

Food for Thought

What are Infants and Toddlers Really Eating?

Synopsis — Because food preferences develop early in life, and these preferences predict consumption habits, making daily decisions about which foods to feed a hungry and curious baby is an important responsibility. Your professional guidance is critical to helping parents make thoughtful, reasoned choices when feeding their infants and toddlers. In offering this advice, it may be useful to know more about the foods your youngest patients are actually eating.

According to the recent Feeding Infants and Toddlers Study (FITS), overall, the diets of infants and toddlers are nutritionally adequate. However, analysis of the specific foods being fed revealed a surprising number of potential problems. Perhaps the most important finding was that eating patterns identified as problematic in older children and adults — for example, lack of fruits and vegetables and use of foods that are high in sugar and/or fat — begin appearing in children’s diets at very young ages. This article reviews the food consumption patterns of infants and toddlers, with special emphasis on areas where parents may need additional guidance from pediatric health care providers.

As infants and toddlers grow, they gradually transition from a diet that is largely based on breast milk or infant formula to one that includes the increasingly complex range of foods commonly found on the family table.^{1,3} While this milestone is a source of pride for parents, many may become confused about how to best manage this critical transition. One reason for the confusion is that existing recommendations about feeding complementary foods (foods and beverages other than breast milk and formula) to infants and children under the age of 2 are not very specific.

The general guideline is to introduce complementary foods when infants are developmentally ready, but it is difficult to define precisely the age at which these foods should be introduced.

According to the American Academy of Pediatrics (AAP), there is no



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nutritional need for complementary foods before 4 months of age.⁴ While available research indicates that there is no harm in introducing *safe, nutritious* complementary foods after 4 months of age when the infant is developmentally ready, there is little evidence that delaying the introduction of complementary foods until 6 months of age leads to significant benefits.⁴ The AAP Committee on Nutrition has concluded that complementary foods may be introduced between 4 and 6 months of age, but acknowledges that even within the AAP there is a difference of opinion. For example, the Committee on Nutrition's Section on Breastfeeding recommends that infants be exclusively breastfed for at least 6 months.⁴

There is little evidence to support introducing complementary foods in a particular order,⁴ and there are few specific recommendations in this area. The general guideline is to introduce one new "single-ingredient" food at a time, and to introduce no other foods for 2-7 days to watch for possible allergic reaction.⁵ Feeding of iron-fortified infant cereals and iron-rich meats has been recommended as an important means of preventing iron-deficiency anemia.⁶ The AAP recommends that fruit juices be introduced after 6 months of age, and be limited to 4 to 6 oz. per day.⁴ The AAP also recommends that cow's milk be avoided in the first year of life.⁴ For the toddler years, food choices can be guided by the *Dietary Guidelines for Americans*,⁷ the *Food Guide Pyramid for Young Children*,⁸ which translates the *Dietary Guidelines* into food group-based recommendations. However, both of these publications are designed for children 2 years of age and older and provide no specific guidance for toddlers between 12 and 24 months of age. The recently published *Start Healthy Feeding Guidelines for Infants and Toddlers* is currently the only concise, up-to-date, authoritative reference for infant and toddler feeding.⁵

Because food preferences develop early in life,^{9,10} and these preferences predict consumption habits,¹¹ making daily decisions about which foods to feed a hungry and curious baby is an important responsibility. Your professional guidance is critical to

helping parents make thoughtful, reasoned choices when feeding their infants and toddlers — choices which ensure that children get the nutrients they need today and develop a lifelong habit of healthy eating. In offering this advice, it may be useful to know more about the foods your youngest patients are actually eating. This article reviews the food consumption patterns of infants and toddlers, with special emphasis on areas where parents may need additional guidance from pediatric health care providers.

The Feeding Infants and Toddlers Study

The recent Feeding Infants and Toddlers Study (FITS) provides an important look at the food and nutrient consumption patterns of US infants and toddlers between 4 and 24 months of age. Previous research on consumption patterns of infants and toddlers focused mainly on breastfeeding, the use of cow's milk, and/or the timing of the introduction of solid foods.¹²⁻¹⁴ Given the current epidemic of obesity in young children and the corresponding increased lifetime risk of chronic disease, FITS findings provide a much-needed, critical look at early feeding patterns.

