

Milkshake like cocaine for overeaters: Imaging shows the powerful impact food has on the brain

September 30 2010, By Devin Powell, ISNS



Gaining weight decreases the pleasure that people feel when they eat sugary and fatty foods. Credit: ISNS /NISA /ebruli via flickr

Millions of overweight Americans consider food the enemy. And according to new research, this enemy plays devious mind games.

The same changes in [brain chemistry](#) that push [drug users](#) to snort cocaine or shoot up heroin may also drive overeaters to consume more calories than their bodies need. Gaining weight decreases the pleasure that we get from sugary and [fatty foods](#). Eat a diet rich in these types of food, and one day you might need two pieces of cake to get the same enjoyment once provided by a single piece.

"Just as [drug addicts](#) use more to chase their original high, [obese individuals](#) may need to eat more food to compensate for these changes," said Cara Bohon, a postdoctoral scholar at the University of California, Los Angeles.

Cravings for calorie-dense foods start with the tongue, which is coated with tiny taste receptors built to respond to these foods. Thousands of years ago, sugars and fats helped to keep our ancestors from starving. Compared to the fruits and meats we once ate in the wild, though, today's processed foods are more densely packed with sugars and fats, providing more than evolution may have prepared us for.

But the power of unhealthy food doesn't stop at our sense of taste. Genetically-modified rats that lack the [taste receptors](#) for sweetness still prefer sugar to other foods.

The brain behind the tongue is often to blame.

In a new study published Sept. 29 in the [Journal of Neuroscience](#) , Bohon fed milkshakes to a group of overweight women and monitored their brains' response to the combination of Häagen Dazs ice cream and Hershey's chocolate syrup. She used functional magnetic resonance imaging, or fMRI, to measure changes in brain blood flow and found that the sugary treat stimulated activity in the striatum. The striatum, located deep inside the brain, is a primitive mass of brain cells that, among other things, release feelings of pleasure when we eat foods we like.

Six months later, the women returned and repeated the experience. Some had gained a few pounds. The more weight they had gained during those months, the less their brains responded to the second milkshake, as compared to the first.

Previously, Bohon and her colleague Eric Stice at the Oregon Research Institute in Eugene had found that the brains of obese people tend to respond to milkshakes with less pleasure than the brains of lean people. They now believe that the food itself, or the weight gain it causes, may be causing this brain over time.

"The lesson here is that you have to change your behavior early," said Bohon. "The longer you wait, the harder it will be."

Calorie-dense food has been shown to have a similar effect on other animals. Feed a laboratory rat sugary food for a few months, and its brain will be less able to respond to dopamine -- a neurotransmitter in the striatum that motivates us with feelings of pleasure.

Problems with dopamine processing have also been spotted in the brains of obese people -- and also in people who use cocaine, heroin, alcohol, and methamphetamines as well.

"The people are driving a Mustang, going fast, pushing their accelerators," said Gene-Jack Wang, a neuroscientist who studies obesity at Brookhaven National Laboratory in Upton, N.Y. "But they've lost their brakes."

Many Paths To Obesity

As dopamine emerges as a target for treating obesity, though, researchers are quick to point out that the health problem has no one single solution. There are many different paths to obesity and many differences between individuals.

For some people, obesity is as simple as a single broken gene. In the 1990s, researchers discovered that children whose bodies do not produce leptin -- a hormone that helps the body's metabolic systems to balance

the amount of energy consumed and burned -- become obese. Leptin treatment can help these children, but does little to help people without this genetic problem lose weight.

In the population at large, other genetic factors have begun to crop up.

In 2008, Stice found that a particular form of the TaqIA1 gene tends to exaggerate the brain differences between heavy and lean people. The genetic variant doesn't guarantee obesity, but it increases the risk for someone who spends a lot of time around unhealthy food.

Long-term stress may also contribute to overeating. At the University of California, San Francisco, comfort foods high in sugars and fat -- the pint ice cream at midnight -- reduced the levels of stress hormones circulating in the blood of rats.

In light of these new findings, some scientists now argue that overeating should be considered an addiction. A controversy has erupted in the pages of academic journals about whether it should be included in the handbook that psychologists use to make their diagnoses.

"Whether you call it addiction or not, eating can certainly become compulsive," said Paul Kenny of the Scripps Research Institute in Jupiter, Fla. "There are so many people that are overweight, so many people that wish they could control their eating."

The United States is one of the fattest countries in the world: nearly 30 percent of Americans are obese, according to one report, and that number is growing. Everyone agrees that turning this trend around is going to be challenging.

Just ask a lab rat. When given a choice between cocaine and sugar, it will go for sugar every time.

Source: Inside Science News Service

Citation: Milkshake like cocaine for overeaters: Imaging shows the powerful impact food has on the brain (2010, September 30) retrieved 26 April 2024 from <https://medicalxpress.com/news/2010-09-milkshake-cocaine-overeaters-imaging-powerful.html>

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