

Gluten Sensitivity: A Rising Concern

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When we question the health benefits of bread, even the whole-grain variety, we are raising concerns about the entire fabric of our food supply. Bread has been the staff of life for eons. A piece of fresh bread straight out of the oven, perhaps smeared with organic butter, is a very special treat. Unfortunately, for an increasing number of people, eating bread of any kind on a regular basis – along with flour products such as pastries and pasta, and condiments containing wheat starch – contributes to a wide variety of uncomfortable symptoms and sometimes to debilitating disease.

Most of us have intense emotional attachments to bread, cookies, and pasta, which are usually made from wheat flour. We reach for these foods when we are feeling happy or sad, lonely or tired, in health and in sickness. Eating bread is both filling on the physical plane and fulfilling on an emotional level. The *Eating for Health*™ approach encourages people to depend largely on non-gluten grains, such as millet, quinoa, brown rice, buckwheat, and non-GMO corn. These delicious grains do not provoke the negative effects that come from a reaction to the gluten found in wheat, rye, oats, and barley.

Technically, this is not a paper about *Celiac Disease* (CD). However, it is not possible to discuss sensitivity to gluten without directly addressing CD, the most serious expression of gluten intolerance. A good deal of research has been done on the gluten/CD connection, while non-celiac gluten sensitivity is barely on the medical radar screen.

Though CD is an issue of gluten sensitivity, the line between celiac and non-celiac gluten intolerance is fuzzy at best. CD can be latent and can pres-

"Bread is the staff of life."

Anonymous

"Among those kinds of food which the good housekeeper should scrupulously banish from her table, is that of hot leavened bread.... I believe it more often lays the foundation of diseases of the stomach, than any other kind of nourishment, used among us."

Sarah Josepha Hale,
"The Good Housekeeper" (1839)



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ent atypically and asymptotically; non-celiac gluten sensitivity presents with similar symptoms.

CD, once thought to be quite rare in this country, is now thought to affect one out of every 133 people in the general population, those not considered at risk for the disease. This translates to about 1% of the overall population (UMMC, 2003), a far larger percentage than previously thought just a decade ago. Among those with celiac-like symptoms, or with a first-degree relative with CD, the number goes even higher.

That gluten sensitivity in all its forms is on the rise can be attributed to two things. First, testing since the 1980s has become increasingly sensitive, leading to the discovery of once undetectable problems. Secondly, screening of high-risk groups, such as first-degree family members of celiac patients, has revealed many cases.

Gluten By Any Other Name...

So just what is this substance that is plaguing so many? *Gluten* (Latin for glue) is just one of many proteins found in wheat. Comprised of two protein groups — *gliadin* and *glutenin* — gluten gives wheat its strength, malleability, and the elasticity that allows it to rise. The gliadin portion, which is a type of *prolamin* (a group of simple proteins consisting chiefly of proline and glutamine) and the most studied protein fraction, has been recognized since the 1960s as the cause of the intestinal damage seen in celiac disease.



Gliadins are subdivided further into four groups — alpha, beta, gamma, and omega. The alpha portion is the most problematic, but all of them appear to cause more problems in susceptible individuals than any other of the protein fractions (Helms, 2005). Glutenin is now suspected of causing problems, as well, most notably autoimmune skin problems and perhaps some types of asthma (Braly et al., 2002, p.26). Prolamins are found in other grains as well, most notably barley and rye, and to a lesser extent oats. Though they have their own specific names (the prolamin in rye is *secalin*, in barley, *hordein*, and in oats, *avenin*), they are known collectively as *gluten*. Though this is technically incorrect, gluten-sensitive individuals can use this nomenclature to steer clear of the grains they need to avoid: wheat, rye and barley.

Spelt and kamut, two types of wheat that more closely resemble ancient varieties, may not cause problems, though no consensus exists about this. Eating oats is also controversial. Oats do contain a gliadin, but they are not widely recognized as a problematic grain, and at least one prominent researcher has found them to be benign when fed to celiac patients (Collin et al., 2002). Other researchers, however, note that oats often contain traces of wheat due to being grown in fields that previously grew wheat or being processed in plants that also process wheat, and advise that they be avoided, even if the gliadin component is harmless. It appears likely that oats, corn, millet, and buckwheat, while not causing celiac disease, may contribute to increasing symptoms in sensitive individuals by promoting ongoing inflammation. This suggests that they should be eliminated from a celiac patient's diet at least temporarily and reintroduced only after a period of abstention from all gluten cereal grains (Helms, 2005).