To gather FITS data, parents or primary caregivers were asked to report everything that their 4- to 24-month-old child consumed during the preceding 24-hour period. Between March and July of 2002, data for 3,022 infants and toddlers were collected using the Nutrition Data System for Research (NDS-R, version 4.03, 2001) from the University of Minnesota Nutrition Coordinating Center in Minneapolis, MN.

Contrary to AAP recommendations, 20% of infants 9 to 11 months of age are consuming some cow's milk in a day. In addition, 18% of toddlers 12 to 14 months of age are fed reduced-fat or non-fat milk.



For purposes of data analysis, the children were divided into six age groups, ranging from 4 to 6 months through 19 to 24 months.

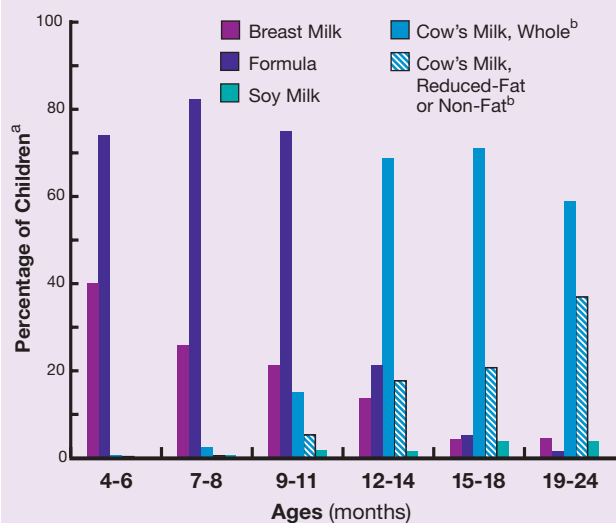
Individual foods and beverages that they consumed were assigned to major and minor food groups and classified based on the most recent Continuing Survey of Food Intakes by Individuals (CSFII).¹⁵ Minor adjustments were made to better reflect dietary patterns of infants and toddlers. For example, rather than considering milk and milk-based foods such as cheese, yogurt, and ice cream in a single food group, milk (including breast milk) was considered a major food group, cheese and yogurt were considered in a separate major food group of protein sources, and ice cream was considered a dessert item. Extensive

information on the FITS sample population, data collection methods, and food group classifications is available elsewhere.^{16,17}

So, What Are Infants and Toddlers Eating?

Overall, FITS researchers found that the diets of infants and toddlers are nutritionally adequate.¹⁸ However, analysis of the specific foods being fed revealed a surprising number of potential problems. Perhaps the most important finding was that eating patterns identified as problematic in older children and adults — such as a lack of fruits and vegetables and regular consumption of foods that are high in sugar and/or fat — begin appearing in children's diets at very young ages. This pattern becomes

Figure 1: Percentage Consuming Milks at Least Once in a Day

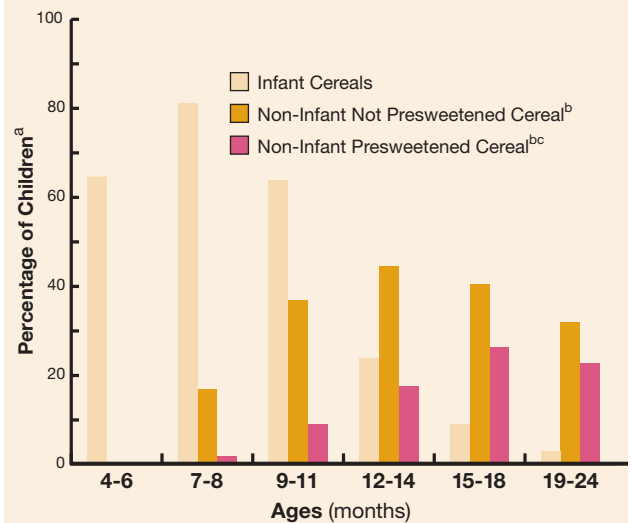


^a Cumulative totals may equal more than 100% because some children consume more than one type of milk in a day.

^b Includes goat's milk, which was consumed by 0.2% of 9 to 11 month olds.

