Nutrition in Toddlers

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Toddlers make a transition from dependent milk-fed infancy to independent feeding and a typical omnivorous diet. This stage is an important time for physicians to monitor growth using growth charts and body mass index and to make recommendations for healthy eating. Fat and cholesterol restriction should be avoided in children younger than two years. After two years of age, fat should account for 30 percent of total daily calories, with an emphasis on polyunsaturated fats. Toddlers should consume milk or other dairy products two or three times daily, and sweetened beverages should be limited to 4 to 6 ounces of 100 percent juice daily. Vitamin D, calcium, and iron should be supplemented in select toddlers, but the routine use of multivitamins is unnecessary. Food from two of the four food groups should be offered for snacks, and meals should be made up of three of the four groups. Parental modeling is important in developing good dietary habits. No evidence exists that early childhood obesity leads to adult obesity, but physicians should monitor body mass index and make recommendations for healthy eating. The fear of obesity must be carefully balanced with the potential for undernutrition in toddlers. (Am Fam Physician 2006;74:1527-32, 1533-4. Copyright © 2006 American Academy of Family Physicians.)

Patient information: A handout on child nutrition, written by the authors of this article, is provided on page 1533.

See related editorial on page 1483.

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An important change in nutritional habits occurs during the transition from infancy to toddlerhood at about one year of age. During this time, toddlers gain independence by developing self-feeding skills and increasing control over food choices. The transition is accompanied by improved motor skills, awareness of table behavior, appreciation for tastes and preferences, and increased energy and nutrient requirements.

Caregivers for children at this age are responsible for providing appropriate foods in a proper setting, structuring mealtimes, and responding to behavior. As toddlers gain responsibility for their food choices, many parents become concerned about meal refusal, erratic appetites, preference for sweet foods, and undisciplined table behavior. Physicians and other health care professionals may have an opportunity for anticipatory guidance in this developmental transition period.

Background

The number of overweight children has increased dramatically since the 1970s, especially in low-income households and among racial minorities.[1-3] Prevention of pediatric obesity is a key effort of the American Academy of Pediatrics (AAP).[4] However, the increased rates of overweight and obesity must be balanced by the fact that 13.5 million U.S. households were "food insecure" in 2004, with hunger especially prevalent in minority and single-parent families.[5]

Trends in children's food choices coincide with the national food supply and are influenced by taste, television, and cultural norms.[6,7] Since 1973, there has been a decline in the consumption of milk, vegetables, grains, and eggs, with a corresponding increase in consumption of fruit juices, sweetened beverages, poultry, and cheese.[8] Although the percentage of energy from total and saturated fats decreased, actual fat intakes remained the same or increased because of an increase in total calories.[9]

Food and Nutrient Recommendations

MILK

Cow's milk is not recommended during the first 12 months of life.[10,11] However, fortified cow's milk is an important dietary component of a toddler's diet because of its high-quality protein, calcium, and vitamins A and D. Calcium is involved in bone growth, tooth development, and muscle contraction, and it may play a role in the regulation of

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	*Evidence Rating*	*References*
A toddler's diet should include two or three servings of milk or other dairy products per day.	C	14, 27
Fat and cholesterol should not be restricted in children younger than two years. Children older than two years should consume an average of 30 percent of total energy from fat.	C	23, 26, 27
Toddlers should not have more than 4 to 6 ounces of 100 percent fruit juice per day; whole fruits and vegetables should be offered instead.	C	17
Daily supplementation with 200 IU of vitamin D is recommended for toddlers who consume less than 2 cups of milk daily or do not get regular sunlight exposure; otherwise, vitamin and mineral supplementation is unnecessary except in undernourished and chronically ill toddlers.	C	27, 28
Good nutritional habits should be fostered by sitting at the table, turning off the television, and interacting socially.	C	27, 33
Parents should offer children a variety of foods, expose them repeatedly to healthy foods, and model healthy eating behaviors.	C	14, 27, 32
To reassure parents and detect undernourished children, physicians should monitor growth patterns, including body mass index.	C	4, 38

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see page 1463 or http://www.aafp.org/afpsort.xml.

blood pressure and body fat.[12] One study showed that children who consumed milk with the noontime meal were the only group to meet or exceed 100 percent of the daily Dietary Reference Intake for calcium (i.e., 500 to 800 mg).[13] Two or three servings of milk or dairy products per day are recommended to meet these requirements.[14] Some toddlers are poorly weaned from an all-milk diet and consume more than the recommended number of servings; this "milk diet" is high in fat and total calories and inadequate in iron *(Table 1)*.

