

Researchers tie genes, lower reward response to weight gain

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The brains of obese people seem to respond to a tasty treat with less vigor than the brains of their leaner peers, suggesting obese people may overeat to compensate for a reduced reward response, according to a new brain imaging and genetics study conducted by researchers at Yale University, The John B. Pierce Laboratory, the University of Texas and Oregon Research Institute.

Published in the journal *Science*, the study showed that a blunted response to food in the reward centers of the brain, which was more pronounced in subjects with a particular genetic variant, helped predict which young women from the study would gain weight.

"The study is novel because it is the first to use brain response to food to try to predict future weight gain," said Dana Small, associate professor at Yale and associate fellow, The John B. Pierce Laboratory. "Individual differences in how the brain processes food reward have been postulated to play a role explaining why some, but not all, people are gaining weight in an environment where calories are plentiful. Our finding is exciting because it supports this possibility by demonstrating an association between an abnormal response to food and future weight gain - and it shows that this relationship depends upon your genetic make-up."

Twin studies have shown that genetics play a major role in obesity but few prospective studies have shown which biological factors put people at most risk of gaining weight. The researchers in the *Science* study used functional magnetic resonance imaging to measure brain response in

college-aged women and adolescent girls as they drank a chocolate milkshake.

Women with a higher body mass showed a much less robust response in the dorsal striatum part of the brain when drinking the milkshake than their leaner peers. And after a year, women with the blunt response to the milkshake gained more weight than women with a stronger response to the milkshake – if they possessed a genetic variant linked to the neurotransmitter dopamine.

The researchers focused on a variant of the Taq1A1 gene, which is associated with increased body mass as well as a reduction of dopamine signaling in the dorsal striatum. The blunted response to tasty food was particularly pronounced in women with the variant. In addition, women with the variant were much more likely to gain weight after a year.

Prior work had shown that obese people tend to have fewer dopamine receptors in the brain and suggested that they overeat to compensate for this reward deficit. The current findings are consistent with the theory that the blunted response to food represents a vulnerability factor for obesity but it does not conclusively rule out the possibility that the finding reflects an adaptation to over-eating, Small cautioned.

Source: Yale University

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