Reference: Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating? J Am Diet Assoc 104:S22-S30, 2004.

Figure 2: Percentage Consuming Cereals at Least Once in a Day



^a Cumulative totals may equal more than 100% because some children consume more than one type of cereal in a day.

^b Includes both ready-to-eat and cooked cereals.

^c Defined as cereals with more than 21.2 grams sugar per 100 grams.

Reference: Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating? J Am Diet Assoc 104:S22-S30, 2004.

One of the most disturbing findings from FITS is the large percentage of infants and toddlers that are not eating fruits or vegetables on a daily basis.



particularly apparent as toddlers make the transition from prepared baby foods to so-called table foods, which reflect the foods being eaten by other members of the family.



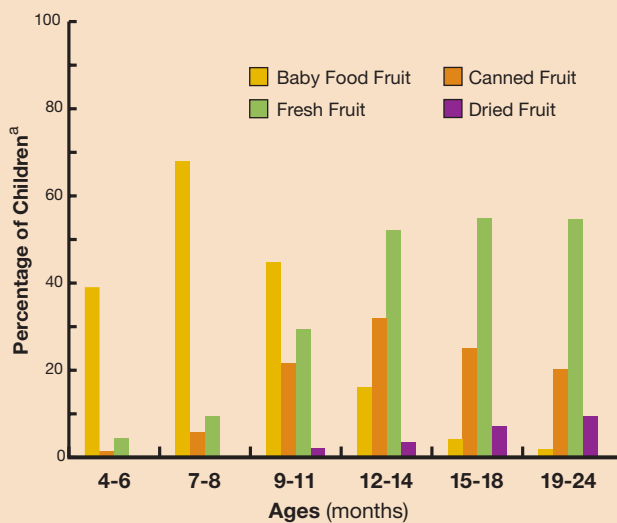
(Figure 1). By the time toddlers are 12 to 14 months old, less than 14% consume breast milk in a day.

Breast Milk, Infant Formula, and Cow's Milk

Milks figure prominently in the diets of nearly all infants and toddlers throughout the first two years of life. However, FITS researchers found that breastfeeding rates are below the *Healthy People 2010* objective of 50% at 6 months of age and 25% at 12 months of age, respectively.¹⁹ In fact, only 40% of 4 to 6 month-old infants consume some breast milk in a day, with this percentage dropping off sharply at 7 to 8 months (25%) and continuing to decline thereafter

Beginning around 12 months of age, consumption of formula decreases markedly, and cow's milk takes over as the principal milk consumed. The AAP recommends that cow's milk not be introduced until 12 months of age and that toddlers up to 2 years of age be fed whole milk rather than reduced-fat or non-fat milk.²⁰ FITS data indicate that some parents are not adhering to these recommendations, with 20% of infants 9 to 11 months of age consuming some cow's milk in a day (Figure 1). In addition, 18% of toddlers 12 to 14 months of age are fed reduced-fat or non-fat

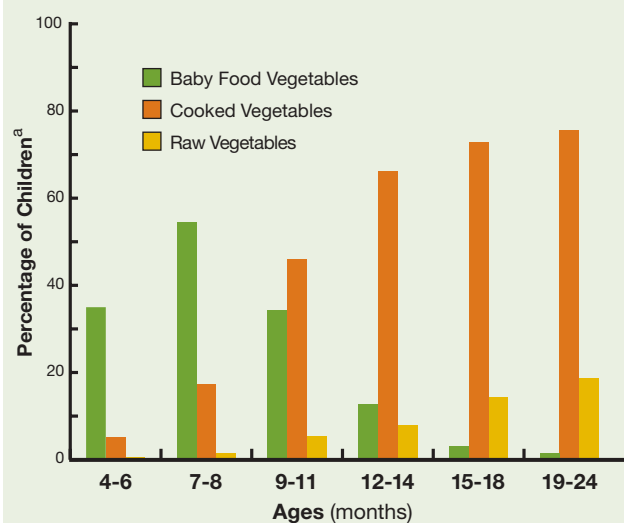
Figure 3: Percentage Consuming Fruits at Least Once in a Day



^a Cumulative totals may equal more than 100% because some children consume more than one type of fruit in a day.

