



## Gluten and Your Gut's Good Health

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### What is gluten?

Gluten is the protein in wheat, rye, barley, and some related grains that provides the elastic, chewy properties in breads and other baked products. The word gluten comes from Latin gluten, meaning “glue.” It is this glue-like characteristic that allows bread dough to stretch, but not break, as it proofs or rises. Bakers and producers select flours for the amount of gluten they contain — for example, high-protein durum flour works well for pasta, while low-protein flour is used for tender cakes or pastry. Though gluten’s elastic properties are essential in baking and cooking, some people must avoid gluten to prevent gastrointestinal (GI) tract symptoms and even intestinal damage.

### Who should follow a gluten-free diet?

As part of the make-up of whole grain foods, gluten has long been considered part of a sound diet for healthy people. However, for some people, good health depends on the elimination of gluten and wheat foods from the diet. Persons with celiac disease and others who are intolerant of gluten must adopt a gluten-free diet to control symptoms. Here are more details about the medical conditions that require a gluten-free diet.

- Celiac disease — Celiac disease (sometimes spelled “coeliac,” and formerly known as “celiac sprue”) affects about 1 percent of the North American population — approximately 3 million people in the United States. Celiac disease is an autoimmune disorder — the only one where the trigger (in this case, gluten) is known. Celiac damages the villi (the finger-like projections) of the small intestine where nutrients are absorbed. This may result in decreased absorption of nutrients from food, which in turn can lead to dietary deficiencies. The disease may become apparent when an infant begins eating cereals containing gluten, or it may not appear until later in life. About half of celiac patients experience GI symptoms, including bloating, gas, and/or diarrhea. The symptoms vary greatly from one person to another, increasing the difficulty of an accurate diagnosis.
- Dermatitis herpetiformis — This is a type of celiac disease that not only results outwardly in a painful skin rash when gluten is eaten, but also damages the

small intestine of most people with this condition. Diagnosis is made through a skin biopsy and blood tests.

- Non-celiac gluten sensitivity — This response, called NCGS for short, differs from celiac because it is NOT an allergy or autoimmune disease. People with NCGS may have GI symptoms similar to people with celiac disease, including diarrhea, constipation, bloating, and excess gas, though symptoms can vary widely from one person to another. There are no tests at this time that determine NCGS, but a diagnosis is made by the physician once celiac disease and other conditions are ruled out. Research continues on this condition, because much about it is unknown. Eating certain carbohydrates as well as other parts of wheat (besides gluten) may also result in symptoms, so some people with this diagnosis must avoid additional foods and ingredients beyond gluten.



People who are diagnosed with the above gluten-related disorders should follow a gluten-free diet. The recent popularity of gluten-free diets is due in part to the increased diagnosis of the above conditions, and also because of the dramatic health benefits noted by some who eliminate gluten from their diet in a personal effort to relieve symptoms. Still others consider adopting a gluten-free diet for reasons unrelated to celiac disease or gluten intolerance, believing it is a healthful eating plan, allowing them to lose weight and improve their nutrition.

## How can I know if I would benefit from a gluten-free diet?

Many people today are asking this question, as facts and myths surrounding a gluten-free diet abound. If you believe you suffer from celiac or a related disease, it is important that you see your health-care provider before starting a gluten-free diet. Since celiac disease is determined by blood tests and a biopsy of the small intestine, beginning a gluten-free diet before testing could interfere with an accurate diagnosis.

While it is not considered dangerous to eat gluten-free, it can be overly restrictive and unnecessarily costly. A gluten-free diet has not been shown to be an effective weight loss diet. Dieters may needlessly limit important nutrients such as iron, folic acid, and other B vitamins by excluding wheat foods and others that contain gluten if they choose to follow a gluten-free diet for reasons other than symptom relief.

## My doctor told me I have a wheat allergy. Is a gluten-free diet right for me?

No. Different from both celiac disease and NCGS, wheat allergy is an allergic reaction to wheat or its components, such as starches, proteins, and even fat. A true wheat allergy will bring about near-immediate or slightly delayed symptoms following a wheat-containing meal. Like other allergies, wheat allergy symptoms are often respiratory in nature (nasal congestion, wheezing, watery eyes) but may escalate to breathing difficulty and shock. People diagnosed with wheat allergy need to avoid foods that contain wheat ingredients — and it is important to note that some gluten-free foods may contain other wheat components, especially in Europe and the United Kingdom.

In short, wheat allergy and gluten intolerance are two completely different problems with similar, but not identical, treatments.



