Getting Children to Eat a Variety of Healthy Foods Starts Early in Life

Healthy Eating Research
Building evidence to prevent childhood obesity

Issue Brief, December 2017

Introduction

Humans are born predisposed to accept foods that taste sweet and reject those that are sour or bitter. Throughout history, these predispositions helped humans to adapt in times of scarcity, but today they have the potential to promote unhealthy eating patterns, such as overconsumption of sugary processed foods and underconsumption of nutrient-dense foods like fruits and vegetables, in modern food environments that include so many tasty, high-calorie foods. Fortunately, humans are also predisposed to acquire new likes and dislikes through experience, which means that taste preferences can be modified. Early life is an important time to promote the acceptance of healthier foods given that diet quality is already poor in early childhood and the high prevalence of nutrition-related diseases.

This issue brief, based on "Promoting healthy food preferences from the start: a narrative review of food preference learning from the prenatal period through early childhood," published in *Obesity Reviews*, relies on a search of the literature from 2007 to 2016 on how children learn food preferences during the prenatal period, infancy, and early childhood (ages 2-5). The search focused on articles published in peer-reviewed journals during the past 10 years that included terms such as: prenatal, fetal, infant, children, toddlers, preschoolers, breastfeeding, formula feeding, introduction to solid foods, food preferences, flavor preferences, taste preferences, taste familiarization, variety exposure, neophobia (fear or dislike of anything new and/or unfamiliar), liking, acceptance, marketing, and branding.

The evidence from this review can be used to help caregivers and practitioners promote the development of healthy food preferences early in life, as well as to inform the development of policies and practices that support healthy eating in a variety of settings where young children spend time.

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The Evidence

Children can learn preferences for foods before birth.

Before birth, humans' senses of taste and smell emerge to help prepare the fetus with attractions to foods that are safe and available after birth. The fetus is exposed to flavors from the mother's diet and can get used to specific flavors and variety, setting the stage for later acceptance of foods after birth. For example, studies have found that newborns showed greater preference for garlic or anise if their mothers regularly consumed those flavors during pregnancy, and newborns exposed to carrot flavor during pregnancy preferred carrot-flavored to plain cereal when introduced to solid foods.

Food preferences are influenced by breastmilk and formula.

After birth, exposure to flavors in breastmilk or formula also influences infants' feeding behaviors. Breastfed infants are exposed to a wide variety of flavors because flavors are transferred from the mother's diet into breastmilk. Formula-fed infants are typically exposed to a lower variety of flavors.

Prior to the introduction of complementary foods, young infants are attracted to new flavors in breastmilk or formula. These experiences can have longer-term effects, as infants and young children later prefer solid foods with flavors they have already been exposed to through breast- or formula-feeding. Thus, infants' natural attraction to new flavors during breast- or formula-feeding can help them learn to accept these flavors, and repeated exposure to flavors within breastmilk or formula also sets the stage for subsequent acceptance of these flavors within solid foods.

Infants continue to learn to accept new foods when they are introduced to complementary foods (e.g., cereals, pureed fruits, and vegetables) around 6 months of age. Repeatedly offering a variety of foods during infancy can have lasting effects on acceptance and consumption of healthy foods.

Research shows that infants react positively (e.g., readily accepting spoon, smiling) to most new foods, but their reactions can also vary in response to the taste of specific new foods. For example, salted vegetables are more readily accepted than plain vegetables, and fruits or sweeter vegetables are more readily accepted than bitter vegetables. Popular belief suggests that vegetables should be introduced before fruits, given that infants naturally prefer sweet tastes. Yet, among the handful of studies examining this issue, there is no research supporting the idea that early repeated exposure to fruits will disrupt later acceptance of vegetables.

Overall infants are likely to eat more of a new food and react more positively to it if they are exposed to the taste of that same new food repeatedly. Variety is also important, as studies find that repeated exposure to a variety of foods helps to promote acceptance of new foods. Daily changes in variety appear to be better than less frequent changes, such as every three days, at increasing infants' acceptance of new foods. The effects of variety exposure appear to be strong, lasting at least 3 to 6 years. Infants can also learn to prefer new foods and beverages if they are paired with flavors they already prefer. For example, breastfed infants prefer cereal prepared with their mothers' milk to cereal prepared with water.

To establish healthy food preferences, research supports continuing to expose infants to a variety of healthy foods and limiting exposure to less-healthy foods like sweets throughout the introduction to complementary foods.

Early childhood (ages 2-5) brings additional feeding challenges, yet repeatedly offering a variety of healthy foods and pairing new foods with already-liked foods continue to be successful strategies for increasing food acceptance.

As infants transition into early childhood, children are typically eating the same foods as the rest of the family, yet they are still learning "how to eat." This period is characterized by increased independence and often a rejection of new foods. Because of these changes, some of the feeding strategies used to shape food preferences in infancy will remain relevant but look different when applied.