Reference: *Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating?* J Am Diet Assoc 104:S22-S30, 2004.

Figure 4: Percentage Consuming Vegetables at Least Once in a Day



^a Cumulative totals may equal more than 100% because some children consume more than one type of vegetable in a day.

Reference: *Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating?* J Am Diet Assoc 104:S22-S30, 2004.

Fewer than 15% of infants under the age of 7 months consume meats and other foods high in protein (e.g., eggs, cheese, peanut butter, legumes).

milk. This percentage increases with age; among toddlers 19 to 24 months of age, 38% are fed reduced-fat or non-fat milk. These data suggest that parents may need to be reminded that cow's milk should not be offered to infants under 1 year of age, and that only whole milk should be offered to children 12 to 24 months of age.

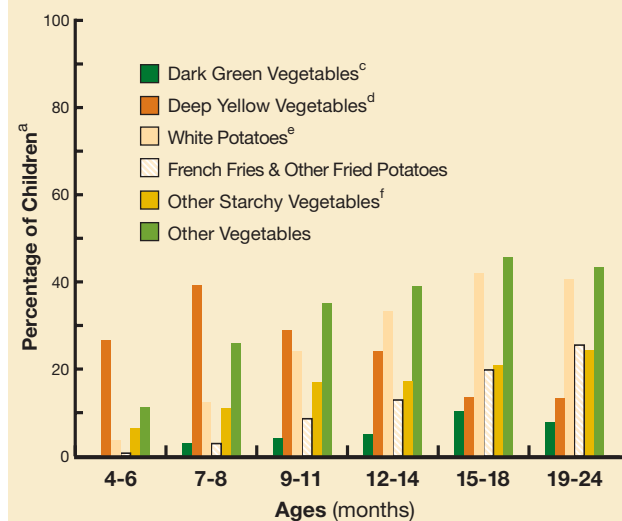
Grains and Grain Products

By 4 to 6 months of age, the majority of infants (66%) consume at least one grain product in a day, the most common of which is infant cereal. Consumption of grain products increases steadily with age and consumption of infant cereal drops off as other grain products (such as non-infant cereals) and grain-based mixed dishes (such as sandwiches) take center stage. It is encouraging that the majority of infants up to 11 months of age are consuming infant cereals (Figure 2, pg 4). Iron-fortified infant cereals play an important role in preventing iron deficiency, as recommended by the Centers for Disease Control and Prevention (CDC).⁶ However, FITS data suggest that consumption of non-infant cereals that are high in sugar (defined as those containing more than 21.2 grams of sugar per 100 grams) may be a concern. These cereals appear in the diets of infants as young as 7 to 8 months of age and are consumed by roughly one-quarter of toddlers 15 months of age and older. Early use of such cereals may contribute to a preference for highly sweetened foods.

Fruits and Vegetables

Forty-two percent of infants 4 to 6 months old consume at least one type of fruit in a day, excluding fruit juices and small amounts of fruit that may have occurred in mixed items such as cookies or pies. The percentage of infants consuming fruit increases through 12 to 14 months, peaking at 77% and then declining for older age groups. For infants through 8 months old, the most common source of fruit is commercial baby foods. Baby foods are gradually

Figure 5: Percentage Consuming a Variety of Vegetables^b at Least Once in a Day



- a Cumulative totals may equal more than 100% because some children consume more than one type of vegetable in a day.
- b Totals include commercial baby food, cooked vegetables, and raw vegetables.
- c Reported dark green vegetables include broccoli, spinach and other greens, and romaine lettuce.
- d Reported deep-yellow vegetables include carrots, pumpkin, sweet potatoes, and winter squash.
- e Excluding French fries and other fried potatoes.
- f Reported starchy vegetables include corn, green peas, immature lima beans, black-eyed peas (not dried), cassava and rutabaga.

Reference: Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating? J Am Diet Assoc 104:S22-S30, 2004.

replaced by other sources of fruit — mainly fresh fruits — as age increases (Figure 3, pg 5).