Concern about obesity has prompted many parents to begin giving their children reduced-fat or nonfat milk at an early age. One study that compared 2 percent milk with whole milk consumption in children 12 to 24 months of age found no difference in height, weight, and body fat percentage.[15] Although the use of lower-fat milk is probably safe in the second year of life and is effective in reducing total fat intake, the evidence has yet to show its overall benefit.

NON-MILK BEVERAGES

Several studies that examined trends in North American eating behaviors have reported a "substitution effect" of exchanging sweetened beverages for milk; this change has a significant negative impact on nutritional status.[7,16] Excessive weight, failure to thrive, chronic diarrhea, dental caries, and poor nutrient intake (especially calcium) have been linked to a disproportionate intake of fruit juices, sodas, and other sweetened beverages.[17-19]

Parents should be encouraged to meet the recommendations for two or three servings of milk each day and to offer plain water for fluids consumed alone. Juice should be limited to 4 to 6 ounces daily of 100 percent fruit juice with no added sugars, and whole fruits and vegetables should be offered as much as possible.[17] Attention should be given to preventing frequent and unregulated consumption of juice via bottles or portable cups.[16]

FAT

Fat is a calorically dense nutrient containing nine calories per gram compared with four calories per gram in carbohydrates and protein. This makes fat an important component of toddlers' diets because of their limited gastric capacity. Infants and young toddlers also may need high amounts of energy from fat because of increased caloric requirements for growth and rapid brain development. Some parents may restrict fat intake because they are concerned about obesity and atherosclerosis; however, fat restriction has been associated with poor growth in young children.[20]

The AAP recommends that fat and cholesterol not be restricted in children younger than two years.[21] Parents should be advised of the potential harms of low-fat diets in toddlers. Deficiencies in essential fatty acids are believed to affect the maturation of the central nervous system, and fat restriction may impede growth and deprive toddlers of nutrients such as fat-soluble vitamins.[21] *Table 1* demonstrates that a low-fat diet in an 18-month-old boy also is likely to result in high carbohydrate intake with inadequate nutrients.

Toddlers older than two years should consume 30 percent of total calories from fat, averaged over several days.[4,22] *Trans*-fatty acids and saturated fats should be avoided in preference of polyunsaturated fats.[23,24] Parents who wish to restrict fat intake should be warned of the potential for delayed growth when fat intake is

TABLE 1
Sample Meal Patterns for an 18-Month-Old Boy

Meal	*Recommended*	*Excessive juice**	*Excessive milk**
Breakfast	1 slice wheat bread 1 soft-boiled egg 2 oz orange juice	1 slice wheat bread 1 soft-boiled egg 8 oz orange juice	1 slice wheat bread 1 soft-boiled egg 8 oz whole milk
Snack	1 medium apple, sliced 2 oz whole milk	4 oz apple juice 0.5 oz cheddar cheese cubes	1 medium apple, sliced 2 oz whole milk
Lunch	1/2 peanut butter sandwich (1/2 Tbsp peanut butter, 1 slice wheat bread) 2 oz whole milk 4 baby carrots, raw	1/2 peanut butter sandwich (1/2 Tbsp peanut butter, 1 slice wheat bread) 4 oz grape juice	1/2 peanut butter sandwich (1/2 Tbsp peanut butter, 1 slice wheat bread) 4 oz whole milk 4 baby carrots, raw
Snack	1/4 cup dry cereal 0.5 oz cheddar cheese cubes	1/4 cup dry cereal 2 oz whole milk	1/4 cup dry cereal 0.5 oz cheddar cheese cubes
Supper	1/2 cup cooked pasta, 1/4 cup spaghetti sauce with 1 oz lean ground beef 3 broccoli spears 4 oz water	1/2 cup cooked pasta, 1/4 cup spaghetti sauce with 1 oz lean ground beef 3 broccoli spears 4 oz apple juice	1/2 cup cooked pasta, 1/4 cup spaghetti sauce with 1 oz lean ground beef 3 broccoli spears 4 oz whole milk
Snack	1/4 cup canned fruit cocktail in juice 1/4 cup low-fat fruit yogurt	1/4 cup canned fruit cocktail in juice 1/4 cup low-fat fruit yogurt	1/4 cup canned fruit cocktail in juice 1/4 cup low-fat fruit yogurt
Nutritional information			
Calories (estimated energy requirement)	825.4 (783.3)	1,045.3 (783.3)	1,059.6 (783.3)
Fat (% calories)	25.5 g (28)	23.9 g (21)	39.6 g (34)
Protein (g per kg)	39.5 g (4.1)	38.6 g (4.0)	53.1 g (5.5)
Fiber	15 g	12.5 g	15 g

NOTE: *Child's length is 29.5 inches (75 cm), and weight is 9.7 kg (21 lb, 5 oz).*

**—Note that excessive juice and milk patterns often lead to poor solid intake.*

less than 20 percent of calories.[25,26] *Table 2* presents a sample day for a four-year-old child, with an example of high fat intake.

