

NUTRITION BASICS IN FOOD ALLERGY

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The nutritional management of a food-allergic patient is paramount to the successful implementation of a food-restricted diet. As with a patient on a new medication, food-allergy patients need instruction on how to institute the food restriction and close monitoring of their tolerance and progress. The prescription of a food-restricted diet is a major burden to both patient and family. It requires extensive education about foods for which most people have previously been unfamiliar. The tasks of grocery shopping and deciding what and where to eat, which previously required no more than a minute to decide, now become time-intensive tasks. The information that follows is intended to provide a basic understanding of the nutritional management of these patients.

NUTRITIONAL REQUIREMENTS

The nutritional requirements of food-allergic patients do not differ from those of healthy individuals unless the patient has active allergic symptoms. A patient with active allergic symptoms may have increased calorie and protein requirements.

Macronutrients

The first category of nutritional requirements is macronutrients. The macronutrients—protein, carbohydrates, and fats—constitute the

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Table 1. AGE- AND WEIGHT-SPECIFIC CALORIE AND PROTEIN REQUIREMENTS

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Data from Subcommittee on the 10th Edition of the RDA's Food and Nutrition Board, Commission on Life Sciences, National Research Council: Recommended Dietary Allowances. Washington, DC, National Academy Press, 1989

majority of nutrient intake and are the sources of energy for the body. Both energy and protein requirements are based on age and weight in kilograms. The requirements for these nutrients decline on a per kilogram basis as age increases, but total intake increases over time to support growth. Once growth has ceased, total caloric requirements decline, whereas total protein requirements stabilize at 0.8 g/k per day (Table 1). Protein intakes within the range of 10% to 15% of total calories would provide adequate amounts of total protein. In a food-restricted diet, the adequacy of essential amino acids should be monitored in addition to total protein intake.

Requirements for fats and carbohydrates are based on total caloric intake rather than body weight. During the first 3 years of life, fats are essential sources of energy in the rapidly growing child. During the first 4 to 6 months of life, both breastfed and formula-fed infants receive approximately 50% of their total caloric intake from fats. Over the next 6 months, the percent of calories from fats decreases slightly to 45% as solid foods are added to the diet. From 1 to 3 years of age, the percent of calories from fats should gradually decline to 30% to 35% of calories. By 5 years of age, fats should contribute 30% of total caloric needs and remain at this level into adulthood. The types of dietary fats should be equally distributed between saturated, polyunsaturated, and monounsaturated fats through the use of a variety of animal and plant fats.

The carbohydrate intake completes the remainder of caloric needs and is the body's primary source of energy after the first 6 months of life. Carbohydrates provide between 40% and 60% of caloric requirements. As the primary source of energy, carbohydrates become major sources of vitamins and minerals. Complex carbohydrates should be emphasized for both their nutrient and fiber contributions to the diet.

Micronutrients

The next category of nutritional requirements is the micronutrients that encompass vitamins, minerals, and trace elements. The adequacy of these nutrients is dependent upon the variety of foods in the diet. As diets become limited either by the institution of food restrictions or by personal preferences, the risk of nutritional deficiencies of these nutrients increases.

The Food and Nutrition Board of the National Academy of Sciences (NAS) regularly updates the requirements for each of these nutrients based on current scientific research. In 1998, the NAS released a new system of defining nutrient requirements called the Dietary Reference Intakes (DRI).¹⁵ The DRI include four categories of nutrient requirements: (1) Estimated Average Requirement (EAR), which is used to assess the nutrient intakes of population groups, not individuals; (2) Recommended Dietary Allowance (RDA), which is the estimation of the daily nutrient requirement for an individual; (3) Adequate Intake (AI), which is the level of nutrient intake that has supported normal growth in defined populations; these references are used when no RDA has been established; and (4) Tolerable Upper Intake Level (UL), which is the maximum daily nutrient intake that can be tolerated safely and is unlikely to cause adverse effects in most individuals.

The micronutrient intakes of individuals on allergen-restricted diets should be assessed for adequacy utilizing the RDAs and AIs. Intakes of individuals using combinations of formulas, fortified foods, and supplements should also be evaluated for potential intakes above the UL references.

ASSESSMENT OF NUTRITIONAL STATUS

The assessment of nutritional status is a combined evaluation of growth, anthropometric measurements, dietary or medical history, intake, and supporting laboratory data. The assessment of both children and adults is presented in this section because both are at nutritional risk once a food restriction has been initiated.

