

Vegetarian Eating for Children and Adolescents

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ABSTRACT

During the past decade, vegetarianism has risen in popularity among American families. Well-planned vegetarian diets can satisfy the nutritional needs and promote normal growth of infants and children. Research has highlighted nutritional advantages to vegetarian diets and has indicated that this style of eating can lead to lifelong healthy eating habits when adopted at a young age. Several vitamins, minerals, and macronutrients may be deficient within a vegetarian diet. Careful nutrition assessment and counseling will allow nurse practitioners to play a key role in encouraging families to adopt healthy eating habits to assist in disease prevention. *J Pediatr Health Care.* (2006) 20, 27-34.

The American Dietetic Association and the American Academy of Pediatrics agree that well-planned vegan and vegetarian diets can satisfy the nutritional needs and promote normal growth of infants and young children (American Academy of Pediatrics Committee on Nutrition, 1998; Messina & Burke, 1997). In addition, a vegetarian style of eating follows the dietary guidelines and meets requirements of the Recommended Dietary Allowances for nutrients (National Academy of Science, 2003; United States Department of Agriculture, 2005). Many well-designed studies have concluded that children and adolescents who follow a properly designed vegetarian diet grow and develop normally (Nathan, Hackett, & Kirby, 1997; O'Connell et al., 1989; Sabate, Lindsted, Harris, & Sanchez, 1991; Sabate, Lindsted, Harris, & Johnston, 1990; Sanders & Manning, 1992; Sanders & Reddy, 1994). Birth weights of infants born to well-nourished vegetarian women have been shown to be similar to birth weight norms and to birth weights of infants born to nonvegetarian mothers (O'Connell et al.). Research has highlighted nutritional advantages to vegetarian diets and has indicated that this style of eating can lead to lifelong healthy eating habits when adopted at a young age. Studies show that children and adolescents who follow a vegetarian diet have a lower intake of cholesterol, saturated fat, and total fat and a higher intake of fruit, vegetables, and fiber than their nonvegetarian counterparts (Fulton, Hutton, & Stitt, 1980; Neumark-Sztainer, Story, Resnick, & Blum, 1997; Novy, 2000; Sanders & Manning). In addition, research suggests that vegetarian children are leaner than nonvegetarian children (Krajcovicová-Kudláčková, Simoncic, Bederova, Grancicova, & Magalova, 1997; Sabate et al., 1990).

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We also have learned that vegetarian adults have a decreased risk for several chronic diseases such as diabetes, coronary artery disease, hypertension, obesity, and some types of cancer (Appleby, Thoroughgood, Mann, & Key, 1999; Beilin, 1994; Dwyer, 1988; Fraser, 1999; Fraser, Lindsted, & Beeson, 1995; Kahn, Phillips, Snowdon, & Choi, 1984; Key et al., 1999; Key, Thoroughgood, Appleby, & Burr, 1996; Knutsen, 1994; Messina & Burke, 1997; Phillips et al., 1980; Rajaram & Sabate, 2000; Roberts, 1995). Aside from nutritional advantages, individuals may choose to adopt a vegetarian style of eating for other reasons. For instance, religion, economic status, environmental issues, and concerns of world hunger may play a role in a person's decision to exclude animal products from his or her diet (Messina & Burke; Rajaram & Sabate). The purpose of this article is to provide practical, factual information about vegetarian eating for infants, children, and adolescents.

The eating patterns of vegetarians can vary greatly. With the exception of vegans, most vegetarian diets consist of grains, fruits, vegetables, legumes, oils, nuts, seeds, dairy products, and eggs. Vegans exclude all foods of animal origin, including dairy, eggs, butter, honey, and gelatin (Messina & Burke, 1997). Some persons may describe themselves as vegetarian if they just limit meats, making exploration of a patient's definition of vegetarian extremely important (Barr & Chapman, 2002).

Assessing the nutritional intake of a child or adolescent is essential to monitor proper growth and development. This assessment is especially critical if they have adopted a pattern of eating, such as vegetarianism, that partially or completely eliminates an entire food group. Several dietary assessment tools can be used in a clinical setting to assess a patient's eating habits. A 24-Hour Food Recall (Figure 1) and Food Frequency Questionnaire (Figure 2), used together, can provide detailed and adequate information for evaluation. The 24-Hour Food Recall and Food Frequency Questionnaire can be sent home, filled out by the patient, and brought to the next appointment, or if time allows, it can be administered in the office. During a 24-hour food recall, a teen or a child's parent is asked to remember everything (food and beverage) consumed during the previous day. It is important to obtain a good estimate of portion sizes from the reporting individual. Food models, pictures, or measuring cups can serve as visual aids to assist the family in accurately describing intake. If the food recall is done at home, they can look at food labels to record exact measurements. The more details the patient or parent can provide, the more accurate the assessment will be. It is very helpful to ask if this was a typical day in terms of dietary intake; this information should be noted. A clinician can quickly compare the patient's intake to the dietary recommendations in MyPyramid, ac-

cessible at www.mypyramid.gov, to determine where the inadequacies, if any, lie (Stang, 2002).