Similarly, 40% of infants 4 to 6 months old consume some type of vegetable in a day (excluding vegetables contained in mixed dishes such as pizza or pasta with tomato sauce), a percentage that steadily increases to 82% of toddlers by 19 to 24 months of age. For infants through 8 months of age, commercial baby food tops the list of vegetable sources. As age increases, commercial baby foods are replaced by cooked vegetables (Figure 4, pg 5).

One of the most disturbing findings from FITS is the large percentage of infants and toddlers that are not eating fruits or vegetables on a daily basis. In fact, among infants and toddlers 7 to 8 months and older, continued on page 8

Putting Research Into Practice

with Sarah O'Brien, MD



Four-year-old Margaret and her family are new to the area, and present to your office today for a well-child visit. While reviewing her growth chart, you note that Margaret's height is 39 inches (50th %ile) and her weight is 40 pounds (75-90th %ile). However, her body mass index (BMI) is 18.2, just above the 95th %ile for a four-year-old female. You ask Margaret's mother if she has any concerns about her daughter's weight. She laughs and says, "Oh, she just has some baby fat. She'll outgrow it eventually."

The rapidly increasing prevalence of obesity among children is one of the most challenging dilemmas currently facing pediatricians. For many children, unfortunately, obesity starts as early as the preschool years. In the most recent National Health and Nutrition Examination Survey, the prevalence of obesity (BMI > 95th %ile) had reached 10% among children 2 to 5 years of age, with an additional 20% at risk for obesity (BMI 85-94th %ile).¹ As we learn more about the natural history of obesity, it has become clear that the widespread belief among families and even some physicians that young children will simply "outgrow" their obesity is just not true. We now know that even a 4-year-old obese child has a 36% chance of becoming an obese adult, with an even higher risk if there is a history of parental obesity.²

The "baby-fat myth" is likely contributing to the under-identification of obesity in the preschool population. A recent study at our institution found that pediatricians failed to identify obesity in two-thirds of children < 5 years of age, with even poorer identification among children with a milder degree of obesity.³ BMI-for-age is now the recommended screening tool for obesity for children > 2 years of age. As can be seen in our vignette, it is a more sensitive tool for picking up milder

degrees of obesity, even when the height and weight alone appear normal.

Obesity in the preschool age group deserves our attention. Not only do these children have a significantly greater risk of adult obesity compared to their peers, but intervention in this age group is also more likely to be successful. Young children require smaller shifts in calorie balance to yield substantial changes in dietary intake, and habits are more easily changed when a few weeks or months represent a larger proportion of their total experience.⁴ The American Academy of Pediatrics recommends early intervention in childhood obesity, with the initiation of treatment when children are > 3 years of age.⁵ It is important to emphasize, however, that prolonged weight maintenance, rather than weight loss, is usually the first-line therapy for a young overweight child. Suggestions for parents of young children can include establishing daily family meal and snack times, not using food as a reward, and allowing their independence-seeking young child to still make food choices, but between healthy items (i.e. choosing between yogurt or pretzels for an afternoon snack).

Decreasing sedentary behavior is also crucial in promoting weight maintenance, with strong evidence linking television viewing and obesity. The average child now watches three hours of television each day, and one study of low-income preschool children revealed that 38% of 1-4 year olds had a television set in their bedroom.⁶ Parents of young children should be counseled to limit TV time to a maximum of 1-2 hours per day, remove television sets from bedrooms, and to avoid eating meals or snacks in front of the television.



As pediatricians, we need to help dispel the myth of "baby fat" among our preschool-aged patients. Rather than reassuring families that their child will "outgrow" their extra weight, we need to take advantage of the opportunity to help our young patients "grow into" healthy, active adults by initiating early intervention among young obese children. ●

- 1 Ogden CL et al: Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA* 288: 1728-32, 2002.
- 2 Whitaker RC et al: Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med* 337:869-73, 1997.
- 3 O'Brien SH, Holubkov R, Reis EC: Identification, evaluation, and management of obesity in an academic primary care center. *Pediatrics* 114(2), 2004. Available at www.pediatrics.org/cgi/content/full/114/2/e154.
- 4 Davis K, Christoffel KK: Obesity in preschool and school-age children: treatment early and often may be best. *Arch Pediatr Adolesc Med* 148:1257-61, 1994.
- 5 Barlow SE, Dietz WH: Obesity evaluation and treatment: expert committee recommendations. *Pediatrics* 102(3), 1998. Available at www.pediatrics.org/cgi/content/full/102/3/e29.
- 6 Dennison BA et al: Television viewing and television in bedroom associated with overweight risk among low-income preschool children. *Pediatrics* 109(6):1028-35, 2002. Available at www.pediatrics.aappublications.org/cgi/content/full/109/6/1028.

