

# GLUTEN-FREE DIET

## Description

The Gluten-Free Diet is the primary treatment for celiac disease, which is also called gluten-sensitive enteropathy or celiac sprue. The only treatment for celiac disease is lifelong adherence to a gluten-free meal pattern, including strict avoidance of prolamins, which are proteins found in wheat, rye, barley, and triticale (1). Dermatitis herpetiformis is the term for the skin manifestation of celiac disease. The Gluten-Free Diet also helps to control most cases of dermatitis herpetiformis associated with gluten-sensitive enteropathy (1-6).

## Indications

Celiac disease is an immune-mediated disease characterized by chronic inflammation of the small intestine mucosa that results in malabsorption due to atrophy of the intestinal villi (1-6). Although celiac disease was once thought to be a rare childhood disease, it is now recognized as a fairly common multisystem disorder that occurs in one in 133 people (1,6). Individuals with celiac disease have an immunologic reaction to proteins termed prolamins, which are found in wheat, rye, and barley (1). When foods containing gluten are consumed by a person with celiac disease, the digestive process fails and an immunologically reactive protein fragment remains (1). Research suggests that a 33-amino acid molecule may be the cause of the inflammatory response (1,4-6). This molecule enters the intestinal mucosa and cannot be degraded by digestive enzymes or pancreatic enzymes. The molecule then enters the lamina propria, where it causes the release of T cells (1). The presence of the T cells in the lamina propria triggers cytokine activation, antibody production, and inflammatory responses (1). The resulting villous atrophy and inflammation of the mucosa result in malabsorption (1-6). The proximal bowel (duodenum) is the first area of the gastrointestinal tract to be exposed to the immunologically reactive peptide. Therefore, it is exposed to the highest concentration of the peptide and is often the most severely injured section of the small intestine. The jejunum and occasionally the ileum may also be affected.

Although the classic presentation of celiac disease is diarrhea, wasting, malabsorption, failure to grow, bloating, and abdominal cramps, not all individuals with celiac disease have these symptoms. Many individuals with celiac disease are diagnosed when seeking medical care for other problems such as anemia, osteoporosis, peripheral neuropathy, and fatigue (1,6). Celiac disease is categorized into four main classes according to the National Institutes of Health Consensus Conference Statement (6):

**Classical celiac disease:** This class is characterized by predominant gastrointestinal symptoms and sequelae including malabsorption, significant weight loss or gain, failure to grow (in children), diarrhea, constipation, excessive gas, bloating, and abdominal pain. The diagnostic testing reveals positive serologic test results and biopsy-proven intestinal atrophy. Symptoms improve after a patient adopts a gluten-free diet.

**Celiac disease with atypical symptoms:** This class is characterized by predominantly extraintestinal manifestations and few or no gastrointestinal symptoms. Non-gastrointestinal symptoms include anemia, osteoporosis, peripheral neuropathy or neurological symptoms, dental enamel defects, and fatigue. The diagnostic test results and treatment response are consistent with classical celiac disease.

**Silent celiac disease:** This disease is characterized by a lack of clinical symptoms in spite of positive serologic test results and biopsy-proven villous atrophy. Diagnosis of silent celiac disease usually results from screening high-risk individuals, eg, family members and individuals with associated conditions such as type I diabetes mellitus, Down syndrome, or Williams syndrome. A clear outcome benefit of treating these individuals has not emerged from current data analysis.

**Latent celiac disease:** This class is characterized by positive serologic test results, the absence of villous atrophy on intestinal biopsy, and no clinical symptoms of celiac disease. These individuals may develop intestinal changes and symptoms of celiac disease later in life.

**Dermatitis herpetiformis:** This condition is the skin manifestation of celiac disease, which is characterized by a bilateral, symmetric rash or eruptions primarily on pressure points of the skin that may evolve into blisters or bullae (fluid-filled sacs). These lesions are painfully itchy and do not respond well to topical treatment. Dermatitis herpetiformis is diagnosed from a skin biopsy taken from a site next to a lesion. Ninety percent of individuals with dermatitis herpetiformis have no gastrointestinal symptoms characteristic

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of celiac disease, but 75% have biopsy-proven villous atrophy that responds well to a gluten-free dietary pattern. Topical treatment of the lesions with sulfapyridine is effective in treating this form of bullous atopic dermatitis. Although oral medications may also be used, adherence to a gluten-free diet is the most effective way to prevent dermatitis herpetiformis.

Compliance with a gluten-free dietary pattern reduces the prevalence of diarrhea, constipation, abdominal pain and bloating, nausea or vomiting, reduced gut motility, delayed gastric emptying, and prolonged transit time (Grade II) (7). Evidence is limited regarding the effect of a gluten-free dietary pattern on indigestion, dysphagia, and reflux (Grade II) (7). Individuals who comply with a gluten-free dietary pattern have substantial improvement in villous atrophy; however, mucosal abnormalities may persist in some individuals (Grade II) (7). Although normalization of abnormalities may occur within 1 year, it generally takes longer, depending on the severity of villous atrophy, level of compliance, and age at diagnosis (Grade II) (7). Recovery in children may progress faster and more completely than in adults (Grade II) (7). People with celiac disease are more likely than healthy controls to experience neurological symptoms such as depression, cerebellar ataxia, headaches, migraines, and neuropathy (Grade II) (7). Early diagnosis and compliance with a gluten-free dietary pattern may reduce the prevalence of symptoms related to cerebellar ataxia, headaches, and migraines (Grade II) (7). The evidence is less conclusive or limited regarding the effect of a gluten-free diet on depression, anxiety, and epilepsy (Grade II) (7).

### Nutrition Assessment and Diagnosis

Biopsy of the small intestine is the gold standard for diagnosing celiac disease (1-6). Several biopsies should be taken because mucosal abnormalities may be localized (6). Criteria for diagnosis include mucosal abnormalities (eg, increased density of intraepithelial lymphocytes, partial to total villous atrophy, and crypt hyperplasia) and clinical improvement after a period of time on a gluten-free nutrition prescription (6,8). Tests for genetic markers are available to determine the likelihood that a person has celiac disease (1). The DQ2 and DQ8 markers are highly correlated with celiac disease and are tools for assessing a person's risk for celiac disease (6). Persons who exhibit symptoms of irritable bowel syndrome or who have undiagnosed gastrointestinal complaints (eg, diarrhea, bloating, gas, and abdominal pain), especially when accompanied by fatigue and weight loss, should be assessed for celiac disease. In a survey of adults with celiac disease, 37% of cases reported an initial diagnosis of irritable bowel syndrome (9). Serologic markers that can be used by dietitians to screen for celiac disease include immunoglobulin A, antihuman tissue transglutaminase, and immunoglobulin A endomysial antibody (1). Tests for these markers have a high sensitivity and specificity and are the best available tests in terms of diagnostic accuracy (1,6).

A comprehensive nutritional assessment is critical in determining whether recurrent symptoms are related to gluten sensitivity or to an unrelated problem. Damage to the intestinal mucosa may cause various degrees of malabsorption that leads to deficiencies of key vitamins and minerals, including calcium, vitamin D, iron, and folate (4). The following discussion reviews the evidence regarding the long-term effects of following a gluten-free dietary pattern after a diagnosis of celiac disease (7).

**Calcium:** Clinical trials and cross-sectional studies have found reduced bone mineral content and bone mineral density in untreated children, adolescents, and adults (7). Both of these parameters improve significantly with compliance to a gluten-free dietary pattern for at least 1 year (Grade I) (7). Compliance with dietary treatment initiated during childhood or adolescence allows the achievement of normal bone mineralization (Grade I) (7). However, in adults who received no treatment or delayed treatment in childhood or adolescence, a gluten-free meal pattern may improve bone density but not normalize bone mineral density (Grade I) (7). Successful treatment depends on the age at diagnosis, as patients who do not receive treatment in childhood and adolescence may never reach peak bone mass (Grade I) (7). Further studies are needed to evaluate the effects of calcium and vitamin D supplementation on bone mineral content and bone mineral density, as well as the effects of hormone replacement therapy for postmenopausal women (7). Adults with celiac disease should have a bone density test (dual energy X-ray absorptiometry scan) at the time of the diagnosis (6).

