Nutrition and Health Info Sheet: Gluten

For Health Professionals

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August 2016

What is gluten?

Gluten-free products are rapidly popping up in stores, and the popularized misconception that gluten-free diets are healthier has many adopting gluten-free diets.[1] This has created a gluten-free fad, a $3.42 billion global business with a projected $24 billion in sales by 2020, and many misinformed consumers.[2,3]

Gluten refers to the protein complex found in wheat, rye, and barley, and is made up of both gliadins (monomeric proteins) and glutenins (aggregated proteins).[4] The ingestion of gluten-containing products may cause autoimmune (celiac disease), allergic (wheat allergy), or immune-mediated (non-celiac gluten sensitivity) reactions.[4]

What is celiac disease?

Celiac disease is an autoimmune reaction characterized by specific autoantibodies, which are mainly serum anti-tissue transglutaminase (tTG) and anti-endomysial antibodies (EMA).[4]

Celiac disease is one of the most common disorders in countries with mainly people of European origin, such as Europe, North and South America, and Australia.[4] There is an increasing prevalence of celiac disease, most likely due to more people adopting wheat-based products into their diets.[4] The immunologic reaction is caused by specific compounds found in wheat (gliadin), rye (secalin), and barley (horedin).[2] Some patients may have an independent immune reaction to the avenin in oats, which indicates the need to distinguish celiac patients based on their sensitivity to different grains.[2,5]

Celiac disease is caused by a combination of gluten ingestion and a genetic predisposition.

This genetic predisposition relies on multiple genes, so there are varying levels of disease development.[4] The disease onset may be weeks to years after gluten exposure.[4] Factors that may increase risk include a family history of celiac disease, autoimmune diseases, IgA deficiency, some genetic syndromes (Down, Turner, and William syndromes), and especially Type I Diabetes and thyroiditis.[4]

What is the clinical presentation of celiac disease?

Celiac disease is exhibited in two ways:

1. The "classic intestinal" includes chronic diarrhea, weight loss, anorexia, abdominal distension, and perhaps even vomiting or constipation.[2,4]
2. The "non-classical extraintestinal" includes anemia, osteoporosis, neurological disturbances, and more.[4]

Other disease manifestations may include dermatitis herpetiformis and gluten ataxia. Dermatitis herpetiformis is a blistering rash with a characteristic symmetrical distribution.[4] Gluten ataxia has a mean onset age of 53 and may occur weeks to years after gluten exposure.[4] It is characterized by damage to the cerebellum leading to ataxia.[4]

How is celiac disease diagnosed?

Serologic antibody tests are used to diagnose celiac disease.[2,4] The initial test measures IgA antibodies to antitissue transglutaminase (anti-tTG).[2,4] Afterwards, a confirmatory test may be done to measure antiendomysial IgA (EMA).[2,4] A recent test measuring deamidated gliadin peptides (DGP) antibodies has also been introduced.[2,4] Increased anti-TG (and possibly anti-DGP) and anti-EMA antibodies are positively correlated with the typical celiac enteropathy that is found through biopsy of the small intestine.[4]

During the diagnostic investigation, a small intestinal biopsy may be performed.[4] This is to examine the presence of characteristic histological changes, which are an increased number of intraepithelial lymphocytes, elongation of the crypts, partial to total villous atrophy, and a decreased villous: crypt ratio.[4]

Since there is variability in celiac disease manifestation, the 'four out of five rule' has recently been proposed as a quantitative diagnostic approach.[4] Diagnosis is confirmed with at least four of the following symptoms present:[4]

1. Typical symptoms of celiac disease.
2. Positivity of serum celiac disease IgA class autoantibodies at high titer.
3. HLA-DQ2 and/or HLA-DQ8 genotypes.
4. Celiac enteropathy found on small bowel biopsy.
5. Response to a gluten-free diet.

How is celiac disease treated?

Celiac disease is treated with a gluten-free diet.[2,4] The possibility of incorporating oats into the diet is still controversial, as studies alternately show no adverse effect or potential toxicity.[5] In addition, for North America, there is the potential for wheat gluten cross contamination for oats, which compromises its use in a gluten free diet.[2]

What is a wheat allergy?

