MedicalXpress

Genes may make some people more motivated to eat, perhaps overeat

October 15 2007

Science has found one likely contributor to the way that some folks eat to live and others live to eat. Researchers at the University at Buffalo, The State University of New York, have found that people with genetically lower dopamine, a neurotransmitter that helps make behaviors and substances more rewarding, find food to be more reinforcing than people without that genotype. In short, they are more motivated to eat and they eat more.

The findings appear in the October issue of *Behavioral Neuroscience*, which is published by the American Psychological Association (APA). Insights into genes and eating could inspire custom-tailored treatment programs for obesity, perhaps including genetically targeted drugs.

Led by Leonard Epstein, PhD, a distinguished professor of pediatrics and social and preventive medicine at the university's medical school, the team brought 29 obese adults and 45 adults who were not obese into the lab for a controlled study of the relationships among genotype, motivation to eat and caloric consumption.

Epstein's team was particularly interested in the influence of the Taq1 A1 allele, a genetic variation linked to a lower number of dopamine D2 receptors and carried by about half the population (most of which carries one A1 and one A2; carriers of two A1 alleles are rare). The other half of the population carries two copies of A2, which by fostering more dopamine D2 receptors may make it easier to experience reward. People with fewer receptors need to consume more of a rewarding substance

(such as drugs or food) to get that same effect.

Epstein differentiates reinforcing value, defined by how hard someone will work for food, from the “feel good” pleasure people get from food, saying, “They often go together, but are not the same thing.”

Researchers measured participants’ body mass, swabbed DNA samples from inside their cheeks, and had them fill out eating questionnaires. There were two behavioral tasks.

In the first task, participants rated various foods – from chips to candy bars – for taste and personal preference. This apparent preference test disguised a task that measured how much participants ate when food was freely available.

In the second task, participants could swivel between two computer stations. Pressing specified keys on one earned points to eat their favorite food; pressing keys on the other earned points to read a newspaper.

The resulting behavioral measures included calories consumed as energy in kilocalories, reflecting both amount and caloric density, and time spent earning food instead of the opportunity to read the news.

Both obesity and the genotype associated with fewer dopamine D2 receptors predicted a significantly stronger response to food’s reinforcing power. Perhaps not surprisingly, participants with that high level of food reinforcement consumed more calories.

The results also revealed a three-rung ladder of consumption, with people who don’t find food that reinforcing, regardless of genotype, on the lowest rung. On the middle rung are people high in food reinforcement without the A1 allele. Atop the ladder are people high in

food reinforcement with the allele, a potent combination that may put them at higher risk for obesity.

The reinforcing value of food, which may be influenced by dopamine genotypes, appeared to be a significantly stronger predictor of consumption than self-reported liking of the favorite food. What's more, obese participants clearly found food to be more reinforcing than non-obese participants. The authors conclude that, "Food is a powerful reinforcer that can be as reinforcing as drugs of abuse."

Researchers still view reinforcement as one of several factors that motivate eating behavior, but the present study highlights the genetic contribution and role of reinforcement. In theory, people producing less dopamine may, as a result, require more food to reach a certain state of reward or reinforcement that might be reached quicker, after less consumption, by those with a different genotype.

Findings such as these can help obesity experts to pinpoint people at greater risk for obesity and to develop treatments tailored to specific risk factors. "Behavior and biology interact and influence each other," says Epstein. "The genotype does not cause obesity; it is one of many factors that may contribute to it. I think the factors that make up eating behavior are in part genetic and in part learning history."

He and his colleagues speculate that, as with other public-health campaigns, it may be better to focus behavior change efforts on those at high risk. "A strategy for someone who is high in food reinforcement would be very different from the strategy for someone who is low in food reinforcement but higher in activity reinforcement," they wrote. Using overweight men, the group has already found that chemically manipulating dopamine levels alters eating behavior, a finding highly suggestive for pharmaceutical intervention.

Source: American Psychological Association