**Iron:** For most children and adults with celiac disease, compliance with a gluten-free dietary pattern results in significant improvement in hematological parameters including serum hemoglobin, iron, ferritin, mean corpuscular volume, mean corpuscular hemoglobin, and red cell distribution width (Grade II) (7). Recovery from anemia, as indicated by the normalization of hemoglobin concentrations, generally occurs within 6 months; recovery from iron deficiency, as indicated by the normalization of ferritin concentrations, may take longer

than 1 year (Grade II) (7). Iron supplementation in the form of a multivitamin with iron may be necessary to achieve normal values for these hematological variables within these time periods (Grade II) (7).

**Lactose:** Patients may need to be evaluated for lactose intolerance, which can appear secondary to celiac disease. If the patient is lactose intolerant, see the discussion of the Lactose-Controlled Diet later in this section. Usually lactose intolerance will normalize within weeks to months of adopting a gluten-free diet pattern (1).

### Contraindications

One form of celiac disease, refractory sprue, does not respond to the Gluten-Free Diet or responds only temporarily.

### Nutritional Adequacy

The Gluten-Free Diet can be planned to meet the Dietary Reference Intakes as outlined in the [Statement on Nutritional Adequacy](#) in Section IA. Compliance with a gluten-free dietary pattern results in significant improvements in nutritional laboratory values, such as serum hemoglobin, iron, zinc, and calcium, as a result of intestinal healing and improved absorption (Grade II) (7). Often, supplementation may be required to treat deficiencies secondary to celiac disease (1). Anemia may be treated with folate, iron, or vitamin B<sub>12</sub>. Patients who are dehydrated due to severe diarrhea require electrolytes and fluids. Vitamin K may be prescribed for patients who develop purpura, bleeding, or prolonged prothrombin time. Calcium and vitamin D supplementation may be necessary to correct osteomalacia. Vitamins A and D may be necessary to replenish stores depleted by steatorrhea. Daily consumption of a gluten-free, multivitamin-mineral supplement containing the Dietary Reference Intakes is recommended for patients who continue to have suspected deficiencies or malabsorption (1,7).

### How to Order the Diet

Order as “Gluten-Free Diet.”

### Nutrition Intervention and Prescription

The Gluten-Free Diet is based on the avoidance of the grains, chemicals, and natural or artificial ingredients that are toxic for patients with celiac disease or dermatitis herpetiformis (1). This diet eliminates all foods containing wheat, rye, barley, triticale, and their derivatives (1,6). Derivatives of these grains include wheat-based spelt, semolina, and kamut. Quinoa, buckwheat, amaranth, and teff are now allowed on a gluten-free diet, based on plant taxonomy and limited scientific evidence for the need to exclude these items (1). Millet, sorghum, Job’s tears, teff, ragi, and wild rice are more closely related to corn than to wheat. The American Dietetic Association, Dietitians of Canada, and other organizations such as the Gluten Intolerance Group and the Celiac Disease Foundation consider these plants to be acceptable in a gluten-free diet (1,6,10). The following grains and plant foods can be included in a gluten-free prescription (1):

- Rice, corn, amaranth, quinoa, teff (or tef), millet, finger millet (ragi), sorghum, Indian rice grass (Montina), arrowroot, buckwheat, flax, Job’s tears, sago, potato, soy, legumes, tapioca, wild rice, cassava (manioc), yucca, and nuts
- Nonmalt vinegars, including cider vinegar, wine vinegar, and distilled vinegar

**Oats:** Studies have shown that incorporating oats uncontaminated with wheat, barley, or rye into a gluten-free dietary pattern at intake levels of approximately 50 g of dry oats per day is generally safe for people with celiac disease and improves their compliance (Grade II) (7,11-15). However, the introduction of oats may result in gastrointestinal symptoms such as diarrhea and abdominal discomfort (7,16-18). Additional adverse effects include dermatitis herpetiformis, villous atrophy, and an increased density of intraepithelial lymphocytes, indicating that some persons with celiac disease may be unable to tolerate oats (Grade II) (7). The risk of cross-contamination with gluten-containing products remains a substantial concern in the United States. Some food companies such as Gluten Free Oats and Cream Hill Estates are attempting to improve the purity of oat production and may be a resource for persons with celiac disease (1). Until oats are proven safe, the inclusion of oats in a gluten-free diet should be at the discretion of patients in consultation with their physicians and dietitians (1). Patients who consume oats should be advised to limit their daily consumption to approximately 50 g of dry oats, an amount found to be safe in studies (19). Ideally, patients should only consume oats that have been tested and found to be free of gluten contamination (1,19).

**Wheat starch-based gluten-free foods:** Both natural and wheat starch-based gluten-free foods (as defined by the Codex Alimentarius (20)) produce similar histological and clinical recovery in people with celiac disease

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(Grade III) (7). Overall compliance with a gluten-free diet may be more important than the specific type of diet (eg, natural or wheat starch-based), as evidenced by the incomplete bowel mucosal recovery and positive serological test results generally seen in study subjects who have dietary lapses (Grade III) (7).

**Alcohol:** Beer, ale, porter, stout, and other fermented beverages should be avoided because they are derived from barley (1). Distilled alcoholic beverages (eg, gin and vodka) may be included in a gluten-free nutrition prescription. Although these beverages may be derived from gluten-containing grain, the process of distillation should prevent any protein from remaining in the final distillate (1). Checking the manufacturer's label is important with all types of alcoholic products because gluten-containing additives may be added after the alcohol is distilled.

The following guidelines should be considered when determining the nutrition prescription (1):

- The daily protein intake for adults should be 1 to 2 g/kg of body weight (1). Use high-biological value proteins.
- Adequate energy intake should be determined by using the Ireton-Jones or Mifflin-St. Jeor equations, or as outlined in Section II: Estimation of Energy Expenditures. Consider the need for weight gain if weight loss is unintentional and associated with disease.
- Evaluate the need for gluten-free vitamin and mineral supplementation.
- Evaluate the need for a medium-chain triglyceride supplement in adults who are diagnosed with steatorrhea.

The long-term nutritional adequacy of a gluten-free diet has been investigated. Adherence to the gluten-free dietary pattern may result in a diet that is high in fat and low in carbohydrates and fiber, as well as low in iron, folate, niacin, vitamin B<sub>12</sub>, calcium, phosphorus, and zinc (Grade II) (7). A food intake survey of persons with celiac disease found that less than 50% of the female participants consumed the recommended amounts of fiber, iron, and calcium (21). A small number of studies of adults show a trend toward weight gain after diagnosis (Grade II) (7). These factors may need to be considered during long-term patient management. The following dietary guidelines may be suggested to persons with celiac disease (1):

- Consume 5- to 10-oz equivalent servings from the grain food group each day.
- Choose whole grain, gluten-free products whenever possible.
- Choose enriched, gluten-free products over refined, unenriched products whenever possible.
- Increase intake of gluten-free products made from alternative plant foods (eg, amaranth, buckwheat, quinoa, teff, and flaxseed) to provide good sources of fiber, iron, and some B vitamins.
- Increase intake of other enriched, gluten-free foods, such as rice and energy bars.
- Increase intake of noncereal sources of thiamin, riboflavin, niacin, folate, iron, and fiber.
- Consider taking a gluten-free multivitamin and mineral supplement. Gluten-free brands include Freeda ([www.freedavitamins.com](http://www.freedavitamins.com)) and Nature's Bounty ([www.naturesbounty.com](http://www.naturesbounty.com)).