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By 19 to 24 months of age, more than 90% of toddlers consume at least one dessert/sweet, sweetened beverage, or salty snack in a day.

continued from page 6

one-quarter to one-third of children *did not consume a discrete serving of fruit in a day*. Consumption of vegetables was somewhat more prevalent, but *one-third of 7 to 8 month-old infants did not consume a discrete serving of vegetables in a day*. The same is true for about 20% of toddlers 15 months and older.

In addition, FITS found that the relative nutritional quality of the vegetables being consumed decreases with age. While consumption of dark green, leafy vegetables is low in all age groups, consumption of deep yellow vegetables decreases as age increases and consumption of potatoes and other starchy vegetables, such as corn and green peas, grows as age increases (Figure 5, pg 6). By 15 months, French fries and other fried potatoes are the most commonly consumed vegetables.

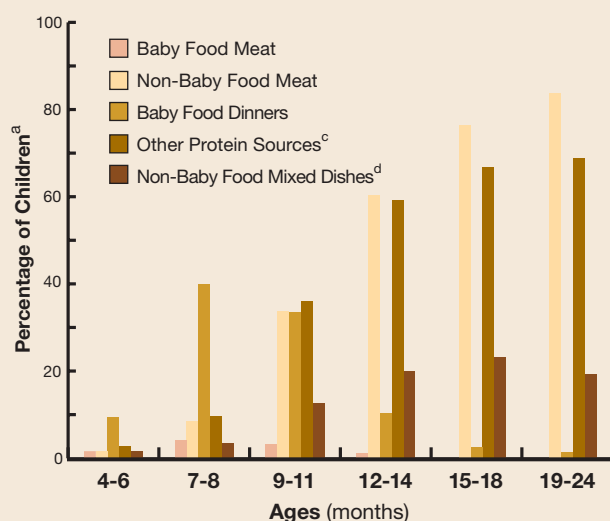
The area of fruit and vegetable consumption — or a lack thereof — is one of the greatest causes for concern unearthed by FITS, particularly since another recent study showed that the unhealthy trend of neglecting fruits and vegetables in the daily diet extends well beyond toddlerhood.²¹⁻²³ For optimum health, people of all ages should consume a wide variety of fruits and vegetables every day.^{7,8} The national “5 A Day” campaign may serve as an effective tool for discussing fruit and vegetable consumption with parents, as this program is well known and its message is simple: Everyone should eat at least five servings of fruits and vegetables each day, with an emphasis on deeply hued varieties.²⁴ Parents may be aware of this message, but may not realize the importance that it has to the health of their infant or toddler. Colorful fruits and vegetables are chock-full of important vitamins and dietary fiber. In addition, emphasizing fruits and vegetables in the diets of young children may promote a lifelong habit. Research has shown that two of the most important predictors of fruit and vegetable intakes among adults are whether they like the taste and whether they have

been in the habit of eating many fruits and vegetables since childhood.²²

Meats and Other Protein Sources

Fewer than 15% of infants under the age of 7 months consume meats and other non-milk protein sources (e.g., eggs, cheese, peanut butter, legumes) (Figure 6). When these foods do begin to appear in the diet, they are most commonly consumed in commercial baby food dinners. Fewer than 5% of infants of any age consume plain baby food meats. By 9 to 11 months, the percentage of children consuming non-baby food meats, poultry, and fish equals that of commercial baby food dinners.

**Figure 6:
Percentage Consuming Meats and Other Protein Sources^b at Least Once in a Day**



^a Cumulative totals may equal more than 100% because some children consume more than one type of meat or other protein in a day.

^b Includes baby food and non-baby food sources.

^c Includes dried beans and peas, vegetarian meat substitutes, eggs, peanut butter, nuts, seeds, cheese, and yogurt.

