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This Scientist Is Trying To Unravel What Sugar Does To The Brain

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[JOE PALCA](http://www.npr.org/people/2101004/joe-palca)

Most of us have been tempted at one time or another by the lure of sugar. Think of all the cakes and cookies you consume between Thanksgiving and Christmastime!

But why are some people unable to resist that second cupcake or slice of pie? That's the question driving the research of [Monica Dus](https://sites.lsa.umich.edu/dus-lab/), a molecular biologist at the University of Michigan. She wants to understand how excess sugar leads to obesity by understanding the effect of sugar on the brain.

Dus's interest in how animals control the amount they eat started with a curious incident involving her two Bichon Frise dogs. One day, Cupcake and Sprinkles got into a bag of dog treats when Dus wasn't around. The dogs overdid it.

"I couldn't believe that these two tiny, 15-pound animals had huge bellies for three days and they couldn't stop themselves from eating," she recalls.

Dus was already an expert in fruit fly genetics, so she decided to study flies to see if she could unravel the puzzle of how the brain controls eating behavior.

Her lab has a working hypothesis. Dus believes a diet high in sugar actually changes the brain, so it no longer does a good job of knowing how many calories the body is taking in. She thinks there are persistent molecular changes in the brain over time – changes that pave the way for excessive eating and eventually, obesity.

"Perhaps it has nothing to do with will, and a lot to do with biochemistry," she says. Just as scientists in the last century showed there was a link between smoking and lung cancer, Dus thinks she can find a link between an early exposure to a diet high in sugar and obesity.

Dus' ideas have been attracting attention. She's just received a $1.5 million, five-year [New Innovator](https://commonfund.nih.gov/newinnovator/index) award from the National Institutes of Health. It's a new kind of grant aimed at "exceptionally creative, early-career investigators who propose innovative, high-impact projects."

She's also a [Rita Allen Foundation Scholar](http://ritaallen.org/scholars/), a program that is intended to help young investigators "establish labs and pursue research directions with above-average risk and promise."

Dus is taking a multidisciplinary approach to understanding how sugar affects the brain. When I visited her lab at the University of Michigan, she took me into a room where Christina May was studying individual cells in a fruit fly's brain.

"I stimulated the fly mouth with sugar, and I recorded from this part of the brain," May explains to me. She is comparing the brains of flies that have been fed a steady diet of sugar with those who are raised on a normal diet.

The flies on the high-sugar diet consumed more calories overall than the flies who ate the normal fruit fly food. In other words, a steady diet of sugar makes you eat more than you need. No surprise there. [As we've reported before](http://www.npr.org/sections/thesalt/2014/01/15/262741403/why-sugar-makes-us-feel-so-good), there's growing scientific evidence that [sugar has addictive properties](http://www.npr.org/sections/thesalt/2014/01/08/260781785/is-sugar-addiction-why-so-many-january-diets-fail). What May and Dus want to do is find out how a diet high in sugar alters normal control systems in the brain.

Across the hall, Jenna Clem takes a very different approach. She's working with Dus to study the genes in the brain that control eating in fruit flies.

"This is an incredibly complex system," says Clem. She believes that an animal's eating habits and environment change its genes and how they function.

Dus is getting ready to write up some of her early results, and things are looking promising. If she can prove that there are chemical changes in the brain that lead to obesity, it could change the way we tackle the obesity epidemic.