Overeating caused by a hormone deficiency in brain?

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If you find yourself downing that extra piece of chocolate fudge cake even though you're not hungry, it might be the absence of a hormone in your brain that's causing you to overeat purely for pleasure.

In a new Rutgers Robert Wood Johnson Medical School study published in *Cell Reports*, researchers found that when the hormone glucagon like peptide-1 (GLP-1) was reduced in the central nervous system of laboratory mice, they overate and consumed more high fat food.

"The mice in which the GLP-1 deficiency was induced ate beyond the need for calories and showed an increase preference for high fat food," says Vincent Mirabella, a medical school and doctoral student who co-authored the study. "Conversely when we enhanced GLP-1 signaling in the brains of mice we were able to block the preference of high fat foods."

GLP-1 peptides are small sequences of amino acids that have many functions, including how our bodies regulate eating behaviors. They are secreted from cells in both the small intestine and the brain and are supposed to let our brain know when we are satisfied and should put down the fork.

Rutgers scientists say it has been unclear how the GLP-1 released in the brain contributes to appetite regulation. Although this is not the only reason why people overeat, the study provides new evidence that targeting neurons in the mesolimbic dopamine system -a reward circuit

in the brain - rather than targeting the whole body might be a better way to control overeating and obesity with fewer side effects.

In the study, the authors found that activating the GLP-1 hormone in the mesolimbic system hindered communication between neurons which communicate to control reward behaviors, including eating. The result was that mice consumed less food altogether and, more important, lost the preference for high fat food.

"These are the same areas of the brain that controls other addictive behaviors like drug and alcohol abuse and nicotine addiction," says senior-author and assistant professor Zhiping Pang. "We believe that our work has broad implications in understanding how GLP-1 functions to influence motivational behaviors."

Pang says why we eat, how much we eat and when we stop eating are behaviors controlled by the central nervous system which enables the body to respond to its environment. This is why it is important to understand the motivation behind hedonic hunger - the drive to eat for pleasure instead of to gain energy. The physiological and motivational factors will provide a better understanding of modern eating habits, why a dysfunction may occur and could lead to more targeted therapies, he says.

Effective therapies for treating obesity are very limited. A drug that mimics the GLP-1 hormone - used first to improve glucose tolerance for those with type 2 diabetes - and recently approved by the U.S. Food and Drug Administration is now being used as a treatment for obesity. The injectable medication that targets the whole body, however, can possibly cause serious side effects including pancreatitis, gallbladder disease and kidney problems.

"Over eating, which causes obesity, can be considered a food addiction,

a neuropsychiatric disorder," Pang says. By finding out how the central nervous system regulates food intake behavior via GLP-1 signaling, we may be able to provide more targeted therapy with fewer side effects."

Provided by Rutgers University