## Where is gluten found?

Gluten is found in wheat and related grains, particularly rye and barley. Oats, though technically gluten free, are frequently contaminated during processing and should be avoided on a gluten-free diet unless the package is labeled “gluten free.” The following chart identifies grains and thickeners containing gluten, and starches and flours that are gluten free.

In 2013, the U.S. Food and Drug Administration published a new regulation defining the term “gluten-free” for voluntary food labeling. The federal definition standardizes the meaning of gluten-free claims across the food industry, and allows people requiring the special diet to make healthful food choices with confidence. When “gluten-free” is used on the label, a food is required to contain less than 20 parts per million of gluten. The rule also requires foods claiming “no gluten,” “free of gluten” and “without gluten” to meet the definition for “gluten-free.”

Gluten may also be used in some prescription drugs, as well as some cosmetics, multi-vitamin, and mineral supplements. If you require a gluten-free diet, you will want to ask the pharmacist if your prescribed medications contain gluten. Products available over-the-counter are required to be labelled so consumers can determine if they contain gluten.

Gluten-Containing Grains/ Thickeners	Gluten-Free Grains/ Thickeners
Wheat	Corn
Kamut	Rice
Spelt	Tapioca (cassava)
Barley (malt, including malt extract, malt vinegar)	Amaranth
Rye	Buckwheat
Farro	Arrowroot
Oats*	Millet
Triticale (a cross between wheat and rye)	Montina
Brewer's yeast	
Wheat starch (not processed)	Lupine
	Flax
	Quinoa
	Soy
	Sorghum
	Taro
	Teff
	Chickpea (gram flour)

## My doctor advised me to follow a gluten-free diet. What do I do?

At first, following a gluten-free diet may be challenging. You may initially think of all the foods you must avoid and feel overwhelmed with the effort required to identify the many sources of gluten you encounter each day. Instead of feeling deprived, you may want to focus on all the foods you CAN eat — those naturally containing no gluten, as well as the many gluten-free products available today.

If you are just beginning to follow a gluten-free diet, it would be helpful to visit with a registered dietitian nutritionist (RDN) who can answer your questions and advise you on ways to exclude gluten while maintaining a healthful diet.

## How do I cook for a gluten-free diet?

Although it sounds like a huge task, and it IS a very important task, you will probably find that many foods you cook are naturally gluten free. Begin by listing those foods — they will be anchors in your meal planning. Plain foods, without sauces, breading, or coating, are great places to start. For example, you might consider roast beef or grilled chicken with baked or mashed potatoes, steamed carrots, mixed green vegetable salad, and fresh berries. Without added coating, croutons, or cookies, this meal is gluten free, naturally. The challenge increases when foods typically containing gluten, such as pasta, bread, other baked goods and desserts, and many processed items, are added into the menu. These foods often contain gluten, and the key will be the food label.

You will want to sharpen your label-reading skills, and make label reading a priority for your health. For those following a gluten-free diet, it is essential to read product labels of foods not labeled “gluten-free” each time you shop. Gluten may be hidden in unexpected places (for example in one brand of pasta sauce, but not in one that looks very similar) and product recipes may change from one time of purchase to the next.

Beware of cross-contact! Cross-contact can occur whenever a gluten-free food comes in contact with a food that contains gluten. Similar to how germs can be spread from dirty hands to clean food, foods that are gluten free may “pick up” gluten anywhere from field, to factory, to fork. For example, a gluten-free grain might be grown next to a field of wheat, barley or rye. A factory must follow good practice to prevent gluten-free foods from contamination by gluten-containing foods. Even at home, it is important to keep gluten-free foods separate from those containing gluten during storage, cooking, and serving.

Some products are labeled gluten-free but contain the word “wheat” in the ingredient label. This is allowed, because some wheat-based ingredients may be included

in foods labeled gluten-free as long as the final product contains less than 20 parts per million (ppm) of gluten. Examples of this type of ingredient include wheat starch, modified food starch (wheat), and ingredients that may be made from wheat starch, including dextrin (wheat), maltodextrin (wheat), glucose syrup (wheat), and caramel (wheat). The FDA’s gluten-free labeling rule states that a food labeled gluten-free that also contains the word “wheat” in the ingredients label must also have this statement: “The wheat has been processed to allow this food to meet the Food and Drug Administration requirements for gluten-free foods.”

If you need some assistance at the grocery store, you may want to investigate the list of available apps for your phone or tablet. Look for those with high ratings from users and recent content updates, as options are many and the field of available, allowable foods is constantly changing.