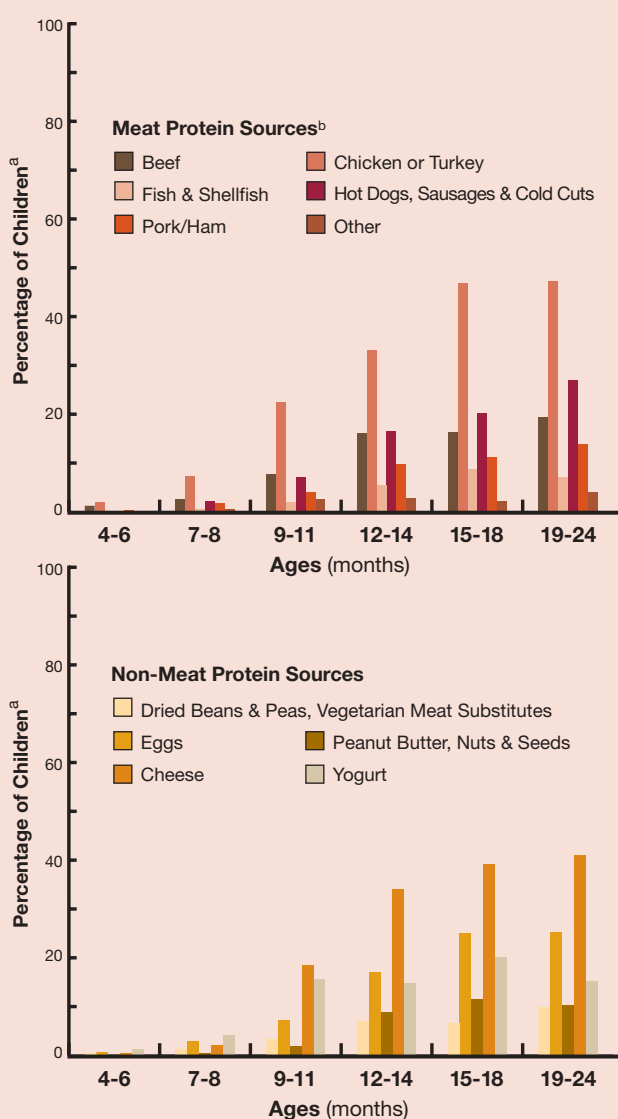
^d Includes beans and rice, chili and other bean mixtures, meat mixtures with vegetables and/or rice/pasta, soup.

Reference: Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating? *J Am Diet Assoc* 104:S22-S30, 2004.

The food consumption patterns revealed in FITS are consistent with those that have been observed among both older children and the US population in general.



Figure 7:
Percentage Consuming Select Meats^b and Non-Meat Protein Sources at Least Once in a Day



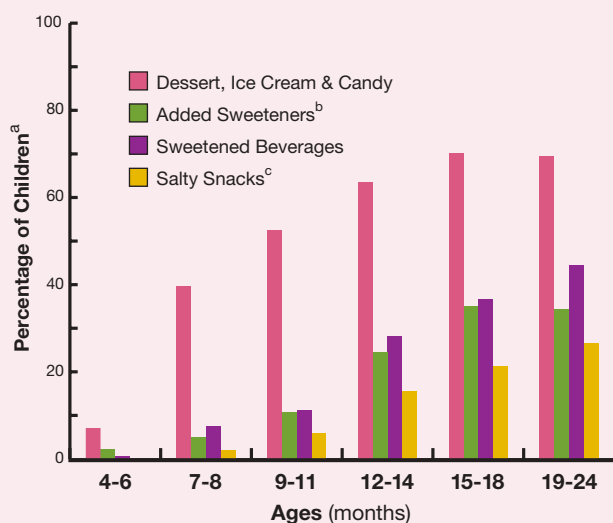
a Cumulative totals may equal more than 100% because some children consume more than one meat or non-meat protein source in a day.
b Includes baby food and non-baby food sources.

Reference: Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating? J Am Diet Assoc 104:S22-S30, 2004.

