Researchers identify genes that directly influence what we eat

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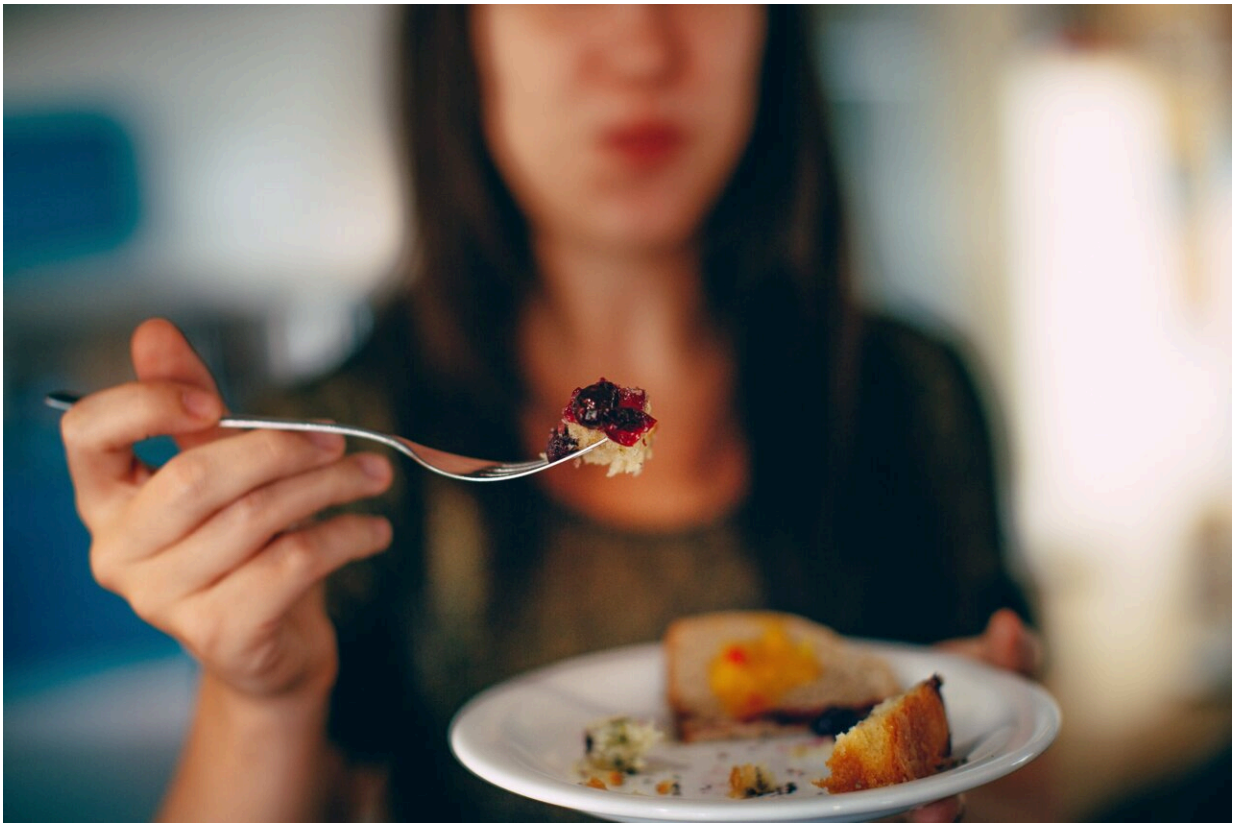

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In one of the first large-scale studies of genes related to diet, researchers have uncovered almost 500 genes that appear to directly influence the foods we eat. The findings represent an important step toward using a

person's genetics to develop precision nutrition strategies that help improve health or prevent disease.

"Some genes we identified are related to sensory pathways—including those for taste, smell, and texture—and may also increase the reward response in the brain," said research team leader Joanne Cole, Ph.D., assistant professor in the Department of Biomedical Informatics at the University of Colorado School of Medicine.

"Because some of these genes may have clear paths toward influencing whether someone likes a food or not, they could potentially be used to create sensory genetic profiles for fine-tuning a person's dietary recommendations based on foods they like to eat."

For the study, the researchers used the UK Biobank, which contains data from 500,000 people, to perform a phenome-wide association study (PheWAS) that identified genes more strongly associated with diet than with any health or lifestyle factor. PheWAS studies are used to find associations between gene variants of interest and a spectrum of human traits and behaviors, including dietary intake.

"The foods we choose to eat are largely influenced by environmental factors such as our culture, socioeconomic status, and food accessibility," said Cole. "Because genetics plays a much smaller role in influencing dietary intake than all the environmental factors, we need to study hundreds of thousands of individuals to detect genetic influences amid the environmental factors. The data necessary to do this hasn't been available until recently."

Cole will present the findings at NUTRITION 2023, the annual meeting of the American Society for Nutrition held July 22–25 in Boston.

One challenge in identifying diet-related genes is that what people eat

correlates with many other factors, including health factors such as high cholesterol or body weight and even socioeconomic status. In the new work, the researchers applied computational methods to tease out direct effects of genetic variants impacting diet and separate those from indirect effects such as ones where a gene impacts diabetes and having diabetes requires a person to eat less sugar.

This study design was possible because the UK Biobank not only contains in-depth genetic information but also detailed health and socioeconomic data. This allowed the researchers to test individual genetic variants for associations with thousands of traits and then eliminate indirect gene variants that were more strongly associated with other factors, such as diabetes.

The analysis revealed around 300 genes directly associated with eating specific foods and almost 200 genes linked to dietary patterns which group various foods together—for example, overall fish intake or fruit consumption.

"The study showed that dietary patterns tend to have more indirect genetic effects, meaning they were correlated with a lot of other factors," said Cole. "This shows how important it is to not study dietary patterns in a vacuum, because the eating pattern's impact on human health may be completely mediated or confounded by other factors."

In the short term, Cole is studying the newly identified diet-related genes to better understand their function while also working to identify even more genes that directly influence food preferences. She would like to pursue several lines of translational research based on these findings. For example, she is interested in studying whether using a person's genetics to adapt the flavor profile of a diet designed for weight loss could improve adherence.

It might also be possible to use these new insights to tailor foods to a person's genetic predisposition. "If we know that a gene encoding an olfactory receptor in the nose increases a person's liking of fruit and boosts the reward response in the brain, then molecular studies of this receptor could be used to identify natural or synthetic compounds that bind to it," Cole said. "Then, we could see if adding one of those compounds to healthy foods makes those foods more appealing to that person."

More information: Cole will present this research at 2:55 p.m. on Saturday, July 22, during the Personalizing Nutrition—Genetics and Dietary Pattern Interactions Poster Theater Flash Session in the Sheraton Boston, Fairfax (abstract; presentation details).

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