As to why gluten should cause some of us such difficulty — why the "staff of life" should become the stuff of strife and a toxin to some — the reason



appears to be a symphony of factors that began to be played out about 10,000 years ago, when humans began cultivating wild grasses as food crops. Until that time, grasses had been utilized as a food source on a minimal basis. It may be that our digestive tracts have not had enough evolutionary time to develop the digestive enzymes necessary to assimilate what nutritionist Sally Fallon calls one of the most difficult proteins to digest (2001, p. 56). Our gluten problems have reached a climax as consumption of wheat (the primary gluten-containing food) has increased to what amounts to a glut of gluten in Western diets. Wheat accounts for approximately 20% of all calories ingested (Helms, 2005). Hybridization efforts have increased the gluten content that gives wheat products the palatable qualities other grains cannot duplicate, adding even more fuel to the fires of inflammation. Another factor that may drive what appears to be an addiction to grains is that undigested peptides in gluten-containing grains contain opiate-like chemicals (Bauman, 2005; Braly et al., 2002).

Food for Thought

It is worth noting here that of everything we have read — research studies, nutrition books, and books that claim expertise in ancient human nutrition — only two authors brought one important factor to light. Sally Fallon and Catherine Czap, both associated with the Weston A. Price Foundation, revealed that existing recipes from traditional cultures indicate that all primitive peoples developed very careful techniques to prepare their grains prior to eating them. At least one of three methods — soaking, sprouting, and fermenting — was *always* used when making grain dishes. Soaking and sprouting grains neutralizes the enzyme inhibitors that are naturally present in all seeds, as well as neutralizing other anti-nutrients, such as phytic acid, which make certain nutrients unavailable for assimilation.

The slow process of true fermentation, where live cultures of wild yeasts and bacteria are carefully nurtured and often passed down through generations, is the true star. It not only neutralizes the anti-nutrients in cereal grains, but also makes the proteins easier to digest (Fallon, 2001, p. 453). A recent study using naturally soured bread, suggests that fermentation appears to at least partially sever the bonds of the toxic peptides in the gluten that are responsible for initiating the intestinal damage seen in celiac disease (DiCagno, cited in Czap, 2006). Czap (2006) also cites work done by cereal microbiologist Michael Gaenzle, who has proposed that people who ferment their cereal grains using local organisms create a mutually sustaining, health-enhancing relationship with those microbes.

Could it be that over the centuries, as food production has been sped up and its efficiency increased, we have lost track of ancient knowledge necessary to keep ourselves well nourished and healthy? That it isn't the food itself that is sickening us, but our own ingenuity? If this is the case, it wouldn't be the first time.

Problems with Grains

Gluten is inflammatory; it has been shown to damage internal organs and tissues on contact even when specific antibodies against gliadins or other gluten proteins are absent (Braly et al., 2002, p. 30). Because of this, non-celiac gluten sensitivity may cause the same serious damage when left untreated as CD. Wheat, and gluten in particular, can cause a wide range of reactions, producing symptoms that are completely different from, or confusingly similar to, each other. In addition, there may be other constituents of grains that can cause symptoms, possibly accounting for some of the confusion concerning kamut, spelt, and other grains.



One of the known problems with grains, especially wheat, is that people can be intolerant. Intolerance to wheat does not elicit an immune response. It may be caused by an enzyme deficiency or by undigested food particles that create bacterial fermentation in the colon, with its resulting symptoms (Steinman et al., 2005).

People can also be *allergic* to grains. Because of the vast quantities of wheat we consume, it is the culprit in most of these reactions. Wheat contains over 100 different proteins, and allergies are mostly related to the albumin or globulin protein fractions rather than gluten (Steinman et al., 2005). These allergies are immune responses and can produce fairly sudden life-threatening reactions, such as anaphylaxis. More frequently, they produce skin (hives, eczema), gastrointestinal (cramps, nausea) or respiratory (asthma, rhinitis) symptoms. Allergies may be present with or without a family history. Wheat allergies are treated with a wheat- and gluten-free diet. As true allergies, they are *Immunoglobulin E* (IgE) mediated reactions.

Celiac Disease (CD)

Celiac disease, also known as *Celiac Sprue*, non-tropical sprue and gluten-sensitive enteropathy, is a genetically inherited sensitivity to gluten. It produces a T-cell autoimmune response to the prolamins in wheat, rye, and barley and is mediated by *Immunoglobulins A* and *G* (IgA, IgG), as opposed to the IgE of wheat allergy. When people with this disease ingest gluten grains, the body's immune reaction damages the mucosal lining of the intestinal tract. This damage is characterized by chronic inflammation of the epithelium and lamina propria; flattening or destruction of the small, finger-like projections in the small intestine known as the *villi*; and *crypt hyperplasia* (crypts are circular-like collections of cells at the base of the villi [Lewey, 2006]).

Mechanisms of Action

In celiac patients, the onset of symptoms is controlled by the interplay between genes, diet, and the environment. The genes that are so far known to be involved are members of the *Human Lymphocyte Antigen* (HLA) family: HLA DQ2 (90% of celiacs have this) and HLA DQ8 (the remaining 10% have this) (Hadjivassiliou et al., 2002). One or both of these is absolutely necessary for the onset of CD, though not everyone with these genes expresses the disease (Fasano, 2006).

