

CELIAC DISEASE AND GLUTEN

What gluten does to the small intestine, and why it can affect the whole body

Celiac disease is an autoimmune disease. This is different from an allergy food intolerance.

"Autoimmune" means the immune system mistakenly directs an attack toward the body's own tissue. In celiac disease, gluten sets off an immune response that injures the lining of the small intestine.

WHAT HAPPENS AFTER GLUTEN IS EATEN?

1 GLUTEN IS DIGESTED

Gluten proteins are broken into smaller pieces called peptides. Some gluten peptides are unusually resistant to complete digestion.

2 tTG MODIFIES SOME PEPTIDES

Tissue transglutaminase (tTG) is a normal enzyme in the intestinal lining. It can modify certain gluten peptides which makes them easier for the celiac immune system to recognize.

3 THE IMMUNE SYSTEM REACTS

People with celiac carry immune-system genes called HLA-DQ2 or HLA-DQ8. These genes can "present" gluten peptides to immune cells that help trigger inflammation.

4 THE INTESTINAL SURFACE IS INJURED

Ongoing inflammation can shorten and flatten the villi (villous atrophy) reducing the surface available for digestion and nutrient absorption.

Celiac genes are part of the picture, but not the whole story. Most people who carry HLA-DQ2 or HLA-DQ8 never develop celiac disease. The genes make celiac possible; but they do not diagnose it by themselves.



Healthy villi

Like shag carpeting: lots of surface area for digestion and absorption.



Celiac-damaged villi

Like a flatter rug: less surface area, so digestion and nutrient absorption are impaired.

THE "SHAG CARPET" ANALOGY

Villi are only the first layer of surface area. Each villus is covered with intestinal cells whose outer surface has even tinier projections called microvilli. Together, the villi + microvilli create an enormous absorptive surface. Flatten the villi and damage that brush-border surface, and there is simply less working area available to finish digestion and move nutrients into the body.

Educational information only; not a substitute for individualized medical care.

Sources available upon request.

WHAT DOES VILLOUS DAMAGE CHANGE?

THE BRUSH BORDER: ABSORPTION

The outer surface of the intestinal cells is called the brush border because the microvilli look like tiny bristles under a microscope. Important digestive enzymes live here, including lactase, which breaks down lactose.

When this surface is injured, lactase activity can fall. So someone with active celiac disease may also feel sensitive to dairy even if it was previously well tolerated. As the intestine heals, lactose tolerance may improve.

LESS SURFACE AREA = LESS ABSORPTION

“Malabsorption” means nutrients are not being absorbed as efficiently as they should be. Depending on the degree and location of intestinal injury, celiac disease can contribute to low iron, folate, vitamin B12, vitamin D, calcium, zinc and other nutrient concerns.

This is why celiac disease can show up as iron-deficiency anemia, fatigue, bone loss, mouth sores, poor growth, neurologic symptoms or other problems even when diarrhea is absent.

TESTING FOR CELIAC

1. Blood antibody testing: The usual first-line test is tTG-IgA – an antibody directed against tissue transglutaminase. Total IgA is often checked at the same time because some people do not make enough IgA for the standard test to be reliable.

2. Other antibodies when appropriate: EMA (endomysial antibody) and DGP (deamidated gliadin peptide) tests can add information in selected situations, including IgA deficiency or certain age groups.

3. Small-intestinal biopsy: In most adults, diagnosis is confirmed by taking tiny tissue samples from the beginning of the small intestine during an upper endoscopy. A pathologist looks for inflammation and villous injury under the microscope.

4. HLA genetic testing: HLA-DQ2/DQ8 testing can be useful when the diagnosis is unclear. If the necessary genes are absent, celiac disease becomes very unlikely. A positive gene test does not prove celiac because these genes are common in the general population.

DON'T START GLUTEN-FREE BEFORE CELIAC TESTING

Celiac antibodies can fall and the intestinal lining can begin healing after gluten is removed. That can make both blood tests and biopsy less reliable.

CELIAC CAN SHOW UP IN MANY WAYS

Digestive symptoms can include bloating, abdominal pain, diarrhea, constipation, nausea, gas, weight loss or greasy stools. But celiac is a whole-body disease because the intestine affects nutrition and immune signaling.

- Iron-deficiency anemia or low ferritin
- Fatigue or low energy
- Low bone density or fractures
- Headaches or some neurologic symptoms
- Dermatitis herpetiformis – a very itchy blistering skin rash
- Mouth ulcers or dental enamel changes
- Abnormal liver enzymes, fertility concerns or others

Some people have very little digestive discomfort despite significant intestinal injury. Symptoms alone cannot tell us how much villous damage is present.

AFTER THE DIAGNOSIS

A strict gluten-free diet removes the trigger, but “feeling better” is only one part of recovery. Three things may improve on different timelines:

- Symptoms – sometimes quickly, sometimes gradually
- Celiac antibodies in the blood – useful for follow-up, but not a perfect measure of intestinal healing
- The intestinal lining itself – villi may take longer to recover, especially in adults

FOLLOW-UP SHOULD LOOK BEYOND GLUTