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Society for the Study of Ingestive Behavior

Blood sugar levels closely linked to how our brains respond to the sight of food, twin study finds

7/29/2014, Seattle, WA. Our brain's response to the sight of food appears to be driven more by how low our blood sugar level is at the moment than our upbringing or genetics, researchers said at the annual meeting of the Society for the Study of Ingestive Behavior. "The finding suggest our brains have a way to override our genetic inheritance, upbringing and habits to respond to our immediate nutritional needs," said Dr. Ellen Schur, associate professor of medicine at the University of Washington.

In the study, Schur and UW Medicine colleagues at Harborview Medical Center, used brain scans to compare how appetite centers in the brains of identical twins responded to images of high- and low-calorie foods. The scans, called functional magnetic resonance imagers (fMRI), detect differences in the activity in different brain centers by measuring changes in blood flow

Studies of identical twins have shown that genetics and upbringing play a major role in a person's body weight regulation. In this study, the researchers wanted to determine what role inherited similarities in brain function had on appetite. In the study, the researchers hypothesized that because identical twins have nearly identical genetic inheritance their brain appetite centers would react similarly when the twins were shown the images of high- and low-calorie foods. To test their hypothesis, the researchers enrolled 21 pairs of identical (monozygotic) twins who had been raised together. The twins were first fed a standardized breakfast, and 3.5 hours later they underwent a baseline fMRI brain scan.

After the first scan, they were fed a filling meal of macaroni and cheese, calibrated to satiate their appetites. The twins then had a second fMRI during which they were shown photographs of non-fattening foods, such as fruits and vegetables, and fattening foods, such as pizza and french fries.

Changes in blood flow measured by the fMRI were used to assess how the activity of key appetite-regulating centers in their brains changed in response to the images. Afterwards, the twins were offered to eat what they would like from a buffet. How much they ate from the buffet was recorded.

At regular intervals during the experiment the twins were asked to rate their feelings of hunger, fullness and satisfaction, using a standardized scale, and blood samples were taken to measure blood glucose levels and levels of regulatory hormones, such as insulin, leptin and ghrelin.

The researchers found the twin pairs gave similar responses when asked to rate their appetite before and after meals, had similar hormonal responses, and even ate similar amounts from the buffet — findings that suggest these responses were influenced by their shared upbringing and genetics. That did not seem to be the case with brain activation in response to the food images, however, when response tended to be greater in the twin with lower blood glucose levels.

The findings suggest that while genetics and upbringing play a big role in how much we weigh and how much we normally eat, our immediate response to food in the environment is driven by our bodies need for nutrition at the time, Schur said. "Just looking at pictures of high-calorie foods when we are hungry strongly engages parts of the brain that motivate us to eat." The study's findings might help explain why eating regular meals helps people keep their weight under control, she said.

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