Cross-contamination with gluten-containing grains or gluten-containing products during processing, preparation, or food handling should be avoided. Patients will need to become proficient in the evaluation of food and manufacturers' labels to screen the ingredients in food products, dietary or medical food supplements, and medications. Hidden sources of gluten in food products include: hydrolyzed vegetable protein, flavorings, malt flavoring (includes malt syrup, malt extract, malt milk, and malt vinegar), brown rice syrup, modified food starch, dextrin, caramel color, vegetable gum, soy sauce, monoglycerides and diglycerides in dry products, emulsifiers, alcohol-based extracts (eg, vanilla extract), prepared meats, and flavored coffees. The following additional components contain gluten and are often overlooked: broth, breadings, croutons, pasta, stuffing, flours, sauces, coating mixes, marinades, thickeners, roux, soup base, self-basting poultry, imitation seafood, and imitation bacon (1). According to the U.S. Food and Drug Administration's Code of Federal Regulations (21CFR137), the following terms on a food label or ingredient list indicate the presence of wheat (22):

- flour, white flour, plain flour, bromated flour, enriched flour, phosphate flour, self-rising flour, durum flour, farina, semolina, and graham flour (1)

Effective January 1, 2006, under the Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA), if a food or an ingredient contains wheat or protein derived from wheat, the word "wheat" must be clearly stated on the food label (1,22). FALCPA applies not only to food products but also to dietary supplements, infant formulas, and medical foods. This regulation includes products that contain dextrin, caramel color, or modified food starch found in food products containing protein derived from wheat (1,22). All prescribed and over-the-counter medications should be evaluated by a knowledgeable pharmacist or physician prior to use. Ingredients used as part of the packaging are not required to be listed on the label.

Persons with celiac disease should be aware of the potential for cross-contamination with gluten-containing foods that may occur as result of preparing or cooking foods (eg, frying or grilling).

**Nutrition Evaluation and Monitoring**

Persons with celiac disease may experience an improvement in symptoms after 3 to 6 days of consuming a gluten-free diet, with full improvement of the intestinal mucosa within 6 months (23). Individuals with celiac disease demonstrate improved quality of life after compliance with a gluten-free dietary pattern for at least 1 year (Grade II) (7). Celiac disease is a chronic disease. An asymptomatic state depends on lifelong maintenance of the Gluten-Free Diet. Patients should be cautioned against ingesting gluten once they start to gain weight and feel better. The ingestion of gluten damages the mucosa and causes recurrent symptoms, although several weeks may lapse before the patient observes symptoms. Villous atrophy is significantly associated with dietary compliance (Grade II) (7). Therefore, an assessment of dietary adherence is critical in determining whether recurrent symptoms are related to gluten sensitivity or to an unrelated problem. Individuals who are diagnosed with celiac disease and are not treated or do not adhere to a gluten-free diet are at greater risk of developing osteoporosis and benign and malignant complications including lymphoma and other autoimmune diseases such as type 1 diabetes mellitus (1-6).

## FOOD GUIDE – GLUTEN-FREE DIET

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
<b>Beverages</b>	Brewed coffee (regular and decaffeinated), tea Instant and freeze-dried Sanka, Maxwell House, and Brim coffee Cocoa Carbonated beverages, except some root beer Artificially flavored fruit drinks, cider Wine, rum	Some herbal teas Other instant coffees Some fruit-flavored drinks <sup>a</sup> Some cocoa or chocolate mixes <sup>a</sup> Some root beer Beer <sup>a</sup> , ale, whiskey, and other distilled spirits made from cereal grains <sup>b</sup>
<b>Breads, Cereals, and Grain Products</b>	Specially prepared breads, crackers, cakes, cookies, pasta, and other products made with these flours and starches: cornflower, cornstarch, cornmeal, potato starch, rice flour, soy flour, soybean starch, tapioca, arrowroot starch, whole-bean flour, sago, rice bran, buckwheat, millet, flax, teff, sorghum, amaranth, and quinoa Pure corn tortillas Potato chips made only of potato; corn chips made only of corn Plain popcorn Rice cakes (check label) Hominy grits Rice, rice noodles Cornmeal Corn or rice cereals containing malt flavoring derived from corn; cream of rice; puffed rice; puffed millet	Breaded foods Breads, crackers, muffins, pizza crust, and other products made from barley, oat <sup>a</sup> , rye, or wheat flour; triticale; graham flour; gluten flour; bulgur; farina; wheat-based semolina; spelt; kamut Bran or wheat germ Commercial “gluten” bread Commercially prepared mixes for buckwheat pancakes or corn bread Cracker crumbs Pretzels, chips, and other snack foods, except those allowed Pasta and noodles made from barley, oat, rye, or wheat flour Communion wafers
<b>Vegetables</b>	Plain, fresh, frozen, or canned vegetables, except those excluded	Commercially prepared vegetables and salads (eg, some restaurant french fries or battered vegetables) <sup>a</sup> Vegetables prepared with sauces Canned baked beans
<b>Fruits and Juices</b>	Fresh, frozen, canned, or dried fruit Fruit juices	Prepared fruits with excluded flours or grains (eg, some pie fillings and thickened fruits)
<b>Milk</b>	Milk Chocolate milk (check label)	Cereal beverages such as Ovaltine Some commercial chocolate milk <sup>b</sup> , malted milk, instant milk mixes
<b>Meat and Meat Substitutes</b>	Pure meat, fish, poultry, eggs, bacon, and ham Pure cottage cheese; natural hard and semisoft cheeses Peanut butter, soybeans, dried beans, and other legumes; tofu Cold cuts, frankfurters, or sausage without fillers <sup>a</sup>	Breaded meat, fish, or poultry Canned or frozen meat dishes, stews, chili Patties, loaves, and croquettes made with bread crumbs or flour Some prepared meats such as cold cuts, frankfurters, sausages, and some hamburgers <sup>a b</sup> Processed cheese, cheese food, and cheese spreads Textured or hydrolyzed vegetable or plant protein products (TVP, HVP, HPP) Self-basting turkey with HVP added Cheese products containing oat gum as an ingredient Imitation crab containing wheat, starch, or other unacceptable fillers

<sup>a</sup> Items may or may not contain gluten or harmful prolamins. Verify ingredient list and purity of product with supplier.

<sup>b</sup> Check product label and contact manufacturer to clarify questionable ingredients, especially the source of flavoring in meat and poultry products.

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
<b>Meat and Meat Substitutes</b>		Frozen individual fish (may be dusted with flour); tuna canned with hydrolyzed protein
<b>Fats</b>	Butter, margarine, lard, cream, shortening, oils Mayonnaise Nuts Olives Gravy and sauce made with allowed thickening agents Salad dressings that do not contain a gluten stabilizer Cream cheese	Some commercial salad dressings (consult label) Cream sauce thickened with flour Nondairy cream substitute Commercially prepared gravy and sauce Coated and flavored nuts
<b>Soups</b>	Homemade broths; vegetable or cream soups made with allowed ingredients	Commercially prepared soups, bouillon, or broth with HVP or HPP <sup>b</sup> Soups containing barley, pasta, noodles, HVP, or HPP
<b>Desserts and Sweets</b>	Cakes, cookies, or pastries made from allowed flours or starches and cereal-free baking powder Custard Cornstarch, rice, and tapioca puddings Gelatin desserts Kozy Shack puddings and flans Ice cream with a few simple ingredients (usually brands that are expensive) Sorbet, frozen yogurt, and sherbet (check labels) Coconut Marshmallows Hard candy Commercial and homemade candies free from excluded grains Sugar, honey, corn syrup, maple syrup, jam, jelly, molasses	Ice cream containing stabilizers <sup>a</sup> Commercially made puddings Cookies, cakes, pies, pastry, and other baked items, unless specially prepared Doughnuts Bread pudding Products made with brown rice syrup prepared with barley malt enzyme Flavored syrups Chocolate and other candy containing excluded ingredients Desserts with malt, malt flavoring, or natural flavoring Chocolate-covered nuts that may have been rolled in wheat flour
<b>Miscellaneous</b>	Salt, monosodium glutamate, tamari, spices, herbs, flavoring extracts, dry mustard Dry yeast Pure cocoa and chocolate Cider Vinegar, except malt vinegar Pickles, olives	Soy sauce <sup>b</sup> , commercial catsup <sup>b</sup> , chili sauce <sup>b</sup> , barbecue sauce, Worcestershire sauce, horseradish, seasoning mixes Cake yeast, baking powder Some pizzas <sup>a</sup> Licorice Chewing gum <sup>b</sup> Malt vinegar

<sup>a</sup> Items may or may not contain gluten or harmful prolamins. Verify ingredient list and purity of product with supplier.

<sup>b</sup> Check product label and contact manufacturer to clarify questionable ingredients, especially the source of flavoring in meat and poultry products.

**SAMPLE MENU**

Breakfast	Noon	Evening
Orange Juice	Baked Chicken	Braised Beef Tips
Cream of Rice	Steamed Rice	Whipped Potatoes
Soft-Cooked Egg	Steamed Broccoli With Carrots	Green Beans
Gluten-free Bread	Gluten-free Bread	Sliced Tomato Salad
Margarine, Jelly	Margarine	Peach Halves
Milk	Pineapple Chunks	Gluten-free Bread
Coffee	Milk	Margarine
Sugar, Creamer	Iced Tea, Sugar	Iced Tea, Sugar

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### Substitutions for Wheat Flour

Most patients find special cookbooks helpful. Recipes can be modified by the following substitutions:

For baking, 1 cup wheat flour may be replaced by:

- 1 cup corn flour (finely milled)
- 1 scant cup fine cornmeal
- ¾ cup coarse cornmeal
- 5/8 cup (10 tbsp) potato starch flour
- 7/8 cup (14 tbsp) rice flour (white or brown)
- 1 cup soy flour plus ¼ cup potato starch flour
- ½ cup soy flour plus ½ cup potato starch flour

For thickening, 1 tbsp of wheat flour may be replaced by:

- 1½ teaspoons of cornstarch, potato starch, rice, flour arrowroot starch, or gelatin
- 2 teaspoons of quick-cooking tapioca
- 1 tbsp rice flour (white or brown)

### Support Groups

American Celiac Society  
PO Box 23455  
New Orleans, LA 70183  
(504) 737-3293  
[www.americanceleacsociety.org](http://www.americanceleacsociety.org)

Celiac Disease Foundation  
13251 Ventura Blvd., #1  
Studio City, CA 91604  
(818) 990-2354  
[www.celiac.org](http://www.celiac.org)

Celiac Sprue Association  
PO Box 31700  
Omaha, NE 68131-0700  
(877) CSA-4CSA  
[www.csaceliacs.org](http://www.csaceliacs.org)

Gluten Intolerance Group of North America  
31214 124<sup>th</sup> Ave SE  
Auburn, WA 98092-3667  
(253) 833-6655  
[www.gluten.net](http://www.gluten.net)

### Suppliers of Gluten-Free Products

Bob's Red Mill  
(800) 553-2258  
[www.bobsredmill.com](http://www.bobsredmill.com)

Ener-G Foods\*  
(800) 331-5222  
[www.ener-g.com](http://www.ener-g.com)

Enjoy Life Foods\*  
(888) 503-6569  
[www.enjoylifefoods.com](http://www.enjoylifefoods.com)

Gluten Solutions  
(888) 845-8836  
[www.glutensolutions.com](http://www.glutensolutions.com)

Gluten-Free Mall  
(866) 575-3720  
[www.glutenfreemall.com](http://www.glutenfreemall.com)

The Gluten-Free Pantry/Glutino  
(800) 291-8386  
[www.glutino.com](http://www.glutino.com)

Health Valley\*  
(800) 434-4246  
[www.healthvalley.com](http://www.healthvalley.com)

Heartland's Finest  
(888) 658-8909  
[www.heartlandsfinest.com](http://www.heartlandsfinest.com)

Kingsmill Foods  
(416) 755-1124  
[www.kingsmillfoods.com](http://www.kingsmillfoods.com)

Kinnikinnick Foods\*  
(877) 503-4466  
[www.kinnikinnick.com](http://www.kinnikinnick.com)

Maple Grove Food and Beverage\*  
(323) 322-0501  
[www.maplegrovefoods.com](http://www.maplegrovefoods.com)

Med-Diet  
(800) 633-3438  
[www.med-diet.com](http://www.med-diet.com)

Miss Roben's  
(800) 891-0083  
[www.missroben.com](http://www.missroben.com)

Pamela's Products  
(707) 462-6605  
[www.pamelasproducts.com](http://www.pamelasproducts.com)

Perky's Natural Foods\*  
(888) 473-7597  
[www.perkysnaturalfoods.com](http://www.perkysnaturalfoods.com)

\*Provides enriched gluten-free bread products or baking mixes

## References

1. Celiac disease. In: *Nutrition Care Manual*. American Dietetic Association; 2007. Available at: <http://www.nutritioncaremanual.org>. Accessed November 15, 2007.
2. Abdulkarim AS, Murray JA. Review article: the diagnosis of coeliac disease. *Aliment Pharmacol Ther*. 2003;17:987-995.
3. Alaedini A, Green PH. Narrative review: celiac disease: understanding a complex autoimmune disorder. *Ann Intern Med*. 2005;142:289-298.
4. Farrell RJ, Kelly CP. Celiac sprue. *N Engl J Med*. 2002;346:180-188.
5. Fasano A, Catassi I. Current approaches to diagnosis and treatment of celiac disease: an evolving spectrum. *Gastroenterology*. 2001;120:636-651.
6. National Institutes of Health Consensus Development Conference Statement. NIH Consensus Development Conference on Celiac Disease. June 28-30, 2004; Bethesda, Md. Final Statement August 9, 2004. Available at: <http://consensus.nih.gov/2004/2004CeliacDisease118html.htm>. Accessed November 27, 2007.
7. Gluten Intolerance/Celiac Disease and Nutrition Evidence Analysis Project. American Dietetic Association Evidence Analysis Library. American Dietetic Association; 2007. Available at: <http://www.adaevidencelibrary.org>. Accessed November 15, 2007.
8. Maki M, Collin P. Coeliac disease. *Lancet*. 1997;349:1755-1759.
9. Zipser RD, Patel S, Yahya KZ, Baisch DW, Monarch E. Presentations of adult celiac disease in a nationwide patient support group. *Dig Dis Sci*. 2003;48:761-764.
10. Thompson T. Case Problem: questions regarding the acceptability of buckwheat, amaranth, quinoa, and oats from a patient with celiac disease. *J Am Diet Assoc*. 2001;101:586-587.
11. Janatuinen EK, Kempainen TA, Pikkarainen PH, Holm KH, Kosma V-M, Uusitupa MIJ, Maki M, Julkunen RJK. Lack of cellular and humoral immunological responses to oats in adults with coeliac disease. *Gut*. 2000;46:327-331.
12. Hoffenberg EJ, Haas J, Drescher A, Barnhurst R, Osberg I, Bao F, Eisenbarth G. A trial of oats in children with newly diagnosed celiac disease. *J Pediatr*. 2000;137:361-366.
13. Janatuinen EK, Kempainen TA, Julkunen RJK, Kosma V-M, Maki M, Heikkinen M, Uusitupa MIJ. No harm from five year ingestion of oats in coeliac disease. *Gut*. 2002;50:332-335.
14. Storsrud S, Olsson M, Arvidsson LR, Nilsson LA, Kilander A. Adult coeliac patients do tolerate large amounts of oats. *Eur J Clin Nutr*. 2003;57:163-169.
15. Hogberg L, Laurin P, Faith-Magnusson K, Grant C, Grodzinsky E, Jansson G, Ascher H, Browaldh L, Hammersjo JA, Lindberg E, Myrdal U, Stenhammer L. Oats to children with newly diagnosed coeliac disease: a randomised double blind study. *Gut*. 2004;53:649-654.
16. Lundin KE, Nilsen EM, Scott HG, Loberg EM, Gjoen A, Bratlie J, Skar V, Mendez, E, Lovik A, Kett K. Oats induced villous atrophy in coeliac disease. *Gut*. 2003;52:1649-1652.
17. Peraaho M, Kaukinen K, Mustalahti K, Vuolteenaho N, Maki M, Laippala P, Collin P. Effect of oats-containing gluten-free diet on symptoms and quality of life in coeliac disease: a randomized study. *Scand J Gastroenterol*. 2004;39:27-31.
18. Arentz-Hansen H, Fleckenstein B, Molberg O, Scott H, Koning F, Jung G, Roepstorff P, Lundin KEA, Sollid LM. The molecular basis for oat intolerance in patients with celiac disease. *PLoS Med*. 2004;1:e1.
19. Thompson T. Oats and the gluten-free diet. *J Am Diet Assoc*. 2003;103:376-379.
20. Joint FAO/WHO Food Standards Program. Codex Committee on Nutrition and Foods for Special Dietary Uses. Draft revised standard for gluten-free foods. *CX/NFSDU 98/4*. July 1998:1-4.
21. Thompson T, Dennis M, Higgins L, Lee A, Sharrett M. Gluten-free diet survey: are Americans with coeliac disease consuming recommended amounts of fibre, iron, calcium and grain foods? *J Hum Nutr Diet*. 2005;18:163-169.
22. US Food and Drug Administration's (FDA) Code of Federal Regulations (21CFR137). Available at: [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108\\_cong\\_bills&docid=f:s741es.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108_cong_bills&docid=f:s741es.txt.pdf). Accessed November 29, 2007.
23. Godkin A, Jewell D. The pathogenesis of celiac disease. *Gastroenterology*. 1998;115:206-210.

## Bibliography

- Green PH, Jabri B. Coeliac disease. *Lancet*. 2003;362:383-391.
- Fasano A, Berti I, Gerarduzzi T, Not T, Colletti RB, Drago S, Elitsur Y, Green PH, Guandalini S, Hill ID, Pietzak M, Ventura A, Thorpe M, Kry D, Fornardi F, Wasserman SS, Murray JA, Horvath K. Prevalence of celiac disease in at-risk and not-at-risk groups in the United States: a large multicenter study. *Arch Intern Med*. 2003;163:286-292.
- Murray JA. The widening spectrum of celiac disease. *Am J Clin Nutr*. 1999;69:354-365.
- Thompson T. Thiamin, riboflavin, and niacin contents of the gluten-free diet: is there cause for concern? *J Am Diet Assoc*. 1999; 99: 858-862.
- American Gastroenterological Association medical position statement: Celiac Sprue. *Gastroenterology*. 2001; 120:1522-1525.

# TYRAMINE-RESTRICTED DIET

## Description

Foods containing tyramine and other vasoconstrictive amines are eliminated from the Tyramine-Restricted Diet.

## Indications

The Tyramine-Restricted Diet is indicated when patients are receiving monoamine oxidase inhibitors (MAOIs) and the medication Zyvox (Linezolid) (1). These drugs treat anxiety and depression by inhibiting the inactivation of neurotransmitters. Therapy with MAOIs is used to prevent the catabolism of dietary tyramine, which normally is metabolized in the gastrointestinal tract. The result is an increased concentration of tyramine in the body, causing the release of norepinephrine and an elevation of mood. Increase amounts of tyramine, however, can cause an excess amount of norepinephrine to be released, which may result in a hypertensive crisis. This is characterized by severe headaches, palpitation, neck stiffness or soreness, nausea or vomiting, sweating, fever, and visual disturbances.

Many foods normally contain small amounts of tyramine and other vasopressor amines. Large amounts have been reported only in aged, fermented, pickled, smoked, or bacterially contaminated products. When fresh foods are stored, especially meat, poultry, fish, and related items such as pâté, gravy, and soup stock, fermentation occurs and the tyramine content of the food increases. Since heat does not destroy tyramine, all foods should be fresh, fresh frozen, or canned and should be handled, prepared, stored, and served in ways that maximize freshness.

The consequences of tyramine intake are dose-related. Therefore, reactions can be prevented without total abstinence from tyramine-containing foods. A rational approach to diet compliance could best be achieved by emphasizing the most crucial items to avoid.

Caffeine does not contain tyramine, but excessive amounts may precipitate hypertensive crisis. Therefore, foods containing caffeine should be ingested with caution.

## Nutritional Adequacy

The diet, a variation of the Regular Diet, can be planned to meet the DRIs as outlined in the [Statement on Nutritional Adequacy](#) in Section IA.

## How to Order the Diet

Order as “\_\_\_\_\_ Diet, Tyramine Restricted.”

## Planning the Diet

Guidelines for dietary counseling in MAOI use include the following:

1. Begin nutrition counseling before drug therapy.
2. Monitor patient compliance.
3. Recommend preparation and consumption of only fresh foods.
4. Continue the diet 4 weeks beyond drug therapy.

Resynthesis of monoamine oxidase occurs slowly, and food interactions may occur up to 3 weeks after withdrawal of some MAOI drugs. Prudent practice is to start the tyramine-restricted diet when the drug therapy is begun and to continue the diet for 4 weeks after the drug regimen is withdrawn.

## Reference

1. Zyvox In: Drug Library. *Drug Digest*. Express Scripts, Inc. @ www.drugdigest.org, accessed October 1, 2005.

## Bibliography

*American Hospital Formulary Series (AHFS) Drug Information*. Bethesda, Md: American Society of Health System Pharmacists; 1999.  
*Nursing 2003 Drug Handbook*. 23<sup>rd</sup> ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2003.  
Gardner DM, Shulman KI, Walker SE, Taylor SA. The making of a user friendly MAOI diet. *J Clin Psych*. 1996;52:99-104.  
Tyramine-controlled diet. American Dietetic Association *Nutrition Care Manual*. 2004. Available at: nutritioncaremanual.org. Accessed November 14, 2005.

## FOOD GUIDE

### FOODS EXCLUDED

<b>Beverages</b>	Wine; beer; champagne (regular, alcohol-free, or reduced alcohol) Caffeine-containing beverages (eg, coffee, tea, or soft drinks) should be limited to two 8-oz Servings per day
<b>Milk</b>	Cheese or cheese products except cottage cheese and cream
<b>Meats</b>	Aged, cured, smoked, pickled, or salted meats and fish Liver; pate Hot dogs; sausage; salami; pepperoni; bacon
<b>Vegetables</b>	Sauerkraut Pickled vegetables such as pickles; chili pepper Broad beans
<b>Fruits</b>	Avocado
<b>Miscellaneous</b>	Soy sauce; teriyaki sauce; black bean sauce Meat tenderizers Bleu cheese, ranch, or other cheese-containing salad dressings Brewer's yeast Olives Chocolate

Note: Patients should be reminded to consult their physician or pharmacist before taking new medications, especially cold tablets, decongestants, most allergy and asthma medications, hypertensive medications, diet pills, and sleeping pills.

### MONOAMINE OXIDASE INHIBITOR (MAOI) DRUGS

GENERIC NAME	GENERAL USE
Tranlycypromine sulfate	Antidepressant
Phenelzine sulfate	Antidepressant
Isocarboxazid	Antidepressant
Furazolidone	Antimicrobial
Procarbazine hydrochloride	Anticancer

# LACTOSE-CONTROLLED DIET

## Description

The Lactose-Controlled Diet limits intake of milk and milk products to the amount tolerated by the individual. Refer to Lactose Maldigestion medical nutrition therapy protocol for medical nutrition intervention strategies (1).

## Indications

The Lactose-Controlled Diet is indicated in patients who are lactose intolerant; they are deficient in the enzyme lactase and are unable to tolerate ingested lactose. Lactose maldigestion occurs when digestion of lactose is reduced as a result of low activity of the enzyme lactase, as determined by the breath hydrogen test (2). Interpretation of the terms used to describe lactose maldigestion varies. For example, lactose intolerance refers to the gastrointestinal symptoms resulting from consumption of too much lactose relative to the body's ability to break it down by the intestinal enzyme lactase (1). Lactose maldigestion or its symptoms (lactose intolerance) should not be confused with a milk allergy, which is an allergy to milk proteins, not lactose. Lactose maldigestion is present in 70% of the world's adults and 20% to 25% of the US population. It is most prevalent among African-Americans, Asians, Hispanics, Native Americans, and people of Jewish descent. Lactose not hydrolyzed by lactase in the small intestine passes into the large intestine, where it is broken down by bacteria. The products of bacterial degradation can irritate the mucosa and raise the osmolality of the intestinal contents, causing a net secretion of fluid. Symptoms include bloating, abdominal pain, flatulence, and diarrhea, usually within 30 minutes after ingestion of lactose-containing foods.