There is wide variability in levels of genetic susceptibility, mediated by levels of exposure to gluten and perhaps by other genetic factors (Helms, 2005), or by some kind of "trigger," which is believed necessary to initiate a reaction. Though more research is necessary to prove establish it, there is some indication that the trigger may be a virus or a fungus. Certain of these — most especially the human adenovirus and the *Candida albicans* fungus — share similar amino acid sequences that may create T-cell cross-reactivity, causing the immune system to confuse gluten with the virus/fungus and produce antibodies in response (Helms, 2005). It also appears clear that severe emotional stress, pregnancy, surgery, and other traumas can activate the disease (Mercola et al., 2003). There may also be other, as yet unknown triggers. Much research is ongoing to understand the etiology of CD, and it is quite possible that other factors will be found to have an influence in its pathogenesis. At this moment, plant lectins are the prime suspects. A few viruses and bacteria are also waiting in the wings to be tested.

In addition to genetic susceptibility, gluten exposure, and some type of trigger, impaired digestion is also probably involved in the expression of celiac disease. Part of the inflammatory process is stimulated by a low intestinal pH (Helms, 2005), creating an overly acidic medium. Impaired diges-



tion may be encouraged by the fact that most of us tend not to chew our foods very well. This allows large particles into the small intestine where the carbohydrate fraction of the grain would be digested, leaving a large peptide behind to cause trouble (Bauman, 2005).

The onset of the immune response generates antibodies to gliadin and tissue transglutaminase (TG2) and is established and maintained by a cascade of inflammatory cytokines. These include *Interleukin 15* (IL-15), *Cyclooxygenase-2* (COX-2), *Interferon* [gamma] (IFN- γ), and those produced by nuclear factor *kappa*, (NF- κ). Together these antibodies orchestrate a generalized inflammatory response in sensitive individuals (Helms, 2005). As this inflammation progresses, the immune system becomes further sensitized to activation by the inflammatory load (Helms, 2005).

The intestinal damage created by the reaction to gluten allows gliadin to cross the intestinal barrier and enter the bloodstream. This "leaky gut syndrome" leads to autoimmune reactions and tissue damage in other parts of the body. Research done at the University of Maryland Medical Center has determined that a protein called *zonulin* is responsible for opening up the tight junctions between cells in the small intestine, increasing intestinal permeability (Fasano et al., 2000). In this study, zonulin was found in greater levels in the intestinal tracts of patients with active CD than in control groups. Zonulin levels returned to normal after three to six months on a completely gluten-free diet. Another recent study has shown that gliadin initiates a rise in zonulin release, opening up tight junctions and leading immediately to increased intestinal permeability (Clemente et al., 2003).

Symptoms

Celiac disease in infants generally becomes apparent at the time of weaning, with a child's first introduction to cereal grains, though this may not be true in mild cases. Interestingly, if infants are breastfed for one month after introduction of grains, CD can be prevented (Helms, 2005). Symptoms in children under the age of two tend to be more pronounced than in older children and can include diarrhea, abdominal distension, abdominal pain, flatulence, nausea, vomiting, and intestinal malabsorption. These are the "classic" symptoms of CD. Children of all ages may also experience irritability, apathy, loss of appetite, weight loss or poor weight gain, short stature, muscle wasting, general failure to thrive, poor school performance, bone and joint pains, and occasionally rickets (Steinman et al., 2005).

Children over the age of two and adults generally present with milder versions of the classic symptoms, and it is possible for only one of the symptoms to be present or for them to appear intermittently. It is also possible for symptoms in children to disappear sometime during childhood or adolescence, only to reappear later on. Though asymptomatic, the intestinal damage continues unabated (Steinman et al., 2005).



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Celiac disease has long been considered a disease of malabsorption because the damage done to the intestinal lining, which contains enzymes essential to digestion, impairs assimilation. Deficiencies of iron and folic acid, serum calcium, and the fat-soluble vitamins D and E often occur; Vitamins B12 and K deficiencies sometimes occur (Collin et al., 2002; Helms, 2005).

Though the classic symptoms have remained constant since being defined in the 1960s, CD currently seems to present with milder symptoms than it used to. In fact, Hadjivassiliou et al. (2002) are certain that most celiac patients have no gastrointestinal symptoms whatsoever. Their findings indicate that in some people the immune reaction is directed primarily at the nervous system, with little or no damage to the gut. They consider *peripheral neuropathy* to be one of the most common manifestations of gluten sensitivity, second only to gastrointestinal symptoms. Many other conditions have also come to be associated with the disease, since its symptoms can mimic those of other conditions, including *Irritable Bowel Syndrome* (IBS), Crohn's disease, and iron loss due to menstruation.