VITAMIN AND MINERAL SUPPLEMENTS

The sale and marketing of children's vitamins is a thriving business because parents often are concerned about poor vegetable and fruit consumption. However, the vitamins and minerals contained in supplements are easily obtained in small amounts of food, and supplements may be lacking in other important nutrients such as calcium and zinc. Routine supplementation is not necessary for healthy children who consume a varied diet.[27]

Toddlers who consume less than two cups of fortified cow's milk and do not get regular sunlight exposure should receive a daily supplement with 200 IU of vitamin D.[28] Other mineral supplements may be considered in children who cannot or will not consume adequate amounts of micronutrients. High-risk children who may benefit from multivitamin supplementation include those in low-income families, children with chronic disease such as cystic fibrosis, and those who are vegetarians. The AAP recommends screening high-risk toddlers for anemia and supplementing with iron as needed. Caution should be used to prevent accidental overdose of candy-like vitamins, especially those high in iron.

Behavioral Recommendations

EATING PATTERNS

Young children are unpredictable in the time and place they feel hungry, and they generally do not have the innate ability to choose a well-balanced diet. These erratic eating habits are often frustrating for parents.[29] "Food jags" occur when toddlers request repetitive presentation of one food while other foods are excluded entirely.

Parents can be encouraged that although toddlers seem to have irregular diets, their total energy intake, averaged

TABLE 2
Sample Meal Patterns for a Four-Year-Old Girl

Meal	*Recommended*	*Excessive sugar*	*Excessive fat**
Breakfast	1/2 cup oatmeal 4 oz of 2 percent milk 1 orange	1 package of oatmeal with "dinosaur bones" 4 oz of 2 percent milk 4 oz orange juice	1 store-bought blueberry muffin with 1/2 Tbsp butter 4 oz of 2 percent milk 1 orange
Snack	1 apple, quartered 1 oz cheese	8 oz fruit punch drink 10 animal crackers	1 peanut butter granola bar with chocolate coating
Lunch	1/2 egg salad sandwich (1 boiled egg, 1 Tbsp mayonnaise, 1 slice wheat bread) 4 oz of 2 percent milk 10 baby carrots 1/2 banana	1/2 egg salad sandwich (1 boiled egg, 1 Tbsp mayonnaise, 2 slices wheat bread) 4 oz orange juice 10 baby carrots	1/2 egg salad sandwich (1 boiled egg, 2 Tbsp mayonnaise, 1/2 Tbsp butter, 1 slice wheat bread) 1/2 cup chocolate pudding 1/2 banana
Snack	1/2 raisin bagel 1 Tbsp peanut butter	1/2 plain bagel 1 Tbsp strawberry jam	1/4 bag (8 oz) plain potato chips
Supper	1/2 chicken breast, grilled 1/2 cup cooked peas 1/2 cup cauliflower 1/2 cup cooked long-grain rice 4 oz of 2 percent milk 1/4 cantaloupe, cubed	1/2 chicken breast, grilled 1/2 cup cooked peas 1/2 cup cauliflower 1/2 cup cooked long-grain rice 4 oz apple juice 2 fruit-flavored wraps	6 chicken nuggets Medium order of French fries 4 oz of 2 percent milk Chocolate-covered ice cream bar
Snack	2 slices Black Forest ham 6 saltine crackers	1 store-bought blueberry muffin 1 Tbsp raspberry jam	2 slices Black Forest ham 6 saltine crackers
Nutritional information			
Calories (estimated energy requirement)	1,393 (1,402)	1,945 (1,402)	2,526 (1,402)
Fat (% calories)	43 g (28)	39 g (18)	130.6 g (47)
Protein (g per kg)	70.2 g (4.4)	59.4 g (3.7)	65.7 g (4.1)
Fiber	25 g	21.8 g	18.9 g

NOTE: *Child's length is 39.5 inches (100 cm), and weight is 16 kg (35 lb, 3 oz).*

**—The high-fat meal pattern has adequate protein intake but almost no fruit or vegetable consumption.*

over several days, usually is constant.[30] Physicians can reassure parents by demonstrating normal growth patterns in toddlers despite "fussy" eating. Children adjust energy intake according to needs and may take years to change to a clock-defined meal pattern.[31] Key components of healthful eating for toddlers are the availability and variety of healthy food choices for snacks and meals. Balanced meals have servings from at least three of the four food groups, and balanced snacks have servings from two of the four food groups.