Assessment of a Child

The child is obviously more nutritionally vulnerable than an adult because of the additional demands of growth and development. The monitoring of an allergic child's growth is a gross measurement of the adequacy of their nutritional intake. Growth, which includes weight for age, height for age, weight for height and head circumference (up to age 3), should be measured yearly for children over 1 who are not undergoing any exacerbations of their allergic disease and are under good control. For younger children or children recently diagnosed with food

allergies for which either eliminations or deletions are being made to their diet, growth should be checked every 1 to 3 months. The National Center for Health Statistics (NCHS) growth statistics⁶ defines normal growth for American children. The use of the NCHS growth statistics allow for reporting of growth percentiles and calculation of actual growth as compared with expected growth for age. To determine the rate of growth as compared with the expected, the child's change in either height or weight over a specific period of time is recorded and compared with the change in weight and height over the same period of time for a child growing at the fiftieth percentile (see following example for a 3-year-old girl).

- Current height: 89.3 cm (10th percentile for age)
- Height 6 months ago: 87.3 cm (25th percentile for age)
- Total height gain: 2 cm
- Expected height gain along the 50th percentile: 4.1 cm
- Actual rate of growth: 49% (total height gain divided by expected [2 cm/4.1 cm])

Reporting the percentage of expected growth is a more dramatic representation of the child's growth compared with charting the growth and seeing a small decrease in height from the 25th percentile to the 10th percentile for age. In addition to seeing declines in growth, one can also use this method to monitor rates of catch-up growth. As an example, use the same 3-year-old girl and look at her rate of weight gain:

- Current weight: 12.3 kg (10th percentile for age)
- Weight 6 months ago: 10.5 kg (3rd percentile for age)
- Total weight gain: 1.8 kg
- Expected weight gain along the 50th percentile: 1.1 kg
- Actual rate of weight gain: 164% (total weight gain divided by expected [1.8 kg/1.1 kg])

Despite poor height gain, the rate of weight gain is excellent and has brought this child to within 350 g of ideal weight for height (12.65 kg). Thus energy intake was adequate to replete weight but not adequate to replete both weight and height. If this level of intake is maintained, this child will probably show catch-up height gain during the next 6-month period.

In addition to reporting rates of gain in weight, height, and head circumference, it is important to assess the child's overall growth to date. One way to address overall growth is to use Waterlow's classification system for stunting and wasting.¹⁸ The Waterlow criteria uses actual height as compared with height for age at the fiftieth percentile to define degrees of stunting. Stunting is described as mild, moderate, or severe dependent on the results of this comparison. Wasting is the comparison of actual weight for height to weight for height at the fiftieth percentile. As with stunting, wasting is also described as mild, moderate, or severe (Table 2). Using the example of the previous 3-year-old girl, she would be classified as follows:

Table 2. WATERLOW CLASSIFICATION OF WASTING AND STUNTING

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Please refer to the printed journal.

From Waterlow JC: Classification and definition of protein-energy malnutrition. In Beaton GH, Bengoa JM (eds): Nutrition in Preventive Medicine. Geneva, World Health Organization, 1976, p 550; with permission.

- Actual height: 89.3 cm
- Height for age at the 50th percentile: 94.1 cm
- Degree of stunting: 95% mild (calculated as actual height divided by height for age at the 50th percentile [89.3 cm/94.1 cm])
- Actual weight: 12.3 kg
- Weight for height at the 50th percentile: 12.65 kg
- Degree of wasting: 97% normal (calculated as actual weight divided by weight for height at the 50th percentile [12.3 kg/12.65 kg])

The combination of examining actual growth over the past year compared with expected growth, growth to date, and plotting the child's growth on standard charts gives a complete picture of the child's growth history. It provides information that answers whether growth is maintained along acceptable rates or whether detrimental changes have occurred with the institution of a restricted diet. The close monitoring of a child's growth is critical to the nutritional evaluation because laboratory measurements of other nutritional indices are often not available.

Assessment of an Adult

An adult's assessment looks at body composition verses growth. The evaluation of an adult's body composition would include percent of ideal weight and a comparison of their lean and fat body mass to normal standards. The assessment begins with an evaluation of their weight for height based on the Frisancho's weight by height tables⁴ and a calculated frame size. The formula for calculating frame size, referred to as Frame Index 2, is [elbow breadth (mm)/stature (cm)] $\times$ 100.⁵ To specifically characterize their body weight as either lean or fat mass, the sum of triceps and subscapular skinfold thicknesses⁴ or bioelectrical impedance are used.