CD is a chronic disease, and damage to the intestines occurs every time gluten is eaten, whether or not symptoms are present. Asymptomatic celiac disease continues to inflame and damage the intestinal mucosa, causing such complications as intestinal lymphomas and other cancers. People with undetected or untreated CD die at twice the rate as non-celiacs, usually from cancers, but sometimes from osteoporotic hip fractures or the complications of autoimmune diseases (Braly et al., 2002, p. 16).

Celiac symptoms in adults may include one or more of the following "classic" symptoms:

- ▶ Gas
- ▶ Recurring abdominal bloating and pain
- ▶ Chronic diarrhea

- ▶ Pale, foul-smelling, or fatty stool
- ▶ Weight loss / weight gain
- ▶ Fatigue
- ▶ Unexplained anemia (a low count of red blood cells causing fatigue)
- ▶ Bone or joint pain

The following symptoms can also occur:

- ▶ Osteoporosis, osteopenia
- ▶ Behavioral changes
- ▶ Tingling or numbness in the legs (from nerve damage)
- ▶ Seizures
- ▶ Missed menstrual periods (often because of excessive weight loss)
- ▶ Infertility, recurrent miscarriage
- ▶ Pale sores inside the mouth, called *aphthous ulcers*
- ▶ Tooth discoloration or loss of enamel
- ▶ Itchy skin rash called dermatitis herpetiformis. (NIH, 2005)

Additionally, CD is now known to occur in many forms, as summarized by Genova Diagnostics' *Celiac Support Guide*:

- ▶ **Classical celiac disease** manifests with classical GI symptoms of diarrhea and weight loss from malabsorption. Both serological and biopsy results confirm the diagnosis, and symptoms improve on a gluten free diet.
- ▶ **Celiac disease with atypical symptoms** features a predominance of extraintestinal manifestations with few or no GI symptoms. As with classical celiac disease, diagnosis is made with positive serology and biopsy samples and amelioration from a gluten free diet.



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- ▶ **Silent celiac disease** is categorized by individuals being completely asymptomatic but testing positive with serology and biopsy. Detection is usually from screening of high risk groups, or when biopsies and endoscopies are performed for other reasons.
- ▶ **Latent celiac disease** is associated with positive serological tests, but negative biopsy results. While asymptomatic at the time of diagnosis, in the future symptoms usually develop and/or histological changes are evident upon repeat biopsy. (gdx.net, 2005)

Associated Conditions:

A host of other diseases and conditions are associated with celiac disease. Some of these conditions can mimic CD, but they can also coexist with it. The following is a comprehensive list of conditions and diseases that are associated with CD. A discussion of some of the more important ones follows:

- ▶ Addison's Disease
- ▶ Alopecia
- ▶ Anemia
- ▶ Anxiety and Depression
- ▶ Arthritis (Rheumatoid)
- ▶ Ataxia
- ▶ *Attention Deficit Disorder* (ADHD)
- ▶ Autism
- ▶ Autoimmune Hepatitis/Chronic
- ▶ Active Hepatitis
- ▶ Brain White-Matter Lesions
- ▶ Cerebellar Atrophy
- ▶ Chronic Fatigue Syndrome
- ▶ Crohn's Disease
- ▶ Congenital Heart Disease
- ▶ Cystic Fibrosis
- ▶ Dental-Enamel Hypoplasia
- ▶ Dermatitis Herpetiformis
- ▶ Dyspepsia
- ▶ Epilepsy
- ▶ Farmer's Lung
- ▶ Fetal Growth Retardation
- ▶ Fibromyalgia
- ▶ Fibrosing Alveolitis
- ▶ Follicular Keratosis
- ▶ Gastroparesis
- ▶ Headaches/Migraines
- ▶ *Irritable Bowel Syndrome* (IBS)
- ▶ Impotency
- ▶ Infertility/Miscarriage
- ▶ Type I Diabetes Mellitus
- ▶ Multiple Sclerosis
- ▶ Myasthenia Gravis
- ▶ Osteoporosis/Osteopenia
- ▶ Pancreatic Disorders/Exocrine
- ▶ Pancreatic Insufficiency
- ▶ Peripheral Neuropathy
- ▶ Polymyositis
- ▶ Pulmonary Hemosiderosis
- ▶ Primary Biliary Cirrhosis
- ▶ Recurrent Pericarditis
- ▶ Sarcoidosis
- ▶ Schizophrenia
- ▶ Scleroderma
- ▶ Short Stature/Delayed Puberty
- ▶ Small Intestine Adenocarcinomas
- ▶ Systemic Lupus Erythematosus
- ▶ Thrombocytosis
- ▶ *Thrombocytopenia Purpura* (ITP)
- ▶ Thyroiditis
- ▶ Vitamin K Deficiency
- ▶ Vasculitis

(Adapted from gdx.net)



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When any of the above conditions presents with an unknown cause, gluten sensitivity should be considered. With some of these conditions, CD should always be regarded as a possibility. These include:

