TABLE 2 DIETARY RECOMMENDATIONS AND GUIDELINES FOR CHILDREN

Food intake patterns:

Shift to more plant- based diet

Increase intake in:

- Vegetables, cooked dry beans and peas, fruits, whole grains, nuts/seeds
- Seafood, and only moderate amounts of lean meats, poultry, and eggs
- Fat-free and low-fat milk products

Reduced food intake patterns:

Reduce intake in:

- Foods containing added sugars and solid fats
- Sodium
- Refined grains (especially those including added sugar, sodium, and solid fat)

Ogata BN, et al.[3]

children on a restricted diet, less supported by evidence but growing in popularity, may include attention-deficit/hyperactivity disorder (ADHD), non-celiac gluten sensitivity, and autism spectrum disorder.[5-6]

Special diets are seen not only in children with medical conditions, however. Some children are placed on special diets because of family preferences or beliefs or because of limited resources. Parents against animal proteins may choose to eat a vegetarian diet, for example, offering the same diet to their children.[7] Some children may lack adequate macronutrients needed for a healthy diet because they come from food-insecure households, which were estimated to account for 6.4 million households in 2015.[1]

TABLE 3 MEDICALLY PRESCRIBED DIETS

MEDICAL INDICATION	DIET	COMPLICATIONS
Celiac disease; non-celiac gluten sensitivity	Gluten free	Poor growth; constipation; deficiencies in iron, calcium, fiber, thiamin, riboflavin, niacin, folate
Lactose intolerance; galactosemia	Lactose free	Deficiencies in calcium and vitamin D; poor weight gain if hypocaloric
Milk protein allergy	Dairy free	Possible low in protein, calories, and calcium
Allergy/intolerance; eosinophilic esophagitis	Elimination	Deficiencies in calcium, iron, zinc, vitamins D, E, folate, and B12; poor growth and weight gain. Risks will be based on the specific food.
Inflammatory bowel disease	Specific carbohydrate diet	Potential decreased caloric intake with subsequent poor growth, vitamin D deficiency, and other micronutrient deficiency if not monitored
Constipation; irritable bowel disease	High fiber	Diarrhea, abdominal pain, gas
Intestinal strictures	Low fiber	Constipation
Sorbitol and fructose intolerance	Sorbitol or fructose free	Constipation; poor weight gain if hypocaloric
Intractable seizures; metabolic disorder	Ketogenic	Poor growth/weight gain; gastrointestinal (vomiting, diarrhea, constipation); anorexia; dehydration; lethargy; irritability; renal stones; acidosis; hyperlipidemia; hypoglycemia; hypertriglyceridemia; bone demineralization; vitamin deficiencies (D, E, Mg, K, Ca, Se, carnitine)
Metabolic diseases	Metabolic	Deficiencies in micronutrients; poor growth and weight gain
Poor weight gain	High-caloric diet	Hyperlipidemia, excessive protein/fat consumption; refeeding syndrome; obesity if not monitored
Irritable bowel disease, high ileostomy output, short bowel syndrome	Low FODMP	Weight loss, micronutrient deficiency if not monitored
Irritable bowel disease	Specific carbohydrate diet	Potential decreased caloric intake with subsequent poor growth, vitamin D deficiency, and diarrhea

Abbreviation: FODMP, fermentable oligo-, di-, monosaccharides, and polyols.
From: Medically prescribed diets: Indications and nutritional risks.[4]

For all children, regardless of whether they receive a special diet or not, healthy nutrition is paramount for normal neurodevelopment growth and good lifelong habits of eating that nourish health and well-being.[1] For pediatricians, knowing the diet of a child is critical to ensure the physical and mental health of that child. Along with educating parents

on what constitutes a healthy diet for their child, parents also need to know the potential adverse effects of special diets on their children. This ranges from inadequate intake of essential micronutrients that may lead to, for example, anemia, to the potential for increased cardiovascular risk in children consuming some gluten-free products that may be higher in sugar and fats (Table 3).[4,8,9]

"Pediatricians are often unaware of the nutritional impact of various diets and do not know if a patient is receiving sufficient and balanced nutrition," according to Diane L. Barsky, MD, a pediatric nutrition specialist in the Division of Pediatric Gastroenterology, Hepatology, and Nutrition at the Children's Hospital of Philadelphia, Pennsylvania, who, with Maria Mascarenhas, MBBS, spoke about special diets in children at the recent American Academy of Pediatrics (AAP) National Conference and Exhibition in New Orleans, Louisiana. "Pediatric patients are also consuming vitamins and supplements that can have benefits, but parents may not be aware of potentially harmful effects from these substances."

"It is the pediatrician's responsibility to educate himself or herself, ask their patients about special diets and supplements, and educate/counsel families about these topics," she says.

Special diets for children

VEGETARIAN DIET

Pediatricians may encounter children on a wide range of special diets. Among the most common are a group of diets that fall under the umbrella of vegetarianism. These are primarily plant-based diets that involve different degrees of restriction on animal products (Table 4).[7,10] Data from the early 2000s estimate that about 2% of US children and adolescents aged 6 to 17 years are vegetarian with about 0.5% described as vegan.[10] This number may be higher based on more recent data showing that between 20% to 25% of US adults report some level of consuming a vegetarian diet.[6]

Although a well-balanced vegetarian diet for children and adolescents is supported by the evidence as well as associations such as the AAP,[10] special attention is needed to make sure that children and adolescents on these diets are receiving the required nutrients and protein intake needed for growth and development during these formative years.[7,10] Of particular concern is the potential for deficiencies in key micronutrients needed for growth, bone mineral content, and neurodevelopment throughout childhood (Table 4).[7]

