, and thirst. Specialized nerve cells in the hypothalamus sense whether the body contains adequate amounts of nutrients and stored body fat. The cells then send out signals telling other parts of the brain to adjust food intake, metabolic rates, and physical activity accordingly — keeping the

body's caloric intake in balance with calories burned.

To learn more about these nutrient-sensing pathways and how they go awry in metabolic disorders, researchers at Einstein focused on an enzyme called p70 S6 Kinase 1, or S6K, which plays a role in regulating the growth and proliferation of all cells, including nerve cells.

"It turns out that this enzyme, and the pathway it regulates, is nutrient sensitive — that is, S6K activity increases in the presence of carbohydrates and protein," says the study's principal investigator, Gary J. Schwartz, Ph.D., professor of medicine and neuroscience at Einstein. "This led us to believe that S6K might not only be involved in maintaining the structure and function of individual cells, but also in regulating the energy balance of the whole body."

To test this hypothesis, the researchers injected rats with special viruses that selectively raise or lower S6K activity. The viruses were injected directly into the lower-middle, or mediobasal, portion of the hypothalamus, an area rich in nutrient-sensing nerve cells.

"When we raised the activity of the enzyme, we saw reductions in food intake, in body weight, and in production of peptides [small chains of amino acids] that normally stimulate feeding," says Dr. Schwartz. "When we lowered S6K activity, we saw essentially the opposite response."

The way increased S6K activity reduced the rats' food intake is important, says Dr. Schwartz: reducing the average size of meals rather than changing the number of meals over the course of a day. So the animals apparently were sated faster and therefore ate less at every meal.

In another experiment, the researchers tested whether increased S6K activity would protect against the natural tendency of mammals on a high-fat diet to overeat. People deal with all those calories by putting on extra

weight and becoming insensitive to insulin — two of the hallmarks of metabolic syndrome, a group of risk factors that raise the risk of heart disease and type 2 diabetes.

When animals on a high-fat diet were given the S6K-enhancing virus, they overate less and gained weight more slowly than control animals, the researchers report. In addition, the virus-enhanced animals had lower body-fat levels and better glucose tolerance than the control group.

Overall, the study shows that S6K acts as a kind of food-sensing thermostat in mammals, increasing or decreasing feeding behavior and metabolism to maintain a normal energy balance. "These findings show that it may be possible to control obesity and other human metabolic disorders by developing drugs that regulate S6K activity," says Dr. Schwartz.

Source: Albert Einstein College of Medicine

Citation: Brain enzyme may play key role in controlling appetite and weight gain (2008, December 12) retrieved 26 April 2024 from <https://phys.org/news/2008-12-brain-enzyme-key-role-appetite.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.