Neurological:

- ▶ **Peripheral neuropathy** – the second most common manifestation of CD – after gastrointestinal symptoms – presenting in approximately 40% of all cases (Hadjivassiliou et al., 2002). Some of its symptoms can be similar to Multiple Sclerosis.
- ▶ **Ataxia** – can also accompany CD, the progress of which can be halted with a gluten-free diet. The CD diagnosis is often missed, though, because gastrointestinal symptoms are present in only 13% of gluten-ataxic patients (Helms, 2005).
- ▶ **Severe headaches** – with visible abnormalities on MRI tests present in approximately 28% of celiac patients (Helms, 2005) and have also been shown to resolve with gluten-free diets (Hadjivassiliou et al., 2002).
- ▶ **Epilepsy** and CD have a known association, though the mechanism of action is unknown, and a gluten-free diet may only incompletely resolve seizures (Helms, 2005).
- ▶ **Depression** – common in CD patients, perhaps due to nutrient deficiencies, as vitamin B6 has been shown to help (Helms, 2005), CD sufferers have also been shown to be low in key mood-regulating neurotransmitters, including dopamine and serotonin (Helms, 2005).
- ▶ **Autoimmune** – endocrinological autoimmune disorders are a well-known accompaniment to celiac disease. The association is not well understood, but it is believed that intestinal permeability, which allows gliadin

peptides into the bloodstream, creates a cross-reactivity that results in organ-specific autoantibodies (Collin et al., 2002). A gluten-free diet can reduce or eliminate these antibodies. The following is a partial list of possible autoimmune conditions that can co-exist with celiac disease.

- ▶ **Type 1 Diabetes** – approximate 4% incidence of CD (Collin et al., 2002)
- ▶ **Hashimoto's and Graves Disease** – strong correlation for both; up to 43% of Hashimoto's patients may have CD (Collin et al., 2002). There are reports of antibody reduction and elimination with gluten-free diets, and possibly reversal of thyroid disease, but symptoms of thyroid malfunction and celiac disease may mimic each other, so this has been difficult to determine (Collin et al., 2002)
- ▶ **Rheumatoid Arthritis**
- ▶ **Autoimmune Addison's Disease** – 7.9-12.2% incidence of CD (Helms, 2005)

Malabsorptive Conditions:

- ▶ **Anemia/Chronic Fatigue**—look for iron, folate, and B12 deficiencies
- ▶ **Osteopenia/Osteoporosis**—strong association between bone loss and CD, especially when anemia is present (Helms, 2005)

Other:

- ▶ **Dermatitis Herpetiformis (DH)** – an itchy skin condition caused by gluten sensitivity. It manifests most commonly on the back of the knees, buttocks, elbows, and face. It is sometimes a rash and sometimes a pimple-like lesion (Braly et al., 2002, p.42). Because autoimmune disorders occur at about the same rate with DH as with CD, this condi-



tion is now considered a separate manifestation of celiac disease, rather than an associated condition (Collin et al., 2002). It can be present on its own, without gastrointestinal symptoms.

Non-Celiac Gluten Sensitivity

Recent advances in testing — both in numbers of tests available and in their sensitivity, along with the testing of more people recognized as being at risk for celiac disease, have turned up some confusing findings. There is a lot more CD out there than previously thought, much of which does not fit the classic symptom profile. But there are also immune reactions to gluten-containing grains that testing cannot verify as celiac disease because intestinal biopsies reveal no tissue damage. They also do not fit the categories of allergy or intolerance, as they are IgG and IgA mediated reactions. Are these non-celiac conditions? Are they latent CD, not yet presenting with intestinal damage? Because celiac disease has been defined for so long by its gastrointestinal symptoms, some researchers are urging the adoption of a more generalized and inclusive term, *gluten sensitivity*, to apply to all immune-mediated reactions to gluten, with or without intestinal damage. As stated by Hadjivassiliou et al. (2002):

"Gluten sensitivity is best defined as a state of heightened immunological responsiveness in genetically susceptible people. This definition does not imply bowel involvement. That gluten sensitivity is regarded as principally a disease of the small bowel is a historical misconception."

A good way to define non-celiac gluten sensitivity may be as a non-specific injury to the intestinal tract, without the flattened villi and the intestinal immune cells found in untreated celiac disease (Braly et al., 2002, p. 41). Patients will have the antibodies against gluten but not the autoim-

mune antibodies that characterize CD. Non-celiac gluten sensitivity presents in much the same way as CD, with great variability in symptom intensity and duration. It is unclear, though, how severe the longterm damage could be compared to untreated CD (Braly et al., 2002, p. 46). Since the reaction to gluten is an immune response, and since gluten is damaging to tissues, it is easy to assume that some of the proteins are leaking into the bloodstream and being carried to other tissues, where further damage is likely occurring. Peptides—partial proteins in the bloodstream — are indicative of a leaky gut, which in celiac disease is caused by gluten. In non-celiac sensitivity, it is not known whether gluten is causing intestinal permeability or if it has occurred due to inflammation caused by other substances.