Repeatedly exposing children to a variety of foods continues to be a relevant strategy to increase acceptance of new foods for 2- to 5-year-olds. Recent research shows that it could take between three and six tries to increase children's acceptance of new foods, but the actual number of exposures needed may vary depending on the specific food, child characteristics, or past experience. Pairing new foods with an already-liked flavor, such as a salty or sweet accompaniment, may also help. For example, research shows that vegetables (e.g., red pepper, squash) can be repeatedly presented alone or with a liked dip to increase liking and intake of the vegetable. While many research studies support the idea that simple repeated exposure is just as effective as this more complex strategy, pairing new foods with a liked flavor may be particularly effective for increasing acceptance of bitter vegetables, such as Brussels sprouts and broccoli.

Variety also continues to be important during early childhood, with repeated exposure to a variety of healthy options again a logical first attempt in introducing foods. Research shows children served a variety of fruits or vegetables consumed more of each compared to children served a single fruit or vegetable type. Other strategies, such as pairing vegetables with an already-liked food, may be useful to encourage children to try the food in instances where acceptance has not increased after many exposures. In applying these recommendations, it is important to note that preference is a relative concept.

There is evidence that children may be willing to eat fruit and vegetable snacks when they are the only choice offered, but are less willing to do so when sweet and salty snacks are available as alternative choices, highlighting the importance of the overarching environment in which these strategies are practiced.

Repeated exposure is an effective strategy and recommendation, but the application of this recommendation should also be considered alongside the challenges present in real-world contexts. For example, there is evidence to suggest that parents from low-income families do not continue to serve previously rejected foods in an attempt to reduce waste and save time. Understanding such barriers experienced in real-world environments and developing efforts to address them through research and practice can help to promote health equity.

Social influences including branding/marketing, modeling, and rewards can impact children's food preferences.

Food marketing practices are one form of social influence that can impact young children's food preferences and selection. For example, research shows that pairing foods with branding, characters, and/or toy incentives increases preferences for those foods in preschool children. This type of marketing is common in promoting unhealthy foods, but it could also be used to promote healthy foods if there were minimal competition from less healthy options.

Another social influence that can impact young children's eating behavior is modeling. Studies show that preschoolers prefer foods eaten by models who enjoy the target foods and are similar to them in age and gender. In addition to in-person modeling that children may experience in settings like the home, screen-based modeling may also be an effective influence, as a recent study showed that children who watched a video of other children eating bell peppers consumed more peppers than those who did not. Modeling can affect both acceptance and rejection of new foods, highlighting the importance of healthy eating for all family members.

Rewarding children with a small tangible non-food reward or verbal praise may also play a role in increasing young children's food acceptance, but more research on this is needed. A study that combined rewards and modeling resulted in increased consumption of a variety of target fruits and vegetables. Children may react differently to rewards, based on their individual characteristics such as temperament or past experiences. In another study, for example, children high on reward sensitivity—i.e., highly motivated by rewards—were more willing to taste vegetables they previously rejected when immediately rewarded. For children lower on reward sensitivity, this reward strategy was not as effective. If foods are already being accepted without rewards, it is recommended that caregivers try other approaches to introduce new foods, such as repeated exposure and modeling.

Conclusions

There is robust evidence to support exposure to a variety of healthy foods from the start of the prenatal period and throughout early childhood to promote subsequent acceptance of those foods. Parents, caregivers, and health professionals should start this process early, taking advantage of periods such as early infancy when many foods and flavors are novel, and children are less likely to reject new foods.

While early exposure is important, it is not too late to shape healthier food preferences after infancy. In early childhood, parents and caregivers can test which strategies work best with their child's temperament and individual personality. Based on the research evidence, it is recommended that parents start with strategies like repeated exposure and modeling, which have demonstrated consistent effects across many studies.

This issue brief is based on the findings of a literature review conducted by Stephanie Anzman-Frasca. The article, which includes the full results of the review and a list of citations can be found at:

Anzman-Frasca S, Ventura AK, Ehrenberg S, Myers KP. Promoting healthy food preferences from the start: a narrative review of food preference learning from the prenatal period through early childhood. *Obes Rev.* Available at: *http://onlinelibrary.wiley.com/doi/10.1111/obr.12658/full*

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About Healthy Eating Research

Healthy Eating Research (HER) is a national program of the Robert Wood Johnson Foundation. Technical assistance and direction are provided by Duke University under the direction of Mary Story PhD, RD, program director, and Megan Lott, MPH, RDN, deputy director. HER supports research to identify, analyze, and evaluate environmental and policy strategies that can promote healthy eating among children and prevent childhood obesity. Special emphasis is given to research projects that benefit children and adolescents and their families, especially in lower-income and racial and ethnic populations at highest risk for obesity. For more information, visit *www.healthyeatingresearch.org* or follow HER on Twitter at *@HEResearch.*

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