

Research Conclusions that Form the Scientific Foundation for the Start Healthy Infant and Toddler Feeding Guidelines*

	Research Questions	Conclusions
1. When	a) When is an infant's gastrointestinal tract capable of handling complementary foods?	The normal, healthy infant's gastrointestinal tract is mature enough to digest complementary foods by 3-4 months of age. By the time most nutrients in the baby's diet come from table foods, the physiological capabilities of the infant digestive tract are near adult proficiency.
	b) When is renal function sufficiently mature to allow introduction of complementary foods?	Despite some renal immaturity, most babies have no problems maintaining water balance even if feedings provide a relatively high potential renal solute load (above 33 mOsm/L). However, during acute illness, when fluid intake may be limited and water losses considerable (e.g. fever, diarrhea, emesis, and elevated environmental temperatures), diets with a higher vs. lower potential renal solute load may lead more rapidly to dehydration.
	c) When are nutrients needed from complementary foods?	For most infants, breast milk and/or formula provide all required nutrients for about the first 6 months after birth and significant but varying amounts thereafter.
	d) When do oral, gross and fine motor skills required for complementary feeding emerge?	Developmental readiness for complementary foods varies considerably among infants (see table 5). In most babies the developmental skills needed to handle complementary foods are present after 4 months of age.
	e) When is it appropriate to introduce textures?	Readiness for and acceptance of different food textures appears to depend on both the child's developmental stage and his or her prior experience with a particular texture. Infants will learn to eat foods of varying textures if they are exposed to them at appropriate developmental stages. A gradual exposure to solid textures during the sensitive period for learning to chew (from the time complementary foods are introduced through 10 months of age) may decrease the risk of feeding problems related to rejection of certain textures, refusing to chew or vomiting. Evidence for any kind of order for introducing textures is limited.
	f) When should parents encourage dietary variety and how?	Exclusively breast fed infants are exposed to a variety of flavors through the breast milk, suggesting the importance of dietary variety from the beginning. Repeated exposures to a particular food is usually necessary before it is accepted by the infant or toddler. Studies show that up to 10 to 15 exposures may be necessary before a specific food is accepted. Introduction of a variety of flavors in the first two years of life may lead to acceptance of a wider variety of flavors in later childhood and may increase the likelihood of children trying new foods.

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2. What	a) What are infants' and toddlers' nutrient requirements?	The Dietary Reference Intakes (RDA and AI) provide recommendations for nutrient intakes for healthy individuals and populations including infants and toddlers. However, these are estimates only. It is important to monitor growth and development.

	<p>b) What nutrients are needed from complementary foods?</p>	<p>After 6 months, most breast fed infants need complementary foods to meet current recommendations (DRI) for energy, manganese, iron, fluoride, vitamin D, vitamin B6, niacin, zinc, vitamin E, magnesium, phosphorus, biotin and thiamin. Amounts of energy and nutrients needed from complementary feeds will vary depending upon the intake of human milk or formula. Although iron-fortified infant formula provides the recommended intakes of energy and nutrients until about one year of age depending on intake, all infants need complementary foods for exposure to flavors and textures as well as to master eating skills.</p>
	<p>c) What is the evidence that specific nutrients require special emphasis in the diets of infants and toddlers?</p>	<p>National nutrition monitoring in the United States of biochemical indicators of nutritional status of infants and toddlers suggests that iron needs special emphasis, the prevalence of deficiency being highest among children less than 2 years of age. Provision of complementary foods such as meats and fortified cereals contribute significant amounts of iron and is helpful in preventing deficiency. Because rickets due to vitamin D deficiency has been observed recently in dark-skinned breast fed infants and other infants without adequate sun exposure, 200 IU vitamin D is recommended as a supplement for breast fed infants and infants receiving less than 500 ml formula per day. Intakes of the essential fatty acids may require emphasis once breast milk or formula is replaced with cows milk.</p>
	<p>d) What foods should be avoided to reduce food allergy risk?</p>	<p>Infants with a strong family history of food allergy (ie those whose parents had or have food allergies and/or those who have a sibling with significant allergy) should be breast fed for as long as possible and should not receive complementary foods until 6 months of age. The introduction of the major food allergens such as eggs, milk, wheat, soy, peanuts, tree nuts, fish and shellfish should be delayed until well after the first year of life. Those foods that are associated with “life-long” sensitization (peanut, tree nuts, and shellfish) should not be introduced until even later years. Consideration of a hypoallergenic formula, duration of formula use, and other dietary restrictions should be decided in consultation with the health care provider.</p> <p>There is no evidence that restriction or avoidance of any foods is necessary for the infant who is not at risk for allergy. Caregivers, however, are advised to introduce new foods one at a time and to watch for adverse reactions. Studies documenting an optimal time before the introduction of the next new food were not found. Recommendations range from 2 days to a week. One new food every 2 to 4 days (e.g., 2-3 per week) seems reasonable.</p>
	<p>e) What is the role of physical activity for infants and toddlers?</p>	<p>While there is no evidence that physical activity in infants or toddlers is related to activity or health in later years, age-appropriate, daily physical activity in a safe, nurturing environment may help promote physical development and movement skills and teach the healthy habit of activity. Encourage parents and caregivers to promote enjoyment of movement and motor skill confidence at an early age. Motor skills, like cognitive skills, flourish when the infant is exposed to a stimulating environment. Early childhood is a key period for promoting physical activity because during this time, fundamental motor skills (walking, running, jumping, etc.) begin to develop. When activity is encouraged, these skills can further develop into advanced patterns of motor coordination. Television viewing should be discouraged for children under 2 years of age.</p>