EATING BEHAVIOR

During the toddler years, children develop the physical ability to self-feed and learn the social, cultural, and behavioral expectations related to food. Self-feeding should be encouraged because it will help the child develop fine motor skills and will lead to the development of controlled energy intake.[24] Children will learn acceptable table behavior as they interact with adults and experience appropriate feedback for "good" and "bad" behaviors, such as eating vegetables and throwing food, respectively. New foods likely will be accepted only after repeated exposures (at least 10), and children will enjoy eating if they have patient caregivers who present a variety of foods and foster independence and confidence.[32]

The structure of adult eating habits will be learned in the toddler years. The transition from on-demand feeding to regular time-based meals is a slow one, and healthy snacks are important "mini-meals" as this change takes place. By sitting at the table, turning off the television, and eating the same foods as the toddler, caregivers can create the desired social environment in which good nutritional habits develop.[33]

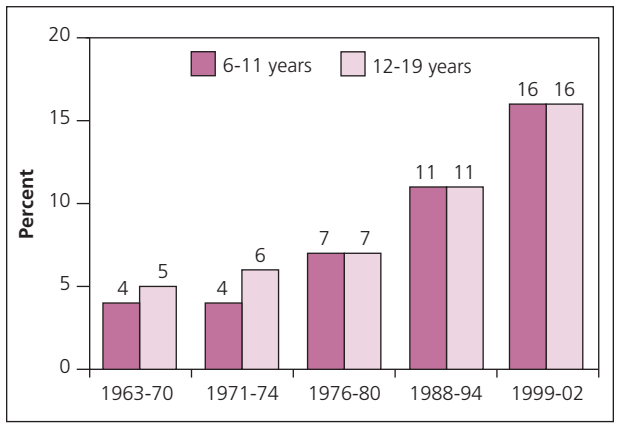

Figure 1. Prevalence of overweight in U.S. children six to 19 years of age between 1963 and 2002.

Reprinted from Centers for Disease Control and Prevention, National Center for Health Statistics. Prevalence of overweight among children and adolescents: United States, 1999-2002. Accessed July 19, 2006, at: http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overwght99.htm.

Obesity

Obesity has risen to the top of the public health agenda,[1] and in children it has implications for negative social stigmatization, poor self-esteem, and the potential adult morbidities of hyperlipidemia, diabetes, and hypertension.[34,35] Obesity in toddlers has not been proven to be a direct risk factor for these conditions, yet overweight toddlers may grow into overweight school-age children who clearly are at high risk. *Figure 1* shows the trend of overweight in older children in the United States over the past few decades.[36]

Preventing obesity is a complex balance between appropriate diet without excess restriction and parental concern without being overly controlling. Concerned parents may inadvertently promote unhealthy eating behaviors by restricting choices and disrupting the coordination of well-regulated energy intake.[37] However, overweight toddlers should not be allowed to continue poor dietary habits. Although unproven, a prudent approach would be to provide weight management counseling to parents whose child's body mass index (BMI) is above the 85th percentile, especially if they have morbidities or developmental delay.[38,39] Physicians can individualize dietary and behavioral changes based on ascertainment of home environment, family history, parental abilities, average daily food intake, and activity level. Caution must be used to avoid encouraging a strict low-calorie, low-fat, or fad diet, which may be unbalanced and nutrient-poor. Toddlers with severe obesity should be referred to an endocrinologist or pediatrician for further evaluation.

The AAP recommends monitoring growth patterns (including BMI), promoting physical activity, and encouraging parents to provide and model healthy food choices.[4] The effect of parental modeling should be emphasized, because children with obese parents are at particularly high risk for adult obesity.[40,41] Downloadable growth and BMI charts are available at http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm.

Undernutrition

The 2002 Feeding Infants and Toddlers Study found that 18 to 33 percent of 3,022 randomly sampled toddlers consumed no discrete servings of fruits or vegetables on a given day.[42] French fries were a common staple, as were doughnuts, soda, and candy. Although many of these toddlers were considered "picky eaters," some lived in low-income homes with absent caregivers or poorly educated parents.[24,43]

Abnormal or delayed growth warrants investigation into possible metabolic and environmental causes, including diet history, family dynamics, and economic situation. Supplementation with a children's multivitamin containing iron, zinc, and calcium is recommended, as is an overall increase in caloric intake, concentrating on high-density foods such as whole milk, peanut butter, and cheese.[25] Caregivers should place persistent emphasis on variety and availability of healthy foods. Sample diet pyramids are available from the U.S. Department of Agriculture Web site at http://www.mypyramid.gov.

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