Some like it sweet, others not so much: It's partly in the genes

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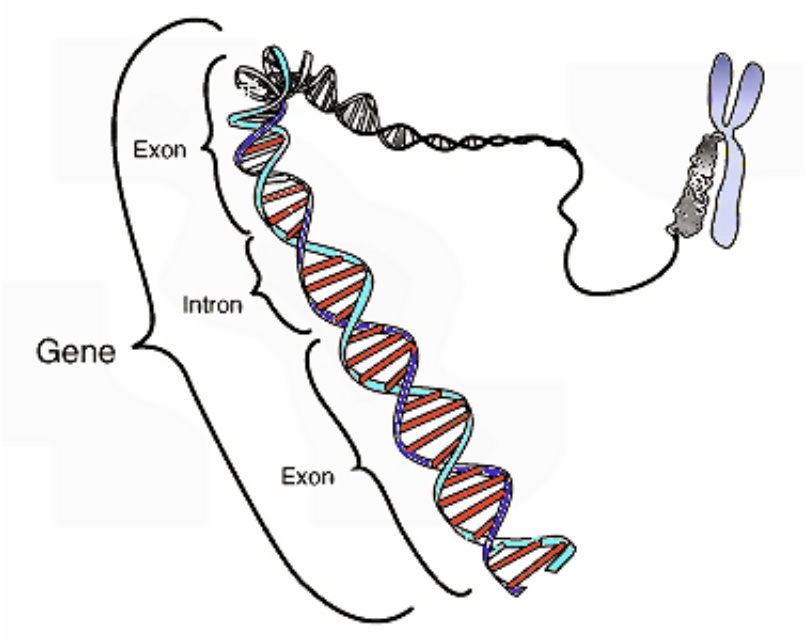

This image shows the coding region in a segment of eukaryotic DNA. Credit: National Human Genome Research Institute

A new study from the Monell Center and collaborating institutions suggests that a single set of genes affects a person's perception of sweet taste, regardless of whether the sweetener is a natural sugar or a non-caloric sugar substitute.

"Eating too much sugar is often seen as a personal weakness. However, our work suggests that part of what determines our perception of

sweetness is inborn in our genetic makeup," said study author Danielle Reed, PhD, a behavioral geneticist at Monell. "Just as people born with a poor sense of hearing may need to turn up the volume to hear the radio, people born with weak sweet taste may need an extra teaspoon of sugar in their coffee to get the same sweet punch."

In the study, published in *Twin Research and Human Genetics*, researchers tested 243 pairs of monozygotic (MZ, or identical) twins, 452 pairs of dizygotic (DZ, or fraternal) twins, and 511 unpaired individuals. Each person tasted and then rated the intensity of four sweet solutions: fructose, glucose, aspartame, and neohesperidine dihydrochalcone (NHDC). The first two are natural sugars, while the latter two are synthetic, non-caloric sweeteners.

MZ twins have nearly identical genes while DZ twins share only about half of their genes. Studying twin pairs allowed the researchers to determine how much influence the twins' shared genetics contributed to their perception of sweet taste intensity.

The resulting data indicate that genetic factors account for approximately 30 percent of person-to-person variance in sweet taste perception.

The study also revealed that those who perceived the natural sugars as weakly sweet experienced the sugar substitutes as similarly weak. This suggests that there may be a shared pathway in the perception of natural sugar and high-potency sweetener intensity.

Scientists are still working to unravel the molecular processes behind how we detect the many different types of sweet molecules. Earlier studies with mice showed that there is one main detection pathway for non-caloric sweeteners and natural sugars, but also a second pathway that responds only to sugars. The current findings suggest that these two

pathways might converge into a single experience of sweetness intensity.

The current study also found little evidence for a shared environmental influence on sweet perception. Assuming twin pairs took part in communal meals during childhood, this result challenges the common belief that access to foods high in sugar may make children insensitive to sweetness.

"Our findings indicate that shared experiences, such as family meals, had no detectable ability to make twins more similar in taste measures," Reed said. "The next big question is if, and how, genes and early experiences interact to affect food choice."

Understanding the genetic differences that affect an individual's perception of sweetness may eventually help food manufacturers reduce the amount of sugars and sweeteners they add to food.

"Even though almost everyone - consumers, physicians, and public health officials - wants to decrease the amount of sugar in our diets, right now we have no tool that has the sensory equivalence of sugar," said Reed. "However, if we can understand why some people have weaker sweetness perception, we might be able to adjust this attribute so we could reduce the amount of sugar in foods."

"The genetics of bitterness have been widely studied in past decades, but there's much less genetic information on sweetness," said lead author Daniel Hwang, a PhD candidate at the University of Queensland, who also is affiliated with the QIMR Berghofer Medical Research Institute. "Our next steps are to identify key genomic regions shared by people who are weak sweet tasters, in the hopes of understanding their weaker perception."

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