Estimation of Caloric Requirements

Once growth and body composition have been assessed, the next step is to estimate caloric requirements. Scholfield has developed a set

of equations for estimating basal metabolic rate using weight and height that are useful for both children and adults.¹³ These equations are both sex- and age-group specific, being divided into six male/female age categories: children under 3 years, 3 to 10 years, 10 to 18 years, 18 to 30 years, 30 to 60 years, and greater than 60 years. Results are reported in Megajoules (MJ) per 24 hours, which can be converted to calories as follows: $\text{MJ} \times 1000 \text{ divided by } 4.18 = \text{calories}$. The basal metabolic rate is then multiplied by factors for growth and activity, to estimate actual caloric requirements.¹⁷

The estimated caloric requirement is used to calculate requirements for protein, carbohydrates, and fats as stated in the previous guidelines. These estimated needs become goals to which actual intake is then compared. Diet records of actual intake for periods of 3 to 7 days are analyzed using a computer program to compare actual intake with the recommended intake for all nutrients. A complete listing of available computer programs for dietary analysis is available on-line from the Food and Nutrition Information Center (www.nal.usda.gov/fnic). The intake is evaluated for nutritional deficits, and an individualized plan is developed to optimize the intake of these nutrients.

NUTRITIONAL THERAPY

It is crucial for the allergist to minimize the list of restricted foods to only those that by history and by testing are suspect foods. The elimination of entire food families only compromises the nutritional quality of the diet and has been shown to be unnecessary.^{1, 2, 9} The nutritional quality of the diet is determined by three factors:

- Number of foods being restricted
- Availability of appropriate food substitutes
- Palatability of the diet

The allergist requires the assistance of a dietitian to transcribe the list of restricted foods into an actual diet. An analysis of this diet should be provided to indicate any nutrient deficiencies. Together, the allergist and dietitian should discuss available food options and establish a plan that includes the duration of the current restrictions, verification of "suspect" foods, and a schedule of follow-up visits.

The basics of a balanced allergen-free diet include the following:

- Utilizing a modified version of the food pyramid guidelines
- Emphasizing fresh, unprocessed foods
- Home cooking
- Identification of potential nutrition deficits
- Use of fortified foods and formula when necessary

Allergen-Free Food Pyramid

The allergen-free food pyramid provides guidelines for a diet that is restricted for the eight major allergens: milk, egg, soy, peanut, tree nuts, wheat, fish, and shellfish (Fig. 1). The pyramid is developed around the number of servings needed in each of the six food categories, which include grains, fruits, vegetables, meat and meat substitutes, dairy substitutes, and fats and sweets to provide a balanced diet.

Six to eleven servings of grains should provide the bulk of the recommended dietary intake. This food category includes rice, corn, barley, oatmeal, amaranth, quinoa, buckwheat, and homemade allergen-free baked goods. Grains are a primary source of calories, the B vitamins (thiamin, riboflavin, vitamin B₆, and pantothenic acid), and minerals (phosphorus and magnesium).

The next two categories are fruits and vegetables. A relatively equal number of servings for each of these categories is recommended: 2 to 4 servings of fruits and 3 to 5 servings of vegetables. Fruits include all fresh, frozen, and canned fruits and canned, bottled, and frozen juices. Avoid juices packed in cartons and boxes because of a potential cross-contamination from milk-containing beverages packaged on the same equipment. Fruits provide vitamin C, potassium, and folate. Vegetables include all types, fresh, frozen, and canned. Be aware of prepackaged vegetables with sauces and various seasoning packets that may contain a restricted allergen. Vegetables, especially dark green leafy ones, pro-

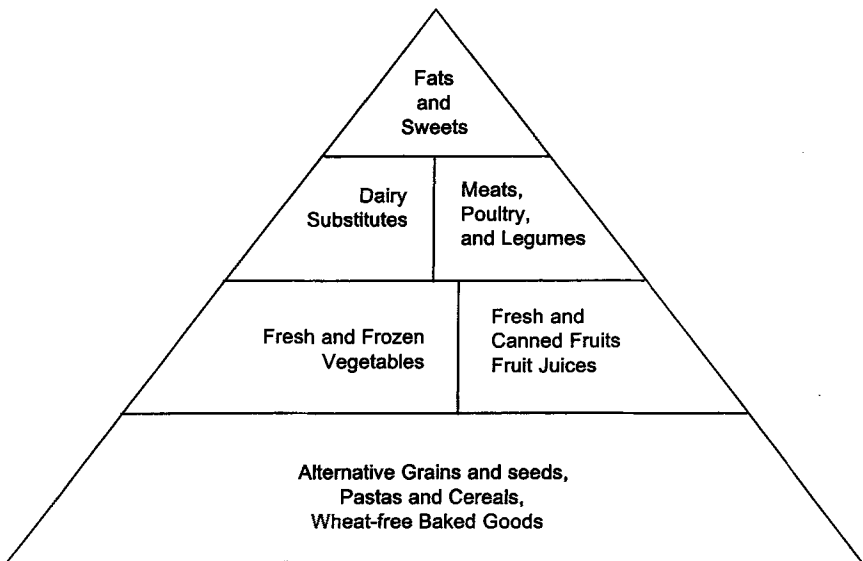


Figure 1. Allergen-free food guide pyramid.

vide good sources of vitamin A, vitamin C, folate, magnesium, and calcium.

