CHILDREN’S TASTE SENSITIVITY AND FOOD CHOICES INFLUENCED BY TASTE GENE

Genetic diversity, age, and cultural experience all contribute to the sensory worlds of children and their parents

PHILADELPHIA, PA -- Variation in a taste receptor gene influences taste sensitivity of children and adults, accounting for individual differences in taste preferences and food selection, report a team of researchers from the Monell Chemical Senses Center. In addition to genes, age and culture also contribute to taste preferences, at times overriding the influence of genetics.

The findings may help to explain why some children are more attracted to sweet-tasting foods, as well as why taste and food preferences appear to change with age.

“The sense of taste is an important determinant of what children eat. We know that young children eat what they like. We also know that many children do not like bitter taste, thereby interfering with vegetable consumption and potentially limiting intake of important nutrients,” comments lead author Julie Mennella, PhD, a developmental psychobiologist. “The recent Nobel Prize award demonstrates the importance of the identification of genes coding for taste and olfactory receptors. We took advantage of this new knowledge to look at how variation in taste genes might relate to the taste likes and dislikes of children and parents.”

In the study, to be published in the February 2005 issue of Pediatrics, researchers compared taste sensitivity and food-related behaviors across three genotypes of the TAS2R38 gene, which encodes a taste receptor responsive to bitter taste.

Using cheek swabs to obtain genetic samples, researchers classified 143 children and their mothers into three groups based on their TAS2R38 genotype: Type AA had two bitter-insensitive sites (alleles), type PP had two bitter-sensitive alleles, and type AP had one of each.

To provide a behavioral measure of sensitivity to bitter taste, children – who were between 5 and 10 years of age - and mothers categorized three concentrations of a bitter-tasting compound (propylthiouracil; PROP) as tasting either “like water” or “bitter or yucky.”
Having a bitter-sensitive allele (P) on the TAS2R38 receptor gene predicted sensitivity to the bitter taste of PROP in both children and mothers. While 70% of children and 50% of mothers with either AP or PP alleles detected bitterness in the weakest PROP solution, the same solution tasted bitter to only a few individuals with two bitter-insensitive alleles (AA).

Children and adults with two bitter-sensitive alleles (PP) were more sensitive to bitter taste than those with just one (AP).

Genetic influences on bitter taste sensitivity were in some cases modified by age. In individuals with the mixed AP genotype, children were more sensitive to bitter than adults, with 64% of children but only 43% of adults able to detect bitterness in the weakest PROP solution.

“This type of information will one day help to improve the diets of our children by allowing us to devise better strategies to enhance fruit and vegetable acceptance in children who are sensitive to bitter taste,” comments Mennella. “It may be that childhood represents a time of heightened bitter taste sensitivity in some children, which lessens with age. Such a scenario would account for the increase of vegetable consumption that often occurs as children mature into adulthood. This is definitely an area that merits more research.”

The bitter receptor genotype also predicted children’s sweet preference, along with their preference for sweet-tasting beverages and foods. Children with a bitter-sensitive allele (PP or AP) preferred higher concentrations of sucrose solutions than did bitter-insensitive (AA) children, and were more likely to identify carbonated drinks as a preferred beverage. They also were less likely to name milk or water as one of their two favorite beverages. Favorite cereals and beverages of PP children had higher sugar content than corresponding selections of AA children.

According to study co-author, geneticist Danielle Reed, PhD, “The children most sensitive to PROP liked sweet more, but the reason for this relationship is not known. This difference could be due to taste receptor biology or it could be because those who are most bitter sensitive use more sugar to mask unpleasant tastes in food, and thus come to prefer it more. Whatever the explanation, this is an important puzzle to solve.”

Unlike children, bitter receptor genotype did not influence sweet preference in adults. Instead, effects of race/ethnicity were the strongest determinants. Mennella comments, “What I find most interesting is that you do not see the relationship between bitter taste receptor genotype and sweet preference in adults. The forces of experience and culture appear to have overridden the genetic effect.”
Some mothers and their children may live in different sensory worlds due to differences of taste sensitivity related to genes, age, or both. Such differences influenced interactions between mothers and children: mothers insensitive to bitter taste perceived bitter-sensitive children as being more emotional than bitter-insensitive children. “This knowledge may bring relief to parents who learn that their children reject foods that they themselves like because of inborn differences in taste ability, rather than rebelliousness or defiance of authority,” explains Reed.

The research continues and extends Monell’s long-term research program exploring development of taste and flavor preferences during childhood, a critical time for learning about food. Mennella comments, “Our previous studies focused on how early experience influences preferences for foods and flavors. Now, we have a tool to look at how experience and genetics interact in determining why we like the foods we do.”

Monell researcher M. Yanina Pepino also contributed to the study.

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