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3. How	a) How can parents establish a healthy feeding relationship?	<p>The healthy feeding relationship is a division of responsibility between the parent and the child. The parent sets an appropriate and nurturing feeding environment and provides appropriate healthy foods. The child decides whether and how much to eat.</p> <p>Responsive parenting appears to be at the core of a healthy feeding relationship. This involves:</p> <ul style="list-style-type: none"> Recognizing the child's developmental abilities with respect to feeding Balancing the child's need for assistance with encouragement of self-feeding. Allowing the child to initiate and guide feeding interactions. Responding early and appropriately to hunger and satiety cues.
	b) How do infants and toddlers communicate hunger and fullness? How should caregivers respond?	<p>For infants, hunger cues may include: crying, excited arm and leg movements, smiling, cooing, and/or gazing at the caregiver during feeding indicating desire to continue, opening mouth and moving forward as spoon approaches, swiping food toward the mouth, moving head forward to reach spoon.</p> <p>Hungry toddlers may point at foods or beverages, ask for foods or beverages, and or reach for foods.</p> <p>Infant's satiety cues may include: falling asleep, becoming fussy during feeding, slowing the pace of eating, stopping sucking, spitting out or refusing nipple, refusing spoon, batting the spoon away, closing mouth as spoon approaches.</p> <p>Toddlers may slow the pace of eating, become distracted or notice surroundings more, play with food, throw food, want to leave the table or chair, and/or doesn't eat everything on the plate. To help avoid under-feeding or over-feeding, parents and caregivers must be sensitive to the hunger and satiety cues of the healthy infant and young child. Crying is often, but not always a sign of hunger, so parents should check if the infant is hungry or experiencing some discomfort (e.g. wet diapers, cold temperature, or pain from air bubbles in their stomach).</p>
	c) How should parents or caregivers introduce complementary foods for the first time?	<p>No controlled studies have addressed the practical aspects of introducing complementary foods for the first time. Mixing cereal with breast milk enhances acceptance of cereal by breast fed infants. Repeated exposure to foods enhances acceptance of new foods by both breast fed and formula fed infants. As with all feeding interactions, caregivers should observe the infant's intake and non-verbal cues and respond appropriately.</p>
	d) How quickly and in what order should complementary foods be introduced?	<p>There is no evidence for a benefit to introducing complementary foods in any specific sequence or at any specific rate. However, it is generally recommended that first solid foods be single ingredient foods and that they be started one at a time at 2 to 7 day intervals. The order of introduction of complementary foods is not critical, except for providing nutrients required from complementary foods. Meat and fortified infant cereals provide many of these nutrients. Combination foods (instead of single-ingredient foods) may be given to older infants after tolerance for the individual components has been established.</p>
	e) How much food provides a portion or serving for infants and toddlers?	<p>There is no evidence for a benefit to introducing complementary foods in any specific sequence or at any specific rate. However, it is generally recommended that first solid foods be single ingredient foods and that they be started one at a time at 2 to 7 day intervals. The order of introduction of complementary foods is not critical, except for providing nutrients required from complementary foods. Meat and fortified infant cereals provide many of these nutrients. Combination foods (instead of single-ingredient foods) may be given to older infants after tolerance for the individual components has been established.</p> <p>Children often eat small frequent meals and snacks throughout the day – customarily 3 regular meals and 2-3 appropriate, healthy snacks. Portions should provide essential nutrients but not exceed energy requirements for the child.</p>

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3. How	f) How are picky eating and food jags described?	There is no scientific definition of picky eating. Rather, picky eating is defined by the caregivers' perception. Parents perceive a toddler to be a picky eater when he or she accepts only a few foods, refuses to try new foods, totally avoids some food groups, and exhibits strong food preferences, including presentation and preparation methods. Studies show that occasional picky eating is not associated with changes in nutrient intake or height and weight. Consuming a single food or foods for extended periods of time is commonly called a food jag. The health consequences of persistent picky eating or food jags on nutritional status or growth are not known.
	g) How can parents and caregivers help children accept a wider variety of foods?	While no specific strategies to address picky eating have been shown to be effective, some general feeding guidelines apply: Be patient; occasional picky eating can be a normal stage of development. Provide multiple and varied options of new and familiar foods and allow the toddler to choose. Offer foods again and again to enhance acceptance. If a particular food is rejected, move on and try it again later; avoid forcing toddlers to eat or finish foods. The parent's role is to provide a variety of foods and allow the toddler to choose how much, if any, she will eat. Since picky eating or food jags may result in inadequate growth or nutrient inadequacy, growth or nutrient status should be monitored. Growth also should be monitored more frequently if a "food jag" persists.
	h) How can caregivers help the child develop independence in feeding?	To help children develop independence in feeding, parents and caregivers may need to demonstrate feeding skills rather than rely on verbal prompts alone. Awareness of developmental feeding skills is needed so that the tasks presented are appropriate. Cultural differences in mothers' expectations and encouragement of self-feeding should be recognized and respected, but if inappropriate, these should not be encouraged.
	i) How can parents and caregivers feed safely?	Keep all foods safe to eat and appropriate for baby's development. Providing guidance to parents and caregivers about safe feeding may increase their awareness and understanding, thereby helping to reduce the risks of food-borne illness, choking, lead poisoning and non-food eating and high intakes of nitrates, nitrites and methylmercury. For infant formula, closely follow manufacturer's use and storage instructions on the label. In handling expressed breastmilk, keep it clean and avoid contamination when it is collected and stored. Bottle-fed infants are at higher risk of exposure to food-borne bacteria, particularly if the bottles are left at room temperature for several hours. Make sure the baby's bottle is cleaned and disinfected after each use. To help ensure that homemade or commercially prepared baby food is safe, follow general food safety guidelines and/or the manufacturer's package directions. Since infants and toddlers can be at risk for choking, knowledge of choking hazards can lessen the chances of it occurring.