

Eating healthy
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March 10, 2009

Across the life span, the senses of taste and smell act as gatekeepers to the body, influencing every decision to eat a food, whether it is peas, soup, a chocolate cupcake, or sushi. As such, taste and smell serve also as gatekeepers to nutritional health. We are indeed what we eat. A healthy diet provides the nutrients necessary to support the body's current needs, from the rapid growth of childhood and adolescence to the physical and mental changes that confront many during the senior years.

It's no secret that the growing prevalence of pediatric obesity is a critical public health issue. The International Obesity Task Force estimates that at least 155 million school-age children worldwide currently are overweight or obese, and that this number will increase to 287 million by 2010. In the United States, obesity is the most widespread nutritional disease of childhood. Nutritional interventions to counteract this trend are viewed as critical, leading to global initiatives to promote a healthier diet and increase fruit and vegetable consumption, such as the 5-A-Day plan sponsored by the US Centers for Disease Control, the World Health Organization, and other organizations. Amazingly, the number one vegetable eaten by a child in the United States is a french fry.

Children are emotional eaters – as any parent knows, kids eat foods they like and spurn those they don't. And what toddlers and children like best are sweet- and salty-tasting snacks and beverages, along with fatty foods such as French fries. These preferences reflect the basic biology of children; they evolved to insure a drive to consume enough calories and sodium. But learning, particularly early learning, also contributes to flavor acceptance.

Research from my laboratory lab has shown that flavor preferences begin to develop in the womb, with the unborn infant sampling tastes and odors of the mother's diet through amniotic fluid. After birth, the introduction to flavor

continues through transmission in breast milk. At weaning, this early exposure influences how an infant responds to a flavor when it first is presented as a solid food. Therefore, mothers need to eat fruits and vegetables themselves during pregnancy and while breastfeeding to help their infants accept these flavors later. What children are eating at about two years of age helps predict what they like when they're older.

Over the past 19 years, my research program has been focused on understanding individual differences in flavor preferences. I incorporate developmental, learning and genetic approaches; the studies relate not only to food, but also extend to other flavor-related substances, such as alcohol and tobacco. One goal of my research is to use this acquired knowledge to provide evidence-based strategies to help people make healthy nutritional choices.

New mothers always receive recommendations about the best way to introduce solid foods to an infant. What's not recognized, however, is that much of the advice is anecdotal. There is very little evidence-based information available to help mothers introduce foods so that their infants will accept them. Accordingly, an ongoing series of experiments in our laboratory is evaluating which feeding techniques actually do contribute to early food acceptance. The results indicate that whether an infant is breast-fed or formula-fed, once a nutritious food is accepted, that acceptance can be further increased. One way to do this is by repeating experience with a given food. This was demonstrated in a study where we fed babies carrots for nine successive days and found that they ate more carrots on the 10th day as compared to infants who had tasted the carrots only once before. A subsequent experiment revealed that experience with food variety also can increase acceptance of a new veggie; in this case, after peas, potatoes, and squash were alternated for nine days, infants increased the amount of carrots they ate on the 10th day.

Along with learning, genetically-determined taste sensitivities contribute to food acceptance. Sequence variations in the TAS2R38 bitter receptor gene predict sensitivity to some bitter tastes in both children and adults. In collaboration with Monell colleagues Yanina Pepino and Danielle Reed, I found that in some cases this sensitivity is modified by age, with young children more sensitive than adults to certain bitter compounds.

We emphasize that mothers should appreciate that they and their children may live in different sensory worlds due to differences in genes, experience, or both. A child who is very sensitive to bitter may find it harder to develop a liking for vegetables. Thus we need to be aware of the large individual differences underlying flavor preferences and food acceptance and understand what drives these differences. This is what we're trying to tease apart with our experiments – how learning, genes, and context interact to influence why we like the foods we do. Because if children are eating more fruits and vegetables, the impact on health will be improved.

Selected references

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