

Had Enough?

The connection between the brain and stomach in overeaters

By Arin Greenwood

Back when our ancestors lived in caves and did other primitive sorts of things, getting a meal wasn't easy. You'd have to chase down or trap an animal to eat meat, or you'd have to do something that required both ingenuity and energy.

Today? "Instead of going and chasing a chicken, you just open your refrigerator and there's fried chicken," says Gene-Jack Wang, MD, chair of the medical department at the U.S. Department of Energy's Brookhaven National Laboratory. "That's why there is so much obesity. Obesity is a modern problem."

Wang studies, among other things, the connections between overeating, neuroscience and addiction. "We want to understand how the gut communicates with the brain," he says.

One of Wang's recent studies involved recruiting seven obese people whose body mass index was higher than 30 and who had been implanted with a gastric stimulator – a pacemaker-like device – to see what effect the gastric stimulator, an appetite-depressant, had on the subjects' brains.

The gastric stimulators sent a low level of electricity into the subjects' vagus nerve, a cranial nerve that runs from the brainstem to the abdomen. The gastric stimulator caused the stomach to expand, which, in turn, caused the vagus nerve to send a "full" signal to the brain.

Wang and his colleagues took a fluorodeoxyglucose (FDG)-PET scan of his subjects' brains twice in two weeks. One scan looked at the subjects' brains after the vagus nerve was stimulated, and the other scan looked at the subjects' brains without the vagus nerve being stimulated.

The point of this test was to see what part of the brain receives the "full" signal. "This gave us the opportunity to understand what happens when a person is full," says Wang. "What is the signal and where does it go?"

You might think that the part of the brain regulating metabolism – the hypothalamus – would be most stimulated by the "full" signal. But, you'd be wrong.

Rather, the parts of the brain most affected by the "full" signal are, it turns out, the same parts of the brain that control drug cravings in drug addicts: the striatum, the orbitofrontal cortex and the hippocampus – all parts of the brain connected with the body's limbic system. The hippocampus, however, is related to emotion, learning and memory.

The striatum and the orbitofrontal cortex are part of the dopamine system. A neurotransmitter implicated in habit-formation, dopamine produces a feeling of pleasure from things like sex and drugs – and, it seems, food.

In other words, says Wang, obese people seem to be addicted to food the way that drug addicts are addicted to drugs.

Addicted to Food

People who become addicted to drugs are frequently people whose brains don't produce enough dopamine, or who have too few dopamine receptors (the part of the brain that absorbs dopamine), or whose dopamine receptors are not very sensitive.

Any of these conditions make a person's brain dopamine-deficient. And when a person's brain is dopamine-deficient, he or she can feel fatigued and depressed.

Some drugs can help the brain produce more dopamine (or absorb it less quickly, or be more sensitive to it), which can alleviate fatigue and depression. The brain learns to associate drugs with increased dopamine, and habits form.

Wang says that obese people may have similarly low levels of dopamine. But instead of turning to drugs, obese people turn to food to relieve fatigue and depression. And "if the person keeps eating to release this depression," says Wang, "Then it becomes part of their habituation. They can't stop."

Patterns in Eating

You can look at overeating from other perspectives, as well. For instance, one way to approach it is by looking at the bottom of your soup bowl.

Brian Wansink, a food psychologist at Ithaca, N.Y.-based Cornell University's Food and Brand Lab and author of the recent book *Mindless Eating*, studies people eating, to see what they eat, how much of it they eat and when.

Wansink conducted an experiment in which he gave subjects a bowl of soup that was constantly refilled (a tube in the bottom of the bowl pumped soup into it without the subjects realizing their bowls were being refilled).

And the results were definitive: People ate 73 percent more soup from the never-ending soup bowls than they ate from regular, non-refilling soup bowls. But the soup-eaters who ate from the bottomless bowls didn't report feeling any fuller than the soup-eaters who ate from regular bowls.

In another experiment – the "red chip study" – Wansink gave stacks of potato chips to three groups of 45 people. One group got a plain stack of chips. Wansink gave the second group a stack of chips where every seventh chip was red.

And, to the third group, Wansink gave a stack of chips where every 14th chip was red. The purpose of the study was to see how many chips people would eat when there was something that would interrupt the automatic behavior of simply eating chips.

The red chips made a big difference. "If they got the tube with every seventh chip, they'd eat in units of seven," says Wansink. "If it was fourteen chips, they ate in units of fourteen."

And what happened to the people who didn't get any red chips? "They ate, on average, 28 chips," says Wansink.

Other experiments showed that secretaries with candy bowls on their desks ate more candy from clear bowls than from white bowls, that people drink more when they are served their beverages in short, wide glasses than when they are served tall, thin glasses, and that people who eat snacks at their desks consume 125 calories more than people who don't.

The moral of these studies is not dissimilar to Wang's findings: People eat for various reasons, many of which don't have anything to do with metabolism or real hunger.

Mindless eating means eating without being aware of your eating decisions – why you're eating, why you're eating particular foods and how much you're eating.

But Wansink's really astonishing finding is that people don't believe his food study results apply to them. "Almost everybody goes, "Oh, yeah, something like that wouldn't influence me,"" he says. "That's what makes this all so powerful. People believe that they alone are immune. We like to believe that we're master and commander of our decisions."

The Root of the Problem

So, now we know: Our brains and our psychologies both influence overeating. But, how about our lives?

"The problem isn't obesity," says Georgianna Donadio, DC, MSc, PhD, a medical educator, healthcare provider and founder of the National Institute of Whole Health. "It's symptomatic of the integrity of the whole person's life."

In other words, there are a whole lot of things going on with people's bodies, brains and lives that are causing them to overeat.

We live in a time of isolation and anxiety, says Donadio. People try to comfort themselves with food – too much food. The over-consumption of food leads the pancreas to produce more insulin, which, in turn, causes more hunger, which causes greater food consumption, which then causes the pancreas to produce more insulin.

And the end result of this continual process? Obesity.

But, there's more. By habitually overeating, says Donadio, people are actually training their stomach muscles to want more food.

"You know how when you run, you can keep increasing the amount you run because you train your body to run more?" says Donadio. "If you increase the amount of food intake, you train your body to eat more. You don't need that much food metabolically. You have conditioned your body to take it in."

Downsizing to Improve Health

Donadio says that people can stop overeating if they stop over-consuming in other areas of their lives. Downsize, she says, not just your body, but also your life. Slow down the speed of life.

"What's wrong is that we're moving so fast but going nowhere," she says. "Practicing kindness, slowing down [and pursuing] more meaningful activity: All of these things are incredibly healing and meaningful. We have to place ourselves in an environment that enhances well-being."

Wansink says the trick is to create the right environment for yourself so you can avoid situations in which you are going to overeat.

"The key isn't to mindfully eat, it's to change your environment so you can mindlessly eat better," Wansink says. For example, Wansink has gotten rid of short glasses in his lab, since short glasses lead to greater beverage consumption.

And you won't find clear candy bowls on many desks in the Food and Brand Lab. Unless they're part of an experiment, of course.

Wang, for his part, says there's one simple thing that overeaters can do to stop overeating: exercise. Exercise, he says, increases the brain's release of dopamine, and increases its sensitivity to dopamine. "The more you exercise, your desire for food will decrease," says Wang.