

Study shows overeating impairs brain insulin function, can lead to diabetes and obesity

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New research from Mount Sinai School of Medicine sheds light on how overeating can cause a malfunction in brain insulin signaling, and lead to obesity and diabetes. Christoph Buettner, MD, PhD, Associate Professor of Medicine (Endocrinology, Diabetes and Bone Disease) and his research team found that overeating impairs the ability of brain insulin to suppress the breakdown of fat in adipose tissue.

In previous research Dr. Buettner's team established that brain insulin is what suppresses lipolysis, a process during which triglycerides in fat tissue are broken down and fatty acids are released. When lipolysis is unrestrained, fatty acid levels are elevated, which can initiate and worsen obesity and type 2 diabetes. The current study is published online in [The Journal of Biological Chemistry](#). The first study was published in the February 2, 2011 issue of [Cell Metabolism](#).

"We are interested in understanding why people who eat too much eventually develop diabetes. Our recent studies suggest that once you overeat, your brain develops insulin resistance. Since brain insulin controls lipolysis in adipose tissue by reducing [sympathetic nervous system](#) outflow to adipose tissue, brain insulin resistance causes increased spillage of fatty acids from adipose tissue into the blood stream," said Dr. Buettner.

Increased fatty acids induce inflammation and that, in turn, can further worsen insulin resistance, which is the core defect in type 2 diabetes. Fatty acids also increase [glucose production](#) in the liver which raises

[blood glucose levels](#), Dr. Buettner explained. "It's a vicious cycle and while we knew that this can begin with overeating, this study shows that it is really the brain that is harmed first which then starts the downward spiral."

In this study, researchers fed rats a high-fat diet comprised of 10 percent lard for three consecutive days. This increased their daily caloric intake by up to 50 percent compared to the control rats that were fed a regular [low fat diet](#). The researchers then infused a tiny amount of insulin into the brains of both groups of rats that they had shown in earlier studies to suppress release of glucose from the liver and [fatty acids](#) from fat tissue. They found that overeating impaired the ability of brain insulin to suppress glucose release from the liver and lipolysis in fat tissue. Similarly, short-term overeating in humans is known to produce comparable insulin resistance which could be explained by brain insulin resistance.

"When you overeat, your brain becomes unresponsive to these important clues such as insulin, which puts you on the road to diabetes. We believe that what happens in rats also happens in humans" said Dr. Buettner.

Dr. Buettner's team plans to investigate methods of improving brain insulin function that could restrain lipolysis and improve [insulin resistance](#).

Provided by The Mount Sinai Hospital

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