Wheat allergy (WA) is an adverse immunologic reaction to wheat proteins caused when gluten exposure activates the T-cells of the immune system in the gastrointestinal mucosa.[4] This causes the release of chemical mediators, including histamine.[4] A reaction may occur minutes to hours after gluten exposure.[4]

What is the clinical presentation of a wheat allergy?

Wheat allergy is exhibited as a classic food allergy affecting the skin, gastrointestinal tract, or respiratory tract.[4]

- The gastrointestinal manifestations are similar to what is experienced in patients with celiac disease.[2] However, there is no lasting gastrointestinal or other organ damage once the acute reaction has been treated.[2]
- Wheat-dependent, exercise-induced anaphylaxis (WDEIA) is caused by a specific type of grain protein called omega-5 gliadins.[4] There are a wide range of symptoms, ranging from hives to severe allergic reactions such as anaphylaxis.[4] Occupational asthma (baker's asthma) and rhinitis (signs and symptoms similar to a cold with sneezing, congestion, etc.) occurs when a number of wheat proteins bind to IgE.[4]
- Dermal hives.[4]

How is a wheat allergy diagnosed?

Skin prick tests and in vitro IgE assays are used to diagnose wheat allergy.[4] Wheat allergy is mainly found in infants and toddlers, who usually grow out of it when they are 3-5 years old.[4]

How is a wheat allergy treated?

Eliminating wheat from the diet and treatment with antihistamines and corticosteroids is recommended. Some may need epinephrine on hand in case of an anaphylactic reaction. Although patients usually do not need to restrict other prolamin-containing grains, such as rye, barley, and oats, some may choose a gluten-free diet.[2]

What is non-celiac gluten sensitivity (NCGS)?

Non-celiac gluten sensitivity refers to those who experience distress when consuming gluten-containing products.[4] Non-celiac gluten sensitivity appears to be similar to celiac disease, but

there are no diagnostic biomarkers and the small intestine is unharmed.[4] NCGS symptoms may overlap with symptoms of other diseases such as Irritable Bowel Syndrome (IBS) and other food hypersensitivities.[6] The onset may be hours to days after gluten exposure.[4] However, the role of gluten is not yet understood and so some have suggested that the term "non-celiac wheat sensitivity" is a more suitable name for the disorder.[7]

What is the clinical presentation of non-celiac gluten sensitivity?

These are similar to celiac disease, but also include extraintestinal symptoms, such as behavioral changes, bone or joint pain, muscle cramps, leg numbness, weight loss, and chronic fatigue.[4] In addition, patients may also experience headaches or migraines, a 'foggy mind', eczema, anemia, and depression.[8]

How is non-celiac gluten sensitivity diagnosed?

Exclusion criteria are used to rule out autoimmune and allergic mechanisms.[4] Diagnosing non-celiac gluten sensitivity is controversial because there are no specific biomarkers.[4] Some research has demonstrated that in patients who reported non-celiac gluten sensitivity experienced a reduction in their IBS-like symptoms with the consumption of a low FODMAP (Fermentable Oligosaccharide, Disaccharide, Monosaccharide, and Polyol) diet, indicating their symptoms were actually triggered by sensitivity to FODMAPs that can be found in products containing gluten.[6] This may indicate that NCGS may simply be a subgroup of IBS, rather than a separate condition.[8] More research needs to be conducted.[2]

How is non-celiac gluten sensitivity treated?

Non-celiac gluten sensitivity is treated with a gluten-free diet.[2,4]

What are some general recommendations?

If diagnosed with a gluten-related disorder, symptoms are usually relieved with a gluten-free diet.[2,4] If symptoms are not relieved after adopting the gluten-free diet, a low FODMAP diet can be considered along with consultation with a health professional.[8] Contrary to popular belief, a gluten-free diet is not healthier for those who do not have a gluten-related disorder.[2] There is no substantial scientific evidence that a gluten-free diet will help with weight loss and health.[1] Often, gluten-free diets have more fat and are low in vitamin B12, zinc, iron, folate, and fiber.[1] Gluten-free products are often more expensive.[2] So, while the growing gluten-free market offers more food choices for those with gluten-related disorders, there is no evidence that a gluten-free diet will benefit the general population.[2]

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