A food frequency questionnaire aims to assess how often a person is eating or drinking certain foods and beverages from each of the food groups over a certain period (day, week, or month). The questionnaire can be short and simple, or it can be several pages long. For clinical purposes, a short form targeting the major food groups (grains, fruits, vegetables, dairy or dairy alternatives, meats or meat alternatives, and fats) would be appropriate. This tool gives a broader sense of what the child or adolescent consumes over a more extended period. If filled out and mailed to the office prior to the appointment, suitable educational materials or a referral to a dietitian could be arranged if necessary.

The purpose of these tools is to identify potential deficiencies in dietary intake and provide direction for patient education discussions. Dietary education materials are readily available through the newly released Food Guidance System of the United States Department of Agriculture (USDA). This interactive and individualized tool replaces the 1992 Food Guide Pyramid. MyPyramid.gov is the access point for this food guidance system. Health care providers can print useful handout materials for parents and adolescents or encourage families to explore the easy-to-use Web site. Vegetarian choices are included in the meat and bean group, including specific tips to increase variety and ensure adequate protein intake without consuming excess calories. Serving sizes for all food types are shown graphically and are described in weight or volume. The Web site includes the recommended daily total intake of each food group by age (2 through >51 years old) and sex.

Nurse practitioners (NPs) can reassure parents, children, and adolescents that a well-planned vegetarian diet is a healthy choice that

Research has highlighted nutritional advantages to vegetarian diets and has indicated that this style of eating can lead to lifelong healthy eating habits when adopted at a young age.

FIGURE 2. Food Frequency Questionnaire.

Food Frequency Questionnaire

How often do you eat or drink the following foods and beverages?

(Example: once a day, three times a day, once a week, etc.)

Milk
Yogurt
Cheese
Fruit
Vegetable
Meat
Meat alternate (dry beans, tofu, soy)
Eggs
Peanut butter, nuts, seeds
Fried foods
Juice
Soda
Kool-Aid/punch
Coffee
Tea
Water

sible. If dietary intake is inadequate, a B12 supplement will be necessary to prevent a deficiency. Breastfeeding mothers who follow a vegan style of eating should be cautioned about the potential neurologic disturbances that could occur in their baby if their diet is deficient in vitamin B12 (Graham,

Arvela, & Wise, 1992; Johnson & Roloff, 1982; Weiss, Fogelman, & Bennett, 2004).

IRON

Iron is necessary for optimal oxygen transport in red blood cells. Meat (red meat, in particular) offers the most easily absorbed type

of iron, called heme iron; however, the iron that occurs naturally in plant products (non-heme) can be consumed along with a vitamin C source to enhance absorption (Cook & Monsen, 1977). For example, adding a tomato, orange, or strawberries to a meal without meat will improve the absorption of the non-heme iron found in plant sources. Foods like spinach, dried fruits, dried beans, bulgur, fortified soy products, fortified cereals, and enriched grains contain iron. Vegetarians require 1.8 times the amount of iron than do non-vegetarians because of the lower bioavailability of iron from plant-based diets (National Academy of Science, 2003). However, it is of interest to add that iron deficiency anemia has not been shown to occur at higher rates in vegetarians compared with nonvegetarians (Ball & Bartlett, 1999; Larsson & Johansson, 2002; Position of the American Dietetic Association and Dietitians of Canada: Vegetarian Diets, 2003). Compounds called phytates, along with some additional factors naturally found in legumes, nuts, and whole grains, can inhibit iron absorption, so it is important to consume a variety of iron-rich foods daily (Gillooly et al., 1983; Hallberg, Brune, & Rosander, 1989; Messina & Mangels, 2001).

ZINC

Zinc absorption also is affected by the phytates that occur naturally in whole grains and legumes. Some vegetarians may require a higher intake of zinc than the dietary reference intake. Methods such as soaking dried beans, then discarding the soaking water before cooking, will help enhance zinc absorption (Gibson, Fiona, Drost, Mtitimuni, & Cullinan, 1998). Additional plant sources of zinc include cereals, tofu, legumes, nuts, wheat germ, and whole-grain pasta. Yeast-leavened bread, tempeh, and miso also contain zinc.