Testing For All Types of Gluten Sensitivity

Since the 1980s, testing for celiac disease, in particular, and other gluten sensitivities has become quite varied and sophisticated. Many options exist for determining the nature and extent of the problem, with varying degrees of sensitivity and specificity. In determining what tests to do, limitations of budget may be the most crucial factor for some people. Those who have already achieved lasting relief from a gluten-free diet may choose to do no testing whatsoever. Unfortunately, because celiac disease has long been thought to be an uncommon occurrence in this country, it is rarely suspected and rarely diagnosed, especially when its symptoms are other than gastrointestinal (Fasano, 2006).

Who Should Be Tested?

Anyone with the classic symptoms of celiac disease should be tested:

- ▶ Chronic diarrhea
- ▶ Malabsorption
- ▶ Abdominal distention
- ▶ Weight loss



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Additionally, anyone who is considered to be at high risk for the disease should consider testing. These individuals include (partial list):

- ▶ All first-degree family members of those with non-celiac gluten sensitivity or celiac disease;
- ▶ All insulin-dependent diabetics and their first-degree relatives;
- ▶ All autoimmune thyroid patients (both underactive and overactive) and their first-degree relatives;
- ▶ All patients with chronic neurological or neuromuscular conditions of unknown cause, including seizures and ataxia;
- ▶ All patients with iron deficiency or iron deficiency anemia of unknown cause;
- ▶ All children with slow growth or failure to thrive, or who are being considered for a diagnosis of ADHD or other learning disorders, including autism (all children who have Type I diabetes, short stature, and enlarged liver with elevated transaminase enzymes should definitely be screened);
- ▶ All patients with persistently elevated liver aminotransferases and liver failure;
- ▶ All women with amenorrhea, infertility, or recurrent miscarriages, which can be complications of CD;
- ▶ Other high risk groups, including Down syndrome patients and those with IgA deficiencies. (Braly et al., 2002, p. 57-8; www.gdx.net, 2005)

The Tests:

- ▶ **Elimination Diet** – This is the simplest, least expensive, and least invasive test and may be sufficient for those with gastrointestinal or neurological symptoms. Elim-

inating all gluten-containing foods, supplements, and medications for two weeks to a month should provide enough time for symptoms to resolve. If celiac disease is the problem, reintroduction of gluten will produce dramatic symptoms (Bauman, 2005). Those with non-celiac gluten sensitivity may find they can eat small amounts of gluten after the period of abstention.

- ▶ **Food Allergy (IgE) and Food Sensitivity (IgG) testing** (Lipski, 1996) – This may be the best way to begin determining if other foods are contributing to digestive problems. Both types of testing can be tested with serum, but IgG can also be done with blood spot analysis. IgG is helpful in determining the presence of leaky gut, delayed-onset food allergies, and the possibility of a toxic liver condition (Braly et al., 2002, p. 69).
- ▶ Testing for **Leaky Gut** can help determine if the intestinal tract has been damaged to the point of allowing proteins into the bloodstream, which can help determine the level of damage done to other tissues in the body. If CD is not present, but gluten is still a problem, leaky gut caused by other irritants can allow gluten peptides to damage other tissues. This test can also help determine if the intestinal tract is healing, obviating the need for further biopsies (Braly et al., 2002, p. 67).
- ▶ Serological tests commonly used to test for celiac disease include:
 - **Total Immunoglobulin A (IgA)** – Celiac patients are 10-15 times more likely than the general population to have low IgA. Testing for this helps rule out false negatives with the other serum tests (gdx.net, 2005).



- In those with normal IgA, the best predictor of celiac disease is a positive **IgA Anti-tissue Transglutaminase (tTG)** and a positive Anti-Gliadin Antibodies (AGA) (a class of IgG) test (Helms, 2005). The IgA-tTG has a 98.2% sensitivity and a 94.2% specificity for CD (www.gdx.net, 2005). These, along with IgG-tTG (below), are also the best tests for asymptomatic patients (Collin et al., 2002).

Notes on gliadin antibodies:

- Elevations are possible in people without CD.
 - They are the best markers in children under two years old who are not yet producing other diagnostic antibodies.
 - Combined with a positive EMA (see below) they are almost 100% predictive of flattened intestinal villi (Helms, 2005).
 - Unlike EMA and tTG, antigliadin antibodies are not autoantibodies. They are antibodies against the proteins responsible for producing gluten sensitivity (Hadjivassiliou et al., 2002) and can, therefore, help to differentiate between celiac disease and non-celiac gluten sensitivity.
- ▶ **Anti-endomysial antibodies (EMA)** — The connective tissue that lines smooth muscle bundles is called the *endomysium*, and high levels of antibodies to this tissue are common in celiac disease (gdx.net, 2005). A positive **IgA-EMA** test is 97% predictive of gluten enteropathy (gdx.net, 2005).

