

Interaction of genes and environment influences obesity in children

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(Medical Xpress)—Neither genes nor the environment alone can predict obesity in children, but when considered together a strong relationship emerges, according to researchers at Penn State, St. Luke's Roosevelt Hospital and the Albert Einstein College of Medicine. The researchers found that children who have a genetic variant that makes them less sensitive to the taste of certain bitter compounds, also called "non-tasters," were significantly more likely to be obese than children who were "tasters" of these compounds—but only when they lived in an unhealthy food environment.

"Eating behaviors and [obesity](#) are influenced by genes and the food environment, but few studies have investigated how both of these variables interact to influence eating behavior and obesity," said Kathleen Keller, assistant professor of [nutritional sciences](#) and food science at Penn State. "We have found that sensitivity to the [bitter taste](#) of compounds, like 6-n-propylthiouracil (PROP), alone does not have a strong impact on obesity, nor does the food environment alone, but when examined together, their influence on obesity was very strong. In fact, non-taster [children](#) who lived in [unhealthy food](#) environments were obese on average."

According to Keller, around 70 percent of the U.S. [Caucasian population](#) is sensitive to the taste of PROP, a bitter-tasting compound similar to those found in [cruciferous vegetables](#) like cabbage and broccoli, while 30 percent are considered to be non-tasters. For many years, researchers have debated findings that non-tasters may also be more prone to obesity

because they have fewer [taste buds](#) than tasters and because of this, they have reduced sensitivity to many tastes and textures.

"We have found that people who have reduced ability to taste dietary fat may be prone to [overeating](#) it," said Keller. "However, no previous studies have taken into account the importance of access to foods in the environment in modifying the influence of PROP status on diet, but when you do, the results become much clearer. We know even less about this relationship in children."

The researchers examined 120 ethnically diverse children between the ages of 4 and 6 who lived in New York City. The children and their parents attended four laboratory visits conducted during dinnertime. The parents completed a series of questionnaires in which they were asked about the types and quantities of foods they typically offered to their children. Researchers worked one-on-one with the children to measure food likes and dislikes, body weight and ability to taste PROP.

The team assessed food acceptance in the children by showing them photographs of common foods, including healthy foods—such as strawberries, bananas, spinach and broccoli—and unhealthy foods—such as doughnuts, cookies, French fries and hot dogs. The researchers asked the children to identify the foods in the pictures and to report whether or not they liked the foods.

To examine the children's food environments, the researchers used specialized software, called Geographic Information Systems (GIS), to map the number of establishments that sold healthy foods (fruits and vegetables) and unhealthy foods (high calorie, low-nutrient foods and fast foods) within a one-half-mile and one-mile radius around the children's homes. They then divided children into two groups based on whether they had more healthy or unhealthy food stores within walking distance around their homes.

The results showed that neither PROP status nor the food environment, when considered alone, explained differences in children's reported liking of fruits or vegetables or obesity status. However, the interaction between PROP status and the food environment did significantly affect children's liking of vegetables and their body weights.

"On average, non-taster children living in healthy food environments liked more vegetables and disliked fewer vegetables than taster children living in the same environment," said Keller. "On the other hand, non-taster children living in unhealthy food environments had higher levels of obesity compared to all other groups of children. Non-tasters who lived in unhealthy food environments had average body mass indexes over the 95th percentile, which is in the obese range. It is possible that non-tasters may have a tendency to like high-fat foods more, and when they are placed in an environment where these foods are plentiful, this may hasten the path to obesity. These findings also give us insight into the importance of our food environment in overcoming our genetic risk factors."

The results appear in the current issue of the journal *Obesity*. In the future, the team plans to investigate whether an interaction exists between genes and the [food environment](#) in people living in a "car culture" in central Pennsylvania.

"If you can walk someplace, there's a higher likelihood you'll frequent that place for your nightly shopping," said Keller. "But we don't know yet if that applies in a place that is primarily a 'car culture' in which a person can choose to drive past an unhealthy food outlet to reach a healthy one or vice versa."

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