The recommended 2 to 3 servings of meats and meat substitutes may be obtained from home-cooked beef, chicken, pork, turkey, game meats, peas, lentils, and other legumes (except soy and peanut). This category provides sources of several important nutrients that include all of the B vitamins (thiamin, riboflavin, niacin, vitamin B₆, vitamin B₁₂, and pantothenic acid), folate, calcium, phosphorus, magnesium, and zinc. This is a critical food category because of its nutrient density; if additional dietary restrictions include foods from this group, the dietary intake may not be nutritionally complete.

Dairy substitutes include enriched rice and potato milks, which provide a vitamin and mineral content similar to milk. The recommended intake is 2 to 3 servings per day. These products are excellent sources of vitamin A, vitamin D, and calcium but contain little or no protein. The fat content also varies from 5 g (equal to 2% milk) to fat-free, which significantly decreases the caloric content of the beverage.

Children who are consuming a formula should be maintained on this beverage for as long as it is acceptable to the child. These formulas act as a nutritional "safety net" for the food-allergic individual. Concerns about the fat content of these formulas are not typically justified because the formula is being used only as an adjunct to their solid food intake. If, however, the volume of intake is too great, one can dilute the formula to a 15 calorie per ounce mixture to make the caloric density similar to a dairy product.

The last category of the pyramid is fats and sweets. This group should provide calories that have not been obtained from the other food categories. During childhood, the number of servings from this group is greater than in adulthood, secondary to the high-caloric demands of growth. Foods that would be included in this category are milk and soy-free margarine, animal fats, processed vegetable oils, sugar, honey, maple syrup, and allergen-free baked goods. The vegetable oils, in addition to providing a concentrated source of calories, also provide vitamin E.

The nutritional management of a food-allergic child requires an extensive knowledge of the entire spectrum of foods including (1) various names or terms for foods, (2) how foods are prepared both in the home and commercially (3), what ingredients may be used in various dishes, (4) alternative sources of specific nutrients, and (5) appropriate recipe substitutions.

The next section addresses these concerns for each of the eight major allergens.

NUTRITIONAL MANAGEMENT OF THE MAJOR ALLERGENS

Milk

A milk-restricted diet demands that the patient remove all milk and milk byproducts from their diet. Because milk and dairy products

contribute significant nutrients in children's diets and milk proteins are widely used in the commercial food industry, milk-restricted diets are challenging and pose significant nutritional risks.⁸ Milk-restricted diets have the potential to be deficient in calcium, vitamin A, vitamin D, riboflavin, pantothenic acid, phosphorous, protein, and calories. The potential is greater in young children where milk is a primary source of these nutrients. Enriched milk substitutes such as soy, rice, or potato "milks" offer levels of calcium, vitamin A, and vitamin D similar to those found in milk. Other sources of calcium include calcium-fortified fruit juices, drinks, and cereal products. Recommendations for calcium intake were recently revised as Dietary Reference Intakes (DRIs) and are 500 mg per day in children 1 to 3 years of age, 800 mg per day in children 4 to 8 years of age, 1300 mg per day in children 9 to 18 years of age, and 1300 mg per day in pregnant or lactating teens.¹⁶ The recommendations for adults have also changed, but the data is insufficient to support new RDAs. We recommend the following intakes for adults: 1000 to 1200 mg per day for women ages 19 to 30 years, 1200 mg per day for pregnant and lactating women ages 19 to 50 years, 1000 mg per day for men ages 19 to 50 years and women ages 31 to 50 years, and 1200 mg per day for men and women over 50 years of age. Milk substitutes offer calorie levels similar to 2% milk but are poor sources of protein. Meats, legumes, nuts, and whole grains are alternative sources of protein, and they provide riboflavin, pantothenic acid, and phosphorous. A milk-allergic individual is at significant nutritional risk if meats and legumes are also limited in the diet.