Lactose maldigestion is not a disease, but a normal physiologic pattern (3). Primary lactase deficiency is the most common type and occurs as a normal physiological process in which lactase production in the brush border of the small intestine is reduced (3). Lactase deficiency may be secondary (secondary lactase deficiency) to significant protein-energy malnutrition, acquired immunodeficiency syndrome (AIDS), or iron deficiency anemia. Secondary lactase deficiency has also been observed following the use of antibiotics and anti-inflammatory drugs for arthritis. A transient secondary lactase deficiency may occur following viral gastroenteritis. It has been observed following surgical resection of the stomach or small bowel when there is a decrease in the absorptive area, following radiation therapy to the gastric or pelvic area, and after prolonged disuse of the gastrointestinal tract (eg, with total parenteral nutrition). However, the lactase activity may return to normal in the latter conditions over time. In children, it is typically secondary to infections or other conditions, such as diarrhea, AIDS, or giardiasis. Lactose intolerance may also be secondary to conditions that produce intestinal damage, such as celiac sprue, regional enteritis, Crohn's disease, and gluten-sensitive enteropathy.

Treatment is aimed at the underlying disorder in order to restore the patient's tolerance to lactose and to eliminate lactose restrictions. Evidence suggests that people with medically confirmed lactase maldigestion can include the recommended number of servings of milk and other dairy foods in their diet, which may actually improve their tolerance to lactose (1-3).

In feeding malnourished hospitalized patients and other patients with lactose intolerance, intolerance to 12 g of lactose can be clinically relevant. The following are used to determine the presence of lactose intolerance:

- *A diet history* can reveal symptoms of lactose intolerance following ingestion of lactose. Relief of symptoms following trial of a reduced lactose intake also indicates lactose intolerance.
- *A breath hydrogen analysis test* is the gold standard, or method of choice, to diagnose lactose maldigestion, especially in children. An increase in breath hydrogen concentration, generally 10 to 20 ppm above baseline, warrants a diagnosis of lactose maldigestion.
- *A lactose tolerance test* gives an oral dose of lactose equivalent to the amount of 1 quart of milk (50 g). In the presence of lactose intolerance, the blood glucose level increases less than 25 mg/dL of serum above the fasting level, and gastrointestinal symptoms may appear.
- *A biopsy* of the intestinal mucosa to determine lactase activity.

Congenital lactose intolerance is a rare condition. It is commonly diagnosed during the newborn period by intestinal biopsy and enzyme assay. Congenital lactose intolerance can cause life-threatening diarrhea and dehydration in the newborn. A lactose-free formula is indicated as soon as the diagnosis is made.

### Nutritional Adequacy

The Low-Lactose Diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the [Statement on Nutritional Adequacy](#) in Section IA. Adequate calcium can be obtained through the inclusion of dairy products, including cheese, yogurt, and milk or lactose-hydrolyzed milk.

When dairy products are limited, adequate intake of calcium, phosphorus, vitamins A and D, and riboflavin may be difficult to obtain. Because of the increased importance of calcium and its relationship to various diseases (eg, osteoporosis, hypertension) maintaining calcium intake of 1000 to 1300 mg/day for adults is a primary goal (4). Vitamin D fortified milk is the most dependable source of vitamin D. A vitamin D supplement may be indicated if exposure to sunlight is not ensured and if other foods fortified with vitamin D are not included in the diet.

### How to Order the Diet

Order as “Lactose-Controlled Diet”.

### Planning the Diet

The important consideration is how much lactose can be tolerated without developing intestinal symptoms.

Between 80% and 100% of people with lactase deficiency experience the symptoms described if they drink 1 quart of milk a day. Research indicates that most people with low levels of lactase can comfortably ingest at least 1 cup (8 oz) of milk (12 g of lactose) with a meal and even 2 cups of milk in a day (5,6). One study has found that people with lactose maldigestion can consume 1500 mg of calcium per day if the dairy products are distributed between the three meals and provided partially in the form of yogurt and cheese (2 cups of milk, 2 oz of cheese, and 8 oz of yogurt) (7). Tolerance to milk products is greater when they are consumed with other foods and spaced throughout the day. Whole milk is better tolerated than lower fat milk, and chocolate milk is better tolerated than unflavored milk (8,9). Generally, cheeses and ice cream are better tolerated than milk because of its lower lactose content. Adults with lactose intolerance can usually tolerate the amounts of milk in many prepared foods, such as breads, luncheon meats, and creamed foods, if these foods are given at intervals throughout the day.

Milk contributes a number of important nutrients to the diet, and dairy products are a major source of calcium, protein, and riboflavin. The maximum amount of milk products that can be taken without adverse effects should be included in the diet of persons with lactose maldigestion. Tolerance to lactose can be improved by gradually increasing intake of lactose-containing foods such as dairy products (3).

Commercial lactase enzyme preparations (eg, Lactaid® and Dairy Ease®) will hydrolyze 70% to 90% of the lactose in milk depending on the amount added. Lactose-reduced milks (reduced-fat, nonfat, calcium-fortified, and chocolate) with 70% to 100% of their lactose hydrolyzed are available. Lactose-reduced cottage cheese, pasteurized processed cheese, and some ice creams are available in some markets. Lactaid® caplets and Dairy Ease® tablets, which can be taken before ingestion of milk or milk products, are also available. Products made from soy, eg, tofu, calcium and vitamin fortified soy milk, tofu-based ice cream substitutes, and pasta entrees, are also available.

The following ingredients contain lactose and can be identified on the product’s food label: (dry) milk solids/curds, casein, whey (solids), and lactose.

Other compounds that may appear on the food label but do not contain lactose are calcium compounds, kosher foods marked “pareve” or “parve,” lactate, and lactic acid.

**LACTOSE CONTENT OF MILK PRODUCTS**

<b>10 - 15 g</b>	<b>1 - 6 g</b>	<b>&lt;1 g<sup>a</sup></b>
Milk, fluid, 1 cup	Pudding, ½ cup Ice Cream, ½ cup Ice Milk, ½ cup	Processed American Cheese, 1 oz Cream cheese, 1 oz
Yogurt <sup>b</sup> , 1 cup	Sherbet, ½ cup Processed Cheese Spread, 1 oz Cottage Cheese, ½ cup Lactaid® and Dairy Ease® Milk (<100% reduced), 1 cup	Natural Hard and Semisoft Cheeses, 1 oz Half-and-Half, 1 tbsp Sour Cream, 1 tbsp

<sup>a</sup>These foods are processed with small amounts of milk, milk products, milk solids, or lactose and can be considered to have minimal to undetectable amounts of lactose.

<sup>b</sup>Only yogurt with active cultures is well tolerated by persons with a lactase deficiency. Yogurt with active cultures is labeled "live and active culture."

**FOOD GUIDE — LACTOSE-CONTROLLED**

<b>FOOD GROUPS</b>	<b>FOODS THAT MAY CAUSE DISTRESS</b>
<b>Beverages and Milk</b>	Milk (including acidophilus milk) and milk products except yogurt <sup>a</sup> ; however, 4 to 8 oz of milk can usually be tolerated with meals several times per day Mocha mix
<b>Fruits and Juices</b>	None
<b>Vegetables</b>	Any prepared with milk or cheese Instant mashed potatoes containing lactose Creamed, scalloped, or commercial products containing milk
<b>Breads and Cereals</b>	Instant Cream of Wheat; high-protein cereals; cereals with milk
<b>Meat, Fish, Poultry, Cheese</b>	Meats and meat substitutes in cream sauce Cold cuts, luncheon meats, sausage, processed meats that contain milk, nonfat milk solids or lactose filler Cottage cheese; processed cheese spread (Hard, aged cheeses, eg, bleu, brick, Camembert, cheddar, Colby, Edam, provolone, and Swiss, and processed cheeses, eg, American, Swiss are low in lactose and usually do not present a problem.)
<b>Fats</b>	Cream; half-and-half; whipping cream Gravies made with milk
<b>Soups</b>	Cream soups; chowder; commercially prepared soups that contain milk or milk products
<b>Desserts</b>	Ice cream Pudding, custard, and other desserts containing milk or milk products
<b>Sugar and Sweets</b>	Candy containing milk or cocoa Butterscotch candies, caramels, chocolate

<sup>a</sup>Only yogurt with active cultures is well tolerated by persons with a lactase deficiency. Yogurt with active cultures is labeled "live and active culture."

## SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Honey Glazed Chicken	Braised Beef & Noodles
Oatmeal	Baked Potato With Margarine	Seasoned Green Beans
Hard-Cooked Egg	Steamed Broccoli	Sliced Tomato Salad
Biscuit	Fruited Gelatin	French Dressing
Margarine; Jelly	Dinner Roll	Peach Halves
Coffee	Margarine	Dinner Roll
Sugar; Nondairy creamer	Frosted Banana Cake	Fruited Yogurt
Milk (½ cup if tolerated) or Lactose-Reduced Milk	Milk (½ cup if tolerated) Tea; Sugar	Margarine Tea; Sugar

## References

1. Inman-Felton A. Overview of lactose maldigestion (lactose nonpersistence). *J Am Diet Assoc.* 1999;99:481-489.
2. *Lactose Intolerance.* Washington, DC: National Digestive Disease Information Clearinghouse; 1994. NIH Publication No. 94-2751.
3. McBean LD, Miller GD. Allaying fears and fallacies about lactose intolerance. *J Am Diet Assoc.* 1998;98:671-676.
4. Yates AA, Schlicker SA, Sutor CW. Dietary Reference Intake: The new basis for recommendations for calcium and related nutrients, B vitamins and choline. *J Am Diet Assoc.* 1998;98:699-706.
5. Suarez F, Savaiano D, Levitt MD. A comparison of symptoms after the consumption of milk or lactose-hydrolyzed milk by people with self-reported severe lactose intolerance. *N Engl J Med.* 1995;333:1-4.
6. Suarez F, Savaiano D, Arbisi P, Levitt MD. Tolerance to the daily ingestion of two cups of milk by individuals claiming lactose intolerance. *Am J Clin Nutr.* 1997;65:1502-1506.
7. Suarez F, Adsheed J, Furne J, Levitt MD. Can lactose maldigesters tolerate the ingestion of a dairy-rich diet containing approximately 1500 mg calcium/day? New Orleans, La: American Gastroenterological Association Digestive Disease Week Syllabus. 1998;A-520, #2086.
8. Dehkordi N, Rao DR, Warren AP, Chawan CB. Lactose malabsorption as influenced by chocolate milk, skim milk, sucrose, whole milk, and lactose cultures. *J Am Diet Assoc.* 1995;95:484-486.
9. Hertzler SR, Levitt MD, Savaiano PA. Colonic adaptation in the daily lactose feeding in lactose maldigesters reduces lactose intolerance. *J Am Clin Nutr.* 1996;64:1232-1236.

## Bibliography

- Escott-Stump S. *Nutrition and Diagnosis-Related Care.* 5th ed. Baltimore, Md: Lippincott Williams & Wilkins; 2002.
- Hermans MM, Brummer RJ, Ruijters AM, Stockbrugger RW. The relationship between lactose tolerance test results and symptoms of lactose intolerance. *Am J Gastroenterol* 1997;92:981-984.
- Hetzler S, Huynh BL, Savaiano DA. How much lactose is low lactose? *J Am Diet Assoc.* 1996;96:243-246.
- Lactose-controlled diet. *Manual of Clinical Dietetics.* Chicago, Ill: American Dietetic Association; 1996.
- Lactaid. Available at: <http://www.jnj.merck.com>. Accessed April 28, 1998.
- Lee MF, Krasinski SD. Human adult-onset lactase decline: an update. *Nutr Rev.* 1998;98:1-8.
- Lin MY, Yen CI, Chen SH. Management of lactose maldigestion by consuming milk containing lactobacilli. *Dig Dis Sci.* 1998;43:133-137.
- Beyer PL. Medical nutrition therapy for lower gastrointestinal tract disorders. In: Mahan KL, Escott-Stump S, eds. *Krause's Food, Nutrition and Diet Therapy.* 10<sup>th</sup> ed. Philadelphia, Pa: WB Saunders; 2000:679-680.
- National Digestive Diseases Information Clearinghouse. Lactose intolerance. Available at: <http://www.gastro.com>. Accessed April 28, 1998.
- Ramirez FC, Lee K, Graham DY. All lactase preparations are not the same: results of a prospective, randomized, placebo-controlled trial. *Am J Gastroenterol.* 1994;89:566-570.
- Savaiano DA, Abou A, Anouar EI, Smith DE, Levitt MD. Lactose malabsorption from yogurt, pasteurized yogurt, sweet acidophilus milk, and cultured milk in lactase-deficient individuals. *Am J Clin Nutr.* 1984;40:1219-1223.
- Vesa TH, Korpela RA, Sahi T. Tolerance to small amounts of lactose in lactose maldigesters. *Am J Clin Nutr.* 1996;64:197-201.

# NUTRITION MANAGEMENT OF FOOD HYPERSENSITIVITIES

## Description

This diet eliminates the offending food or foods that cause an adverse reaction. Generally, the diet is the Regular Diet with the omission of the offending food. Each individual's sensitivity to the food determines the degree to which the particular food must be omitted.

## Indications

Food hypersensitivity is an immune response, generally from IgE, to food components. The reaction results from an antigen of food source (usually protein) and may occur immediately (1 minute to 2 hours) or as a delayed reaction (2 to 48 hours) (1). Allergic tendencies are inherited, but not necessarily to a specific antigen. Foods most commonly reported to cause allergic reactions in children are cow's milk, chicken eggs, peanuts, soy, and fish; in adults, the most common are tree nuts, peanuts, fish, shellfish and wheat (2-4). The most common reactions to food allergies are gastrointestinal (eg, diarrhea, nausea, vomiting, cramping, and abdominal distention and pain), skin-related, and respiratory responses as well as systemic anaphylaxis with shock.

No simple test can be used to accurately diagnose the presence of a true food hypersensitivity. Unidentified or misdiagnosed food hypersensitivities can cause fatal reactions, result in inappropriate treatments, and threaten nutritional status. For the diagnosis of hypersensitivity, the following measures should be taken: a food reaction history, a physical examination, a 1- to 2-week diary recording foods eaten and symptoms, biochemical testing, immunologic testing, eg, skin tests such as, radioallergosorbent test (RAST) and the enzyme-linked immunosorbent assay (ELISA), a trial elimination diet for 2 weeks or until symptoms are clear, and a food challenge (2,5,6).

The history, used to identify the suspected food, should include detailed descriptions of symptoms, amount of food ingested, time of intake, and time of onset of symptoms.

A trial elimination diet removes all suspected foods and reintroduces them one at a time; if the symptoms are reduced by 50% or more while the patient is on the diet, that food is suspected (5). The food challenge is made after symptoms are cleared. Although challenges can be open, single-blind, or double-blind, the double-blind, placebo-controlled food challenge (8) is the preferred method for diagnosis of food hypersensitivity. Foods are provided in a pure form, and challenged one at a time, one per day. After the trial elimination diet and food challenge, the patient's diet should be altered eliminating the response-related food for 6 to 8 weeks (5). These foods are challenged again, and if the patient does not react to them, the foods are returned to the diet on an occasional basis.

## Nutritional Adequacy

The trial elimination diet is intended to be short term because of its nutrient inadequacies. Most eliminations that involve a single food can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the [Statement on Nutritional Adequacy](#) in Section IA. However, diets that eliminate cow's milk may be low in calcium, vitamin D, and riboflavin. If children must eliminate cow's milk, the diet may also be low in protein and vitamin A. Diets that restrict or eliminate eggs, meats, and fish may be deficient in protein. Grain-free diets may be deficient in B vitamins, iron, energy, and carbohydrates. Citrus-free diets may be deficient in vitamin C and folic acid. Diets that eliminate multiple foods can be deficient in certain nutrients and should be evaluated, so that appropriate alternatives are recommended to supply nutrients that are lacking. No food group should be completely eliminated on a permanent basis unless absolutely necessary.