## Can I safely eat at a restaurant or a friend’s home with my gluten-free diet?

While eating out may be challenging, a gluten-free diet should not keep you at home. Plan ahead — if you know the restaurant you will visit, call or check online for their gluten-free options. Many restaurants now offer a gluten-free menu. Remember to ask if cross-contact is likely (are corn tortilla chips fried in the same fryer as flour taco shells? Is the grill used for foods that are not gluten-free, such as buns or breaded products?).

If visiting a friend’s home, let your host know ahead of time about your dietary restrictions. Offer to bring along a gluten-free dish that everyone can enjoy.

## What else do I need to know?

Less is best — If you or someone you know has been diagnosed with celiac disease, you may think that “just a little won’t hurt” when it comes to breaking your gluten-free diet. WRONG! Eating even small amounts of gluten can damage the small intestine. And the amount of gluten in a regular slice of wheat bread is 7,000 times that in a slice of gluten-free bread — hardly “just a little.”



Family matters — First- and second-degree relatives of people diagnosed with celiac disease are more likely than the general population to have celiac disease. They should discuss the need for testing for celiac disease with their health-care provider before starting a gluten-free diet.

## Where can I turn for more information?

If your health-care provider advises you or a family member to follow a gluten-free diet, there are many reputable resources available to help you. Here are just some that are available:

*Academy of Nutrition and Dietetics: [www.eatright.org](http://www.eatright.org)*  
Go to this site to search for information on celiac disease and also to find a registered dietitian nutritionist in your area.

*Celiac Now: [www.celiacnow.org](http://www.celiacnow.org)*  
This site offers instruction on managing celiac disease and living with a gluten-free diet. Topics are addressed on three levels (from introductory to complex) to match the reader's interest and understanding.

*Celiac Disease Foundation: [www.celiac.org](http://www.celiac.org)*  
The mission of the foundation includes advocacy and awareness, and this site provides educational information to help celiac disease patients and those who support them.

*Celiac Disease, 2nd Edition: A guide to living with gluten intolerance* (2014) by Sylvia Llewelyn Bower, RN; Mary Kay Sharrett, SM, RD, LD, CNSD; and Steve Plogsted, PharmD.  
This book discusses how to safely alter the diet, manage symptoms, and adjust to living gluten free. Available at Amazon.

### Apps for gluten-free living:

Is That Gluten Free? by Garden Bay Software. Available on iTunes

Find Me Gluten Free by Gluten Free Classes, LLC. Available on iTunes

Glutenology – Gluten Free Guide by David Ramsey. Available on iTunes.

## References:

Adams J. Willem-Karel Dicke: Pioneer in gluten-free diet in the treatment of celiac disease. 2010. Accessed at <http://www.Celiac.com/articles/22013/1/Willem-Karel-Dicke-Pioneer-in-Gluten-free-Diet-in-the-treatment-of-Celiac-Disease/Page1.html> on January 29, 2015.

Di Sabatino A, Corassa GR. "Nonceliac gluten sensitivity: Sense or sensibility?" *Ann Intern Med.*2012; 156:309-311.

Gaesser GA, Angadi SS. "Gluten-free diet: Imprudent dietary advice for the general population?" *J Acad Nutr Diet.* 2012;112(9):1330-1333.

McKindra L. Agricultural Communications Services, Oklahoma State University Division of Agricultural Sciences and Natural Resources. *Gluten-free diets not for everyone.* Accessed at <http://www.casnr.okstate.edu/Members/leilana.mckindra-40okstate.edu/gluten-free-diets-not-for-everyone> on February 5, 2015.

Office of the Federal Register. Vol. 78, 150, 47154-47179. *Food labeling: gluten-free labeling of foods.* 08/05/2013. <https://www.federalregister.gov/articles/2013/08/05/2013-18813/food-labeling-gluten-free-labeling-of-foods>. Accessed on March 9, 2015.

Riddle, M.S., Murray, J.A., Porter C.K. "The incidence and risk of celiac disease in a healthy US adult population". *Am J Gastroenterol* 2012; 107:1248-1255.

Thompson T. *Celiac disease nutrition guide*, 3rd ed. Academy of Nutrition and Dietetics. 2014.

Volta U, Caio G, Tovoli F, DeGiorgio R. "Non-celiac gluten sensitivity: questions still to be answered despite increasing awareness." *Cellular & Molecular Immunology* 2013; 10, 383-392.

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