Ingredient Terms and Symbols for Milk

Table 3 includes a partial list of terms commonly used on food labels to indicate the presence of milk. On a milk-restricted diet, the patient should avoid all foods with these ingredients. The patient or parents should become familiar with the ingredient list and distribute it to any caregivers, relatives, or food service workers who will be providing food.

Kosher symbols can also help identify unsafe foods for milk-allergic patients. Kosher products meet the standards of kosher dietary law as determined by a rabbinical agency. The agency marks its symbol (U, K) plus information about the product's ingredients on the label. These symbols provide specific information about milk and milk proteins. A "D" next to the agency's symbol indicates the possible presence of dairy, which may or may not be found in the ingredient statement. A "DE" (dairy equipment) next to the agency's symbol indicates that the product has been manufactured on equipment also used to manufacture dairy-containing foods. Neither of these foods are recommended for milk-allergic patients.

Hidden Sources of Milk

Milk and milk proteins are widely used in recipes as food stabilizers and flavorings. As food additives, milk proteins are allowed to be

Table 3. INGREDIENT TERMS THAT INDICATE OR MAY INDICATE THE PRESENCE OF MILK

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Adapted from Munoz-Furlong A (ed): How to Read a Label. Fairfax, VA, Food Allergy Network, 1998; with permission.

labeled as “nondairy” or be concealed under the generic term of *flavorings*. Examples include coffee whiteners, imitation cheeses and butter flavoring, and frozen desserts. Other surprise sources include canned tuna fish, commercial breads, pancake syrup, fruit snacks, reduced-fat lunch meats, sauces and seasoning mixes, salad dressings, and baby foods. As a result, patients and caregivers need to examine food labels closely.

Cooking Substitutions for Milk

Milk substitutes, water and oil, or fruit juice and oil can be substituted one to one for milk in recipes.

Egg

An egg-restricted diet demands that patients remove all egg proteins and egg yolk from their diets. Because eggs are not a primary source of any one nutrient in the U.S. diet, an egg-restricted diet does not pose a significant nutritional risk. Eggs provide vitamin B₁₂, pantothenic acid, flacon, riboflavin, selenium, biotin, and protein. Alternative sources of these nutrients include meat, legumes, and whole grains.

Ingredient Terms for Egg

Table 4 includes a partial list of terms commonly used on food labels to indicate the presence of egg. Patients on an egg-restricted diet should avoid all foods with these ingredients.

Hidden Sources of Egg

Eggs are hidden in many foods at bakeries and restaurants. Eggs may be brushed on baked goods such as pretzels and rolls to give a shiny coating. Eggs may form the custard base of yogurts and ice creams or act as clarifying agents in soups and coffees. Eggs are also used in batters for fried foods. Eggs act as binders in meatloaf and meatballs. Eggs provide texture in imitation seafood products. Egg albumin gives structure to whipped fruit products used in desserts and drinks. Patients should also be aware of the potential for cross-contamination at restaurants where eggs are fried on the same grill as other foods. Other hidden sources include marshmallows, marzipan, noodles, and some candies.

Cooking Substitutes for Egg

Patients may purchase commercial egg replacers or make their own for use in recipes. Jolly Joan (Ener-G Foods, Seattle, WA) is a commercially available product. Patients should be aware that not all egg "substitutes" are egg-free and should read all food labels carefully. Make your own recipe substitutions for leavening by using one of the following to

Table 4. INGREDIENT TERMS THAT INDICATE THE PRESENCE OF EGG

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replace one egg in a recipe: (1) 1 teaspoon of baking powder plus 1 tablespoon of liquid plus 1 tablespoon of vinegar; (2) 1 teaspoon of yeast dissolved in 1/4 cup warm water; or (3) 1½ tablespoons of water plus 1½ tablespoons of oil plus 1 teaspoon of baking powder. Make your own substitutions for binding by using either 1 tablespoon of apricot puree or one packet of plain gelatin plus 2 tablespoons of warm water for each egg in the recipe.¹¹

Peanut

Diet therapy for peanut-allergic individuals usually excludes all peanut and tree nut proteins. Although researchers have found no direct link between peanut (a legume) and tree nut allergies, they have found these allergies to coexist in one third of peanut-allergic patients.^{3, 14} In addition, peanut and tree nut products are often processed in the same manufacturing plant, and peanuts are often substituted for more expensive nuts. Therefore, allergists conservatively recommend that peanut-allergic patients should avoid all tree nuts. Alternatively, allergies to more than one legume are rare, and allergists do not usually recommend a generalized legume restriction for peanut-allergic patients.¹ Because peanuts are not primary sources of any one nutrient in the U.S. diet, a peanut-restricted diet does not pose a significant nutritional risk.