TABLE. Dietary reference intakes

Age/condition	Nutrient						
	Vitamin B12 ($\mu\text{g/d}$)	Vitamin D ($\mu\text{g/d}$)	Calcium (mg/d)	Iron (mg/d)	Zinc (mg/d)	Protein (g/d)	Omega-3 fatty acids (g/d)
Infants							
0–0.5 y	0.4	5	210	0.27	2	9.1 (0–6 mo)	0.5 (0–6 mo)
0.5–1 y	0.5	5	270	11	3	13.5 (7–12 mo)	0.5 (7–12 mo)
Children							
1–3 y	0.9	5	500	7	3	13	0.7
4–8 y	1.2	5	800	10	5	19	0.9
Male							
9–13 y	1.8	5	1300	8	8	34	1.2
14–18 y	2.4	5	1300	11	11	52	1.6
19–30 y	2.4	5	1000	8	11	56	1.6
Female							
9–13 y	1.8	5	1300	8	8	34	1
14–18 y	2.4	5	1300	15	9	46	1.1
19–30 y	2.4	5	1000	18	8	46	1.1
Pregnancy							
≤ 18 y	2.6	5	1300	27	13	71	1.4
19–30 y	2.6	5	1000	27	11	71	1.4
Lactation							
<18 y	2.8	5	1300	10	14	71	1.3
19–30 y	2.8	5	1000	9	12	71	1.4

Adapted from *Dietary Reference Intakes: Vitamins*, Food and Nutrition Board; *Dietary Reference Intakes: Elements*, Food and Nutrition Board, 2001; *Dietary Reference Intakes: Macronutrients*, Institute of Medicine. These reports can be accessed via www.nal.usda.gov/fnic/etext/000105.html.

CALCIUM

Dairy foods are a natural source of calcium for vegetarians and nonvegetarians. Vegans can consume fortified soy formulas, soy milk, soy cheese, soy yogurt, and various other calcium-fortified foods. Eating these foods in the age-appropriate amounts will ensure adequate calcium intake (Weaver & Plawecki, 1994). For infants, it is important to note that commercial soy milk should not be introduced before the end of the first year because of the low bioavailability of iron and zinc from soy (Sandstrom, Kivisto, & Cederblad, 1987). Fortified infant soy formulas are recommended for infants who are not breastfed (Mangels & Messina, 2001). As long as a child is growing normally, it is suitable to offer him or her full-fat commercial soy milk at age 1 year or older. Not all soy milk is fortified with vitamin D and calcium, so it is important that parents check the label. Other foods such as figs, blackstrap molasses, collard greens, sesame seeds, kale,

and broccoli contain calcium as well; however, a large quantity of these foods must be consumed to provide the body with as much calcium as one 8-oz glass of milk (Weaver, Proulx, & Heaney, 1999).

VITAMIN D

Vitamin D is found naturally in milk and dairy products. The body also can make vitamin D when exposed to sunlight. Past research has shown that exposing one's hands and face to the sunlight two to three times each week for 20 to 30 minutes provides enough vitamin D for light-skinned children and adolescents in moderate climates (Messina & Burke, 1997; Messina & Mangels, 2001). The most recent literature recognizes that specific age groups require a vitamin D supplement: infants who are exclusively breastfed; infants drinking less than 500 mL of vitamin D–fortified milk each day; and children and adolescents who do not receive adequate sunlight exposure, are not drinking at least 500 mL of vitamin-D fortified milk

each day, or do not take a multivitamin containing at least 200 IU of vitamin D (Gartner & Greer, 2003). Persons with dark skin or those living in a cloudy climate need more exposure. Vegetarians can choose vitamin D–fortified soy milk, cheese, yogurt, and cereals as dietary sources of this nutrient.

OMEGA-3 FATTY ACIDS

Many vegetarian diets are low in omega-3 fatty acids if eggs, fish, or large amounts of sea vegetables are not consumed. Therefore, it is important that vegetarians consume a reliable source of linolenic acid in their diet to ensure adequate production of the long chain n-3 fatty acids, docosahexaenoic acid, and eicosapentaenoic acid. Foods such as flaxseed (ground or oil), canola oil, soybean oil, soybeans, tofu, walnuts, and walnut oil contain a reasonable amount of linolenic acid (Position of the American Dietetic Association and Dietitians of Canada: Vegetarian Diets, 2003).

