

After a sip of milkshake, genes and brain activity predict weight gain

May 20 2015, by Bill Hathaway



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The way the brain responds while sipping a delicious milkshake can predict who will gain weight and who will not—but only if the individual has just eaten and has a certain genetic profile, a new brain imaging study by Yale School of Medicine researchers show.

The new study published May 19 in the journal *Neuroscience* illustrates that it is the way the brain responds to food cues when individuals are not hungry that predicts [weight gain](#) and that the reasons why people gain weight can be fundamentally different.

"What this study shows is that different neural circuits confer susceptibility for weight gain depending upon an individual's [genotype](#)," said Dana Small, professor of psychiatry and psychology, deputy director of The John B Pierce Laboratory, and senior author of the study. "The implication is that we might start thinking about taking more of an individual approach for the prevention and treatment of obesity."

When subjects are hungry, the hypothalamus, the master homeostatic regulator that initiates eating, sends signals to amygdala, part of the brain crucial in processing stimuli. But this network reversed when subjects were fed a meal before sipping the milkshake, researchers found. When fully fed, the amygdala signaled the hypothalamus.

This was true in all subjects, but researchers found the strength of the amygdala response predicted whether the subjects would [gain weight](#)—but only for the two-thirds of the subjects who possessed a genotype associated with high numbers of receptors for dopamine, a neurotransmitter involved in responses to reward. And this prediction held only for fully-fed [subjects](#).

Small said that about one-third of the population possesses a second genetic variant associated with fewer dopamine receptors. In these individuals it is response in the dorsal striatum, a region critical for forming habits, that predicts weight gain. People with this genotype are also more prone to addiction and impulsive behavior, she said.

Provided by Yale University

Citation: After a sip of milkshake, genes and brain activity predict weight gain (2015, May 20)
retrieved 9 April 2024 from
<https://medicalxpress.com/news/2015-05-milkshake-genes-brain-weight-gain.html>

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