Peanuts provide chromium, niacin, magnesium, manganese, vitamin E, and protein. Substituting meats, whole grains, legumes, and vegetable oils will provide these same nutrients.

Ingredient Terms for Peanut

Table 5 includes a partial list of terms commonly used on food labels to indicate the presence of peanut. Patients on a peanut-restricted diet should avoid all foods containing these ingredients. See Table 6 for terms indicating tree nuts.

Table 5. INGREDIENT TERMS THAT INDICATE OR MAY INDICATE THE PRESENCE OF PEANUT

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Adapted from Munoz-Furlong A (ed): How to Read a Label. Fairfax, VA, The Food Allergy Network, 1998; with permission.

Table 6. INGREDIENT TERMS THAT INDICATE THE PRESENCE OF TREE NUTS

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Hidden Sources of Peanut

Peanuts are often used to improve the flavor or increase the protein content in foods. Ethnic cuisines such as African, Chinese, and Thai often include peanuts in sauces. Many baked goods, candies, and ice creams contain peanuts or are produced on equipment also used for products containing peanuts. Hydrolyzed plant protein and hydrolyzed vegetable proteins labeled on imported foods may be peanut proteins. Patients should also be cautious about artificial nuts that can be re-flavored peanuts and of commercial “nut” products that may use less expensive peanuts to replace some of the nuts in the product. In addition, crude peanut oils (cold-pressed, expressed, expelled) have elicited reactions in peanut-allergic patients.⁷

Tree Nut

Tree nut allergies are common and are often severe in adult patients. Tree nut-allergic patients should avoid all nuts until each individual nut is evaluated. As with peanuts, tree nuts are not primary sources of any one nutrient. Tree nut-restricted diets do not pose any significant nutritional risks.

Ingredient Terms for Tree Nuts

Table 6 includes a partial list of terms commonly used on food labels to indicate the presence of tree nut proteins. Patients with tree nut allergies should avoid foods containing these ingredients unless the specific nut ingredient has been evaluated as safe for them.

Hidden Sources of Tree Nuts

The hidden sources of tree nuts are similar to those for peanuts. More specifically, pure almond extract may contain enough almond

protein to elicit a reaction in an almond-allergic patient. Because many different nut products are processed on the same manufacturing lines, nut-allergic patients should consider avoiding all nut products.

Soybean

Soy allergy is common in infants and young children. Soy-allergic patients should avoid all sources of soy protein. Soybean oil and soy lecithin are usually allowed in the diet because the soy proteins are removed in processing. Although nutrient dense, soybeans are not a primary source of any one nutrient in the U.S. diet. Soybeans and soy products appear in small amounts in a multitude of commercial foods, making soy avoidance challenging and posing nutritional risk.

Soybeans provide calcium, folate, iron, magnesium, phosphorous, riboflavin, vitamin B₆, zinc, and protein. The amount of soy, and therefore the nutrients from soy, in any one commercial product is small. The cumulative elimination of many commercial food products from the diet puts the patient at general nutritional risk if adequate homemade foods are not included in the diet.

Ingredient Terms for Soybean

Table 7 includes a partial list of terms commonly used on food labels to indicate the presence of soy protein. Patients with soy allergy should avoid all foods with these ingredients.

Hidden Sources of Soybean

Soy is used to enhance the protein content and flavor of many commercial foods. Patients should beware of vegetable broth, vegetable

Table 7. INGREDIENT TERMS THAT INDICATE OR MAY INDICATE THE PRESENCE OF SOY

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gum, vegetable starch, natural flavoring, and flavorings that may all indicate soy. In addition, many milled corn products (such as cereals) are now processed with soy.

Wheat

A wheat-restricted diet demands that a patient avoid all wheat proteins. Wheat, as the major grain product composing the base of the food guide pyramid, is a significant part of the diet in the United States. Eliminating wheat from the diet is difficult and poses a significant nutritional risk. Patients on a wheat-restricted diet should consult a registered dietitian to ensure adequate nutrition.

Enriched wheat products are primary sources of thiamin, riboflavin, niacin, iron, selenium, and chromium. Substitutions include enriched commercial grain products made from amaranth, barley, buckwheat, corn, oats, quinoa, rice, and rye. These specialty items are generally available at health food stores and through mail order specialty food companies.

Ingredient Terms for Wheat

Table 8 includes a partial list of terms commonly used on food labels to indicate the presence of wheat. Patients on a wheat-restricted diet should avoid all foods containing these ingredients.