False test results are possible, but different combinations of the above tests can be used to confirm or rule out celiac disease. The *Celiac*

Support Guide from Genova Diagnostics Lab (www.gdx.net) contains a detailed explanation of the above tests.

- ▶ When serum testing is positive for celiac disease, the gold standard for confirmation has been, and remains, a **biopsy of the small intestine** to confirm mucosal damage. Unfortunately, because of the subjective nature of interpreting these tests, and because of the patchy occurrence of damage, false negatives are fairly common (Hadjivassiliou et al., 2002).
- ▶ The year 2006 showed further progress in the area of serological testing. In one study, the combination of three tests — **tTG, anti-actin antibodies, and serum zonulin levels** — yielded a 100% positive predictive value in patients at high risk for celiac disease (Fasano, 2006).

A note on blood testing: These tests must be done while the patient is consuming gluten, as a gluten-free diet, even if undertaken very recently, can seriously reduce any potential reactions.

- ▶ **Genetic testing** is also available for the DQ2 and DQ8 markers. This is probably best reserved for those with indeterminate results from other blood tests.
- ▶ **Gluten Rectal Challenge** — This is not anyone's favorite test, but it may well be the best test to date to ascertain gluten sensitivity. It involves taking a baseline swab of the rectal mucosa and then inserting a gluten mixture into the biopsy site. Four or more hours later, a second biopsy will reveal any immune response that occurs in reaction to the gluten. This is a gluten-specific test. It is less expensive and much less invasive than a biopsy, and it reduces the error potential of biopsies, as well. It will also identify sensitivity up to six months



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after starting a gluten-free diet, which is an issue with the serological tests and the intestinal biopsy (Braly et al, 2002, p.74).

- ▶ The newest test available is a **stool test** that detects antigliadin antibodies directly from the intestine. The developer of this test, Kenneth Fine, M.D., claims it is 100% effective in its ability to detect celiac disease and that it can detect CD in its very first stages, before antibodies are present in the blood (Fine, n.d.). The test appears very promising but is probably too new to trust completely. All the glowing accounts we read of its successes came from Dr. Fine himself. A European study published in 2006 that tested two different, unspecified commercial stool tests on children with symptomatic CD, showed them to be unreliable screening agents for the disease, with high specificity but very low sensitivity (Kappler et al., 2006). They were screening for tTG, as well as AGA.
- ▶ A **skin biopsy** can determine the presence of dermatitis herpetiformis, the skin manifestation of celiac disease.

Healing

The healing of celiac disease and more general gluten sensitivity is a two-part endeavor. Part one requires abstaining from the gluten-containing grains (wheat, rye, and barley), eating a nutrient dense diet, and supplementing to replace malabsorption-induced deficiencies. It may also be a good idea to abstain from eating oats, at least for awhile. Since celiac disease is a life-long affliction, going gluten-free will last a lifetime, though eating naturally fermented gluten grains occasionally may be okay, as mentioned previously.

How much gluten can a CD patient ingest? Catassi et al. (2007) have determined that amounts of gluten in the diet for celiac patients should not exceed an average of 50 mg per day, which is a very

small amount. Individual tolerances will vary. Non-celiac gluten-sensitive individuals, after two weeks to a month of abstention, should be able to add small amounts of gluten back into the diet, preferably soaking, sprouting, and/or fermenting the grains prior to eating them. They should exercise caution, however, and monitor themselves for symptoms. And, as always with foods that can cause reactions, gluten should be eaten on a rotational basis, not every day.

As a Buddhist might say, eliminating gluten from the diet is simple but not easy. Not only does this mean eliminating gluten-containing grains and all products that contain them, which requires constant vigilance, but there is also a sense of social isolation and pressure that accompanies the process. Furthermore, going gluten-free may mean going through withdrawal. The opiate qualities of grains can indeed produce an addiction, and any tiny amount of them in the diet can perpetuate it. Approximately 70% of celiac patients will experience this kind of withdrawal (Braly et al., 2002). Joining a celiac support group, of which there are many online, is highly recommended. And if quitting gluten seems impossible for you, consider consulting a therapist who specializes in addictions.

The second phase of the process is to rebalance the digestive tract and correct the intestinal hyperpermeability through employment of the following Four Rs (more detailed information can be found in books and on celiac disease websites):

- ▶ **Remove** the problem;
- ▶ **Replace** the hydrochloric acid and pancreatic enzymes that are most likely in short supply;
- ▶ **Reinoculate** with the good bacteria necessary for intestinal health; and
- ▶ **Repair** the damage done to the gastrointestinal mucosa.