BOX. Nutrition counseling for pediatric patients with vegetarian diets

- Define vegetarian diet by determining what foods are excluded and what foods are acceptable
- Obtain a careful diet history through 24-hour recall or food frequency
- Evaluate diet by assessing for essential nutrients, not specific foods
- Assess parental knowledge base and access to a variety of vegan/vegetarian foods and fortified foods

Infants

- Support breastfeeding through the introduction of solid foods
 - Supplement with vitamin B12 for breastfed infants if the mother is not supplementing her diet or is not consuming food with adequate sources of vitamin B12
 - Assess sunlight exposure and recommend vitamin D supplementation if the infant is exclusively breastfed
- Review introduction of solids with protein-rich foods: pureed tofu, pureed legumes, soy yogurt
- Full-fat fortified soy milk may be used at age 1 year or older

Toddler/preschool

- Evaluate calcium sources and sunlight exposure
- Ensure healthy and frequent snacks with a variety of foods including refined grains for energy needs
- Review choking hazard with nuts; recommend grinding nuts, cutting vegetables, supervising older preschoolers with fresh celery and carrots
- Assess vegan/vegetarian food availability at day care

School age

- Assess school lunch availability of vegetarian options
- Discuss food choices and alternatives with friends/activities
- Evaluate calcium intake; supplement if the child has an inadequate calcium-fortified food intake
- Assess knowledge base of the child and educate accordingly
- Provide guidance to parents and reassurance to child that this may be the first time the child learns the diet is considered “alternative”; recognize that nutrition education at school may be a variance from the typical home diet

Adolescents

- Understand the adolescent's reason for a vegetarian diet, recognizing that the rationale may be ideological rather than health-related, including:
 - Ecological
 - Ethical opposition to killing animals
 - Disgusted by animal processing
 - Influence of friends
 - Religious reasons
- Assess knowledge base and provide targeted education, including how to read food labels
- Assess school lunch availability of vegetarian options
- Discuss food choices with friends/activities
- Evaluate weight concerns, body image, frequency of dieting for weight loss, and exercise patterns (a vegetarian diet may be an attempt to camouflage an eating disorder)
- Encourage consumption of calcium, including calcium-fortified foods
- Supplementation as necessary with calcium and vitamin B12
- Provide anticipatory guidance for parents that nutrition changes are often a safe way to experiment and assert autonomy; encourage parental support and assistance with menu planning.
- Vegan teens in omnivore households can be encouraged to plan a vegan meal for the family

GROWTH AND DEVELOPMENT ISSUES

Supplementation

Similar to the majority of the population, vegetarians often can benefit from a multivitamin supplement (Willett & Stampfer, 2001). For children and adolescents who follow a vegetarian diet and may not be ingesting 100% of the recommended amounts of vi-

tamins and minerals, a multivitamin or single vitamin/mineral supplements will help ensure that their needs are being met. Table 1 provides a list of the Dietary Reference Intakes of specific vitamins, minerals, and fatty acids that have been discussed in this article.

As mentioned earlier, many infants and children require supplementation of at least 200 IU of

vitamin D daily. Vitamin B12 supplementation (0.4μ /day for the first 6 months, 0.5μ /day beginning at 6 months of age) is necessary for breastfed vegan infants if the mother does not take a supplement or if she does not include B12-fortified foods in her diet. Zinc supplementation also may be indicated for older breastfed vegan infants; however, intake of solid

foods plays a role in this determination. Currently the American Academy of Pediatrics does not recommend zinc supplementation (Mangels & Messina, 2001). Recommendations for supplementation for vegan infants are otherwise the same as for omnivore infants.

Introduction of Solid Foods

Solids can be introduced to vegetarian infants at the same stage and pace as for omnivore infants (Mangels & Messina, 2001). Iron-fortified cereals can be given at 4 to 6 months, followed by fruits and vegetables around 6 to 8 months and alternate protein sources like mashed tofu, soy yogurt, and purred beans and legumes around 7 to 10 months. Because of potential allergens, it is best to wait to introduce nut and seed butters until after age 1 year, or as directed by a health care provider.

Growth Concerns

If growth is not occurring at the expected rate and calories need to be increased, the following foods can help increase the calorie and fat content of the diet: avocado (sliced or mashed), tofu, bean spreads, vegetable oils, margarine, and nut or seed butters (after age 1 year). High-fiber foods can fill a small stomach very quickly; therefore, in addition to the concentrated calorie sources listed above, dried fruit, peeled fruits and vegetables, fruit juices, and some refined grain products can help add calories without adding bulk at any age (Mangels & Messina, 2001).

Nutrition assessment and counseling are important aspects of health promotion in pediatric and adolescent health care. Individuals and families following a vegetarian diet benefit from an NP who is knowledgeable in specific dietary recommendations as well as community resources for a variety of vegan foods. A developmental approach allows the NP to appropriately tailor the counseling and as-

sist with planning vegetarian diets that support the growth and energy needs of children and adolescents. Key vegetarian diet counseling points for each age group are included in the Box. Careful nutrition assessment and counseling will allow NPs to play a key role in encouraging families to adopt healthy eating habits with regular exercise to assist in disease prevention.

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