Poultry is the most common type of meat consumed, followed by beef, and hot dogs, sausages, and cold cuts (does not include contributions from mixed items such as sandwiches and casseroles) (Figure 7). By 15 months of age, hot dogs, sausages, and cold cuts are the second most commonly consumed type of meat. Among infants 12 months and older, cheese is the most commonly consumed non-meat protein source, followed by eggs and yogurt. This pattern holds true through 24 months of age.

The CDC recommends the consumption of plain lean meats after 6 months of age to prevent iron deficiency.⁶ Easily chewed red meats such as baby food meat and pureed home-prepared meat have been

Figure 8:
Percentage Consuming Different Types of Desserts, Sweeteners, Sweetened Beverages and Salty Snacks at Least Once in a Day



a Cumulative totals may equal more than 100% because some children consume more than one type of dessert, sweetener, sweetened beverage or salty snack in a day.

b Milk flavorings, sugar, syrups, preserves.

c Includes potato chips, popcorn, cheese curls/puffs, tortilla chips, corn chips, and other types of chips and salty snacks.

Reference: Feeding Infants and Toddlers Study: What Foods Are Infants and Toddlers Eating? J Am Diet Assoc 104:S22-S30, 2004.

The FITS data provide a foundation for understanding the food consumption patterns of infants and toddlers, so pediatric health professionals can pinpoint the problem areas of this age group's diets, and be better equipped to recommend solutions.



recommended as a source of highly bioavailable heme iron.²⁵ The FITS data indicate that relatively few infants under the age of 9 months are fed plain meats of any kind. Commercial baby food dinners, which provide a less concentrated source of iron, are far more commonly consumed. While these foods have a place in a healthy diet, parents should be encouraged to also feed plain lean meats.

Desserts, Sweeteners, Sweetened Beverages and Salty Snacks

Another cause for concern revealed by FITS data is the consumption of foods high in fat, sugar and/or salt, but low in nutritional value. Surprisingly, 10% of infants as young as 4 to 6 months of age consume a dessert item (including candy and ice cream), some type of added sweetener, such as sugar, syrups, preserves, or milk flavorings, a sweetened beverage, or a salty snack in a day (Figure 8, pg 9). This percentage rises steadily as age increases. By 19 to 24 months of age, more than 90% of toddlers consume at least one dessert/sweet, sweetened beverage, or salty snack in a day: 69% consume a dessert item, 44% consume a sweetened beverage, 34% consume an added sweetener, and 27% consume a salty snack. Commercially prepared desserts and cookies marketed specifically towards infants are the most popular dessert items fed to infants until 9 months of age. After that, other types of dessert items enter into the mix.

Childhood obesity is on the rise in the United States²⁶ and consumption of excess calories is an important part of the problem. Sweets, desserts, and snack foods may provide surplus calories and may replace healthier foods that are lower in calories and higher in micronutrients. While sweets and snacks can be

included in a healthy diet, parents should be encouraged to only offer these foods occasionally. Instead, parents need to emphasize nutrient-dense, age-appropriate snacks, such as fruit, cheese, yogurt, and cereal, and healthier beverages, such as water, milk, and 100% fruit juices.

Conclusion

The food consumption patterns revealed in FITS are consistent with those that have been observed among both older children and the US population in general.^{21-23, 27} This suggests that adults are passing on their unhealthy eating patterns to very young infants and toddlers. Undesirable trends are apparent in the diets of children as young as 7 to 8 months of age. Given that food preferences develop early in life^{9,10} and may predict later eating habits,^{11, 22} it is essential that both pediatricians and parents be made aware of these trends. Improvements in early feeding patterns may yield long-term improvements in the prevalence of obesity and other diet-related health problems.

Parents need clear guidance on what to feed their children to foster the development of healthy eating habits as soon as infants begin to eat solid foods. With the FITS data providing a foundation for understanding the food consumption patterns of infants and toddlers, pediatric health professionals can pinpoint the problem areas of this age group's diets, and be better equipped to recommend solutions. In particular, a family-based approach seems to be in order, as family food choices influence what foods are offered to children. Any dietary guidance provided to parents and caregivers should stress the importance of meeting the special nutritional needs of infants



and toddlers and the potential impacts of early food preferences and eating habits over the long term. ●

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