## How to Order the Diet

Order as "\_\_\_\_-Free Diet" (specify food to eliminate).

## Planning the Diet

The basic diet should be the appropriate diet for the patient's age. Only foods confirmed by the food challenge should continue to be restricted. It is important to personalize the patient's diet based on food preferences.

Labels and recipes should be carefully read to avoid ingestion of the food that causes a reaction. Teaching the patient to read food labels, make appropriate substitutions, and purchase foods free of the suspected allergen, is the most helpful component to the self-management training. Often this training will require more than one session. Patients should be encouraged to contact food manufacturers with questions about

ingredients. The Food Allergy & Anaphylaxis Network (FAAN) has a Grocery Manufacturer's Directory and small, pocket-laminated cards listing food terminology.

These resources are available for purchase directly from FAAN (10400 Eaton Place, Suite 107, Fairfax, VA 22030, 703/691-3179, Fax, 703/691-2713, email: fan@worldweb.net) (5).

The following section lists ingredients and terms found on food labels, which indicate the presence of specific food allergens.

### Corn-Free Diet

Ingredients to avoid:

- Baking powder
- Corn, all types
- Corn flour
- Corn grits
- Corn malt
- Corn meal
- Corn starch
- Corn sugar; corn sweeteners
- Corn syrups
- Dextrin; dextrose
- Equal® sugar substitute
- Fructose
- Glucose
- Hominy
- Lactic acid
- Maize
- Maltodextrin
- Modified food starch
- Popcorn
- Sorbitol
- Vegetable gum; vegetable starch

### Egg-Free Diet

Ingredients to avoid:

- Albumin
- Apovitellin
- Cholesterol-free egg substitute
- Egg
- Egg powder
- Egg whites, all forms
- Globulin
- Livetin
- Mayonnaise
- Meringue (meringue powder)
- Ovalbumin
- Ovoglobulin
- Ovomucin
- Ovomuroid
- Ovovitellin
- Simplese
- Surumi

### Milk-Free Diet

Ingredients to avoid:

- Artificial butter flavor; butter-flavored oil
- Butter, butter solids
- Buttermilk
- Casein; caseinates (ammonium, calcium, magnesium, potassium, sodium)
- Cheese, all types; cheese flavor; cheese sauce; cottage cheese; cream cheese
- Cream; sour cream; whipped cream
- Curds
- Custard
- Ghee
- Goat's milk
- Half-and-half
- Hydrolysates (casein, milk, protein, whey, whey protein)
- Ice cream
- Lactalbumin; lactalbumin phosphate; lactoglobulin
- Lactate solids
- Lactose
- Lactulose
- Malted milk
- Milk: whole, low-fat, reduced fat, and nonfat
- Milk chocolate
- Milk derivative; milk powder; milk protein; milk solids; milk solid pastes
- Nonfat milk solids; nonfat dry milk
- Nougat
- Pudding
- Rennet casein
- Simplese
- Sour milk solids
- Sweetened condensed milk
- Whey: curd, lactose-free, demineralized, sweet dairy; whey protein concentrate; whey solids; yogurt; frozen yogurt; yogurt powder
- Foods that may indicate the presence of milk protein: caramel candies, high protein flour, non-dairy products

Note: The designation "pareve" on food labels indicates that the product does not contain milk.

### **Peanut-Free Diet**

Ingredients to avoid:

- Artificial nuts
- Beer nuts
- Cold pressed or extruded peanut oil
- Ground nuts
- Mandelonas
- Mixed nuts
- Nuts; flavored nuts, nutmeat, pieces
- Peanuts
- Peanut butter; peanut butter chips
- Peanut flour
- Peanut syrup
- Foods may have peanut protein presence: baked goods, candy (including chocolate, egg rolls, chili, enchilada sauce, flavoring, marzipan, nougat)

### **Soy-Free Diet**

Ingredients to avoid:

- Eda-Mame (soybeans in pods)
- Hydrolyzed soy protein
- Kinnoko flour
- Kyodofu (freeze-dried tofu)
- Miso; soy miso
- Modified food starch
- Natta
- Okara (soy pulp)
- Shoyu sauce
- Soy albumin
- Soy concentrate
- Soy flour; soybean flour
- Soy milk; soybean milk
- Soy nuts
- Soy protein; soy protein isolate
- Soy sauce
- Soy sprouts
- Soybean granules
- Supro
- Tamari
- Tempeh
- Textured Vegetable Protein (TVP)
- Tofu
- Yakidofu

### **Wheat-Free Diet**

Ingredients to avoid:

- All-purpose flour, enriched flour
- Bran
- Bread; bread crumbs
- Bulgur
- Cake flour
- Cereal extract
- Couscous
- Crackers; cracker meal
- Durum; durum flour; durum wheat
- Farina
- Flour, wheat, bran, graham
- Food starch
- Gluten; high-gluten flour
- Graham flour
- Malt; malt extract
- Noodles
- Pasta
- Pastry flour
- Semolina
- Spelt
- Soy Sauce
- Starch
- Surumi
- Wheat; wheat bran; wheat flour
- Wheat germ
- Wheat gluten
- Wheat malt
- Wheat starch
- Whole-wheat berries

Note: Alternatives to wheat flour include rice flour, potato flour, rye flour, oat flour, barley flour, and buckwheat flour. See Gluten-Restricted, Gliadin-Free Diet earlier in this section for flour substitution recipes.

### **Shellfish-Free Diet**

Ingredients to Avoid:

- Abalone
- Clams
- Crab
- Crawfish
- Lobster
- Mollusks
- Oysters
- Prawns
- Scallops
- Shrimp
- Foods that may indicate the presence of shellfish protein: fish stock, flavoring (including natural or artificial), seafood flavoring (such as crab or clam extract), surimi

### Tree Nut-Free Diet

#### Ingredients to Avoid:

- Almonds
- Artificial nuts
- Brazil nuts
- Caponata
- Cashews
- Filbert/hazelnuts
- Gianduja (nut mixture found in chocolate)
- Hickory nuts
- Nougat
- Natural nut extract (i.e, almond, walnut)
- Nutmeal
- Nut oil
- Nut paste (i.e, almond paste)
- Nut pieces
- Pecans
- Pesto
- Pine nuts (also known as Indian, pinon, pinton, pignoli, pignolia and pignon nuts)
- Pralines
- Walnuts

### Bibliography

1. Escott-Stump S. *Nutrition and Diagnosis-Related Care*. 5th ed. Baltimore, Md: Lippincott Williams & Wilkins; 2002:76.
2. Wilson SH. Medical nutrition therapy for food allergy and food intolerance. In: Mahan KL, Escott-Stump S, eds. *Krause's Food, Nutrition and Diet Therapy*. 10<sup>th</sup> ed. Philadelphia, Pa: WB Saunders; 2000. p 916-924.
3. American Academy of Allergy, Asthma, and Immunology. Position statement on anaphylaxis in school and other childcare settings. *J Allergy Clin Immunol*. 1998;102:173.
4. Nutrition management of food hypersensitivities. In: *Pediatric Manual of Clinical Dietetics*. 2<sup>nd</sup> ed. Chicago, Ill: American Dietetic Association; 2003.
5. Watson WT. Food allergy in children. *Clin Rev Allergy Immunol*. 1995;13:347-359.
6. Bischoff SC, Mayer J, Wedemeyer J, Meier PN, Zeck-Kapp G, Wedi B, Kapp A, Cetin Y, Gebel M, Manns MP. Colonoscopic allergen provocation (COLAP): a new diagnostic approach for gastrointestinal food allergy. *Gut*. 1997;40:745-753.
7. Plant M. New directions in food allergy research. *J Allergy Clin Immunol*. 1997;100:7-10.