CONCLUSION

Gluten sensitivity in all its forms is becoming more widely recognized as a serious and pervasive health threat, and it is a popular subject of current medical research. Studies are ongoing into drugs that will correct the problem, so that people do not have to suffer the rigors of a life without gluten. Every minute detail of the gastrointestinal tract is being studied for clues and causes.

We have much to learn. Yet, though reams of scientific and medical research exist, it seems apparent that there may be a much simpler grain of truth at the heart of this complex, yeasty mix of symptoms and chemical reactions. Many of us, nutrition professionals and public alike, have no doubt reached the same conclusion: Modern technology cannot feed us well, no matter how much they pay to advertise otherwise. Primitive cultures did not have these digestive problems, and modern societies have willingly parted ways with ancient knowledge and traditions. By eating a diet consisting of whole foods that are grown and prepared carefully, we can avoid many of the health horrors visited upon our modern world.

Perhaps the best clues to good health can be found in history books rather than laboratories. Perhaps we need to look back in time to find a healthier future. If farmers would stop growing high gluten grain, many people who are currently adversely affected by the gluten and likely other nutrition bandits in flour, such as the anti-fungals, bromides and bleaching agents, would be able to tolerate a modest amount of their favorite foods, such as breads, pasta and even the occasional pastry. Wouldn't that be a wonderful health benefit rather than a lifetime of abstinence and feeling deprived? Healing the gut, restoring the digestive system, diminishing the 'total load' of antigenic compounds will enable a person with a gluten issue to heal and look forward to living naturally ever after.

Hidden Sources of Gluten (Czapp, 2006)

Bread products and baked goods of all kinds represent the usual suspects as far as gluten sources go, but gluten (wheat starch) is an ingredient in many other processed foods (for example, as a thickener or extender in foods lacking honest substance), and also in a surprising array of non-food items.

The following list gives an idea of how pervasive gluten is in many consumer products. Read labels or, better yet, check with manufacturers to be sure of ingredients. As far as food goes, home-made is always best:

- ▶ Flavored prepackaged rice or pasta
- ▶ Tomato and spaghetti sauces
- ▶ Condensed canned soups
- ▶ Vegetable cooking sprays
- ▶ Flavored instant coffees and teas
- ▶ Some veined cheeses such as Roquefort and Bleu Cheese
- ▶ Chow mein noodles
- ▶ Artificial coffee creamer (all kinds)
- ▶ Bouillon cubes or powder, gravy and sauce mixes
- ▶ Imitation seafood products
- ▶ Ground spices
- ▶ Chewing gum (can be dusted with wheat starch)
- ▶ Communion wafers

These label ingredients can indicate the presence of gluten:

- ▶ *Hydrolyzed plant protein* (HPP)
- ▶ *Hydrolyzed vegetable protein* (HVP)
- ▶ Modified food starch (source is either corn or wheat)
- ▶ Mustard powder (some contain gluten)
- ▶ *Monosodium Glutamate* (MSG)
- ▶ Gelatinized starch

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- ▶ Natural flavoring, fillers
- ▶ Whey protein concentrate
- ▶ Whey sodium caseinate
- ▶ White vinegar or white grain vinegar
- ▶ Rice malt (contains barley or Koji)
- ▶ Rice syrup (contains barley enzymes)
- ▶ Dextrin, malt, maltodextrin

These non-food items may also be gluten sources:

- ▶ Lip stick and lip balm
- ▶ Sunscreen
- ▶ Glue on stamps and envelopes
- ▶ Laundry detergents
- ▶ Soaps and shampoos
- ▶ Toothpaste and mouthwash
- ▶ Cosmetics, lotions, creams
- ▶ Prescription drugs
- ▶ Health supplements (vitamin pills, etc.)

RESOURCES:

A SMALL SAMPLING OF WHAT'S AVAILABLE

BOOKS:

Cracking the Metabolic Code, by James B. LaValle, R.Ph., C.C.N., N.D. (Basic Health, 2004).

Dangerous Grains, by James Braly, M.D. and Ron Hoggan, M.A. (Avery, 2002).

Nourishing Traditions, by Sally Fallon. (New Trends, 2001).

WEBSITES:

www.celiac.com

www.celiac.org

www.glutenfree.com

www.mercola.com

www.westonaprice.org

TESTING LABS:

Doctor's Data — *Intestinal Permeability*. Ordered through physician or complementary healthcare provider. 800-323-2784; www.doctorsdata.com.

Genova Diagnostics — *Celiac Profile; various IgG and IgE; Intestinal Permeability*. Ordered through physician or complementary healthcare provider. www.gdx.net.

Metamatrix — *Celiac Panel; IgG and IgE, serum; IgG bloodspot*. Ordered through physician or complementary healthcare provider. 800-221-4640; www.metamatrix.com.

Quest — *Comprehensive Celiac Panel; Food Allergy*. Ordered by physicians. For those with insurance, this is the best bet for getting the testing paid for.

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