Hidden Sources of Wheat

Wheat proteins provide structure and leavening in baked goods and are used as thickeners and flavorings. The alternate grains listed previously do not have the same properties as wheat and are difficult to substitute one for one in recipes. Patients must beware that many alternative grain products use small amounts of wheat to achieve the desired textures and flavors. Wheat proteins are also used as thickeners and flavorings in sauces and lunch meats. In addition, Spelt is an ancient wheat grain promoted as a wheat substitute that has provoked reactions in wheat-allergic patients challenged in our institution. Kamut is another ancient wheat grain that we have not had the opportunity to evaluate in wheat-allergic patients but believe should be avoided by this population.

Cooking Substitutions for Wheat

The following ingredients can be used to substitute in recipes for 1 cup of wheat flour: 1½ cups rice flour, 1 cup barley flour, or ¾ cup amaranth flour plus ¼ cup either arrowroot, tapioca, or potato starch. These substitutions¹⁰ bring slightly different properties to the recipe, and a blend of flours may better provide the desired properties.

Table 8. INGREDIENT TERMS THAT INDICATE OR MAY INDICATE THE PRESENCE OF WHEAT

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Other Grain Allergies

Allergies to other grains are rare. Allergies to rice and corn have more of an impact on a patient's diet. Rice is usually consumed in cereals or as the cooked grain. Rice proteins are not generally added to commercial foods. Enriched rice products provide thiamin, riboflavin, niacin, and iron. Other enriched grains can provide these nutrients.

Corn allergy restricts a patient's diet more severely. Corn-allergic patients must avoid corn and all corn products, such as corn sweeteners and cornstarch. The elimination of corn alone does not pose nutritional risk. Enriched corn products provide thiamin, riboflavin, niacin, iron, and chromium. Other enriched grain products can provide these nutrients; however, the elimination of all the commercial food products containing corn severely limits the patient's food choices and poses nutritional risk. Patients on corn-restricted diets should consult a registered dietitian.

Corn products are present in many commercial food products. These products include baked goods, beverages, candy, canned fruits, jams, jellies, lunch meats, snack foods, syrups, baking powder, and powdered sugar. Patients must cook from scratch to avoid all these foods. Cooking substitutions are needed for sweeteners, thickeners, and leavening agents. Substitutions for sweeteners include fruit juices, beet or cane

sugar, maple syrup, honey, and aspartame. Substitutions for thickeners include wheat starch, potato starch, rice starch and tapioca. Substitutions for leavening include Featherweight baking powder (The Estee Corporation, Parsippany, NJ), baking soda, and cream of tartar.

Fish

Patients with fish allergy are generally advised to avoid all species of fish unless a species has been tested individually. The allergen is similar across species of fish.² Fish is not a primary source of any one nutrient in the U.S. diet so fish avoidance does not pose nutritional risk.

Fish provide niacin, phosphorous, selenium, vitamin B₆, vitamin B₁₂, vitamin E, and protein. Alternative sources of these nutrients include meats, grains, legumes, and oils.

Hidden Sources of Fish

Patients may not be aware of the various forms of fish. Anchovies are found in Worcestershire sauce and Caesar salad dressing. Fish eggs are called caviar and roe. Surimi, or imitation shellfish, is made from reshaped and flavored fish muscle.

Shellfish

Shellfish allergy is common among adults. If a patient is allergic to one shellfish he or she may be allergic to other shellfish in the same family.¹² Patients should be tested for individual shellfish allergies and should avoid all foods containing those shellfish proteins.

Shellfish are not a primary source of any one nutrient in the U.S. diet. No dietary substitutions are necessary.

Ingredient Terms for Shellfish

Table 9 includes a partial list of terms commonly used on food labels to indicate the presence of shellfish. Shellfish-allergic patients should avoid all foods containing these ingredients unless specific shellfish allergies have been individually tested.

Hidden Sources of Shellfish

Few hidden sources of shellfish exist. Shellfish may be ingredients in Asian dishes and stuffing. Imitation seafood may include shellfish as a flavoring.

Table 9. INGREDIENT TERMS THAT INDICATE OR MAY INDICATE THE PRESENCE OF SHELLFISH

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GENERAL CONSIDERATIONS

Generic Terms

Generic terms allow manufacturers flexibility in their use of farm commodities and protection of their trade secret ingredients. There are a limited number of generic terms, and manufacturers are working to improve their labeling to indicate the presence of major allergens. Artificial and natural flavorings are the most troublesome ingredient terms for individuals with food allergies. An artificial flavoring is termed artificial if it has one component that is artificial, even if the majority of the components are natural. Flavorings may contain any of the major allergens.