Table 5 provides some guidance on how to prevent micronutrient deficiencies in children who transition to a vegetarian diet.[1,7]

TABLE 4 **TYPES OF VEGETARIAN DIETS**

DIET	INCLUSION/EXCLUSION	POTENTIAL NUTRIENT DEFICIENCIES
Lacto-vegetarian	Plant-based (grains, legumes, nuts, fruits, vegetables) including milk and milk products. Excludes eggs, meat, seafood/fish, poultry.	■ Vitamin B12 ■ Zinc ■ Iron (potentially)
Lacto-ovo-vegetarian	Plant-based (grains, legumes, nuts, fruits, vegetables) including eggs and dairy. Excludes meat, seafood/fish, poultry.	■ Vitamin B12 ■ Zinc ■ Iron ■ n-3 fatty acids
Ovo-vegetarian	Plant-based (grains, legumes, nuts, fruits, vegetables). Excludes milk, dairy products, meats, poultry, and seafood.	■ Vitamin B12 ■ Vitamin D ■ Calcium ■ Zinc ■ Iron (potentially)
Vegan	Excludes all animal products.	■ Energy ■ Protein ■ Vitamin B12 ■ Vitamin D ■ Zinc ■ Calcium ■ n-3 fatty acids ■ Iron

Di Genova T, et al[7]; Amit M.[10]

GLUTEN-FREE DIET

Another special diet that has gained in popularity with the broadening availability of products is the gluten-free diet.[11] People on a gluten-free diet avoid food and beverages containing wheat and any wheat products (durum, einkorn, emmer, kamut, spelt, enriched flour, farina, graham flour, self-rising flour, semolina, and couscous), barley, rye, triticale, and sometimes oats. Evidence supports the

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New evidence changes guidelines for food allergies

ContemporaryPediatrics.com/food-allergy-guidelines-2019

TABLE 5 TRANSITIONING CHILDREN TO A VEGETARIAN DIET

	VEGAN	NON–VEGAN
Protein	Include more bean and soy products higher in lysine compared with cereals. Eat a variety of plant-based foods and cereal-legume combinations to achieve 1.5 g/kg/d for children aged <4 y and 1.0 g/kg/d for those aged >4 y.	Include ≥1 servings of 150-250 g/d of dairy products.
Energy	Include 20-25 g/d of vegetable oil or 40-50 g/d of nuts/seeds to increase dietary fat and increase energy intake.	
Vitamin B12	Include 125 mL vitamin B12-fortified soy milk to fulfill current daily recommended requirement.	Include 100-150 g/wk of fatty fish.
Vitamin D	Include 250 mL vitamin D-fortified soy milk and add Vitamin D supplements (2-3 µg) as needed.	Include 100-150 g/wk of fatty fish.
Iron	Include iron-rich foods such as soy, legumes, nuts, breads, and cereals. Adding vitamin C (ie, citrus fruit, tomatoes, potatoes, strawberries, spinach) increases iron bioavailability.	
Calcium	Include 125 mL of calcium-fortified soy milk; increase calcium absorption by reducing fiber intake.	Include 6-12 calcium-rich foods daily.

Schwarzenberg SJ, et al[1]; Di Genova T, et al.[7]

TABLE 6 ANTI-INFLAMMATORY DIET AND LIFESTYLE FOR HEALTHY NUTRITION

Mediterranean diet

- Abundant in vegetables, fruits, whole grains, and legumes
- Healthy fats (olive oil, olives, nuts, seeds)
- Spices/herbs
- Garlic/onions
- Moderate amounts of lower fat yogurt/cheese products
- Moderate consumption of fish
- Eggs and white meat low in saturated fat
- Regular consumption of water
- Moderate consumption of wine
- Smaller amounts of potatoes/red meat, cured meats, and sweets consumed less often

Katz DL, et al[12]; Barsky DL, et al.[13]

use of gluten-free diets when appropriately used for children with celiac disease showing that it can help eliminate symptoms of celiac disease and improve quality of life.[11]

However, the nutrient levels of gluten-free products vary significantly, and many may not contain key vitamins and nutrients, such as iron, calcium, fiber, thiamin, riboflavin, niacin, and folate. In addition, some gluten-free produces contain more fat and sugar than non–gluten-free products and may pose a risk of weight gain and obesity in children as well as potential cardiometabolic risk.[9] As such, parents need to be aware of the quality of the gluten-free product their child is consuming to ensure proper nutrition. For most children without celiac disease, a gluten-free diet is not recommended.[11]

ANTI-INFLAMMATORY DIET

A diet that has gained popularity for the entire family and is especially interesting given its well-established benefits with few if any downsides is the anti-inflammatory diet (Table 6).[12,13] Data from studies looking at an anti-inflammatory diet—a diet and lifestyle approach combining Mediterranean and Asian diets—suggest that daily adherence to an anti-inflammatory diet may lower a child's risk of obesity, type 2 diabetes, heart disease, and other conditions linked to inflammation.[12,13]

Much of the evidence to date on benefits of the anti-inflammatory diet come from studies on the Mediterranean diet, including a 2019 meta-analysis of over 2 million people showing a reduction in mortality (8% from any cause and 10% from cardiovascular or cerebrovascular disease) and 13% reduction in neurodegenerative diseases associated with a 2-point increase of adherence to the Mediterranean diet.[14] Other benefits shown in children include a reduction in the severity of asthma and allergies as well as reduced recurrence of asthma and prevention of chronic asthma.[13]

Important to underscore is that the Mediterranean diet is not a specific diet but a pattern of eating habits that includes plant-based food, healthy fat sources, adequate water intake, and overall inclusion of a wide range of foods preferably eaten in season and locally grown. It is also seen as a lifestyle approach to eating that includes regular physical activ-