Manufacturers may receive their flavorings from an outside source, referred to as a "flavor house." These flavor houses provide the manufacturer with a specific blend of ingredients that makes their product's flavor unique. When a consumer calls and demands to know "what is in your natural flavoring?" you can understand why the consumer is often told this is proprietary information and cannot be released. A simple rephrasing of the question to "Is there any milk or milk derivatives in your natural flavoring?" allows the manufacturer to answer the question without revealing any proprietary information. Often, these types of questions cannot be answered immediately. Each company has its own system for answering these types of calls. Some require a written request, whereas others only respond in writing or the information may not be available at all. Whatever the response is, it is only accurate for that one particular package. The product that was "safe" last month

may not be “safe” the next time it is purchased. Generic terms must always be verified with the manufacturer.

Other generic terms found on ingredient listings are spices, food starch, and vegetable broth. Spices, like flavorings contain a blend of different ingredients that make the product unique, but in general spices do not contain any of the major allergens. Individuals with uncommon allergies to garlic, onion, or mustard should contact manufacturers regarding the types of spices used in the product.

Food starches are listed in a variety of ways; some clearly declare the source of the starch, whereas others list various starch sources, and others do not declare the source on the label. Sources of food starches may be corn, wheat, potato, tapioca, and so forth. The listing of various starches is similar to a “may contain” notation. This allows the manufacturer to vary the source of starch depending on availability. The last type of listing must be verified with the manufacturer. Obviously, it is easier for the food-allergic individual to use products that clearly declare the starch source.

Vegetable broth may contain any variety of vegetables and may also contain soy.

Misleading Terms

The label term *nondairy* does not necessarily mean milk-free as was previously discussed. The Food and Drug Administration (FDA) labeling laws allow the use of the term *nondairy* in products that contain casein and caseinates, even though these ingredients are milk derivatives and cause allergic reactions in most individuals with milk allergy. The FDA considers these ingredients to be additives and not dairy products. Caution must be used in consuming any product labeled as *nondairy*.

Egg substitutes are made from egg whites and are meant for individuals on a low-fat or low-cholesterol diet, although for someone with a newly diagnosed egg allergy this label term can be misleading. Eggs are clearly declared as an ingredient, but the information is often overlooked by an anxious caregiver looking for alternative products.

Another label term that may be misleading is the term *whole grain*. The consumer reads this to mean that the product is composed of entirely one grain, whereas whole grain actually means the product contains a whole grain as an ingredient. The product, usually breads and cereals, may contain other grain products as well as other allergens.

Potential Sources of Cross Contamination

Commercial processing involves the use of large pieces of equipment for the production of a variety of products. Manufacturers follow “good manufacturing practice” guidelines in the cleaning and care of their equipment, but this practice does not eliminate the possibility of

cross contamination. Some manufacturers are working to educate their employees about food allergies and to reduce the number of potential cross contamination situations. Examples of these efforts include the following:

- Multiple-check cleaning system that requires employees to sign off
- Color coding allergen ingredients with bright "take notice" colors
- Dedicating lines to the production of certain products
- Elimination of high-risk, low-demand items
- Development of an allergy team whose goal is improved safety of all products

The food manufacturing industry is responding to consumer demands, thus individuals with food allergies need to continue to express their concerns.

Foods from restaurants, delis, bakeries and other carry-out food establishments continue to be high-risk foods. Preparation of foods in these establishments involves the use of shared equipment, utensils, and work surfaces. Standards for clean-up routines may not be strictly enforced, resulting in potentially dangerous clean-up errors. Employees may not be knowledgeable about food allergies or the various ingredients in the foods. If possible, a food-allergic individual should meet with the manager prior to eating in the establishment to discuss the special dietary needs of a food-restricted meal. Food selections should be limited to simply prepared, single-item dishes.

Other situations involving food prepared outside of the home require similar guidelines:

1. Meet with everyone involved with food preparation or service prior to the event
2. Describe food allergies: list allergens, provide list of alternative names for the allergens, and describe symptoms of an allergic reaction
3. Discuss how special needs can be met
4. Follow up the meeting with a letter summarizing the plan

SUMMARY

The intent of this article was to provide a basic overview of the nutritional management of a food-allergic patient. The nutritional care of these patients is obviously time-intensive, requiring a dedicated health care team of allergist and dietitian. Their efforts combined with those of other caregivers, industry, and nonprofit support groups can minimize exposures to known allergens and optimize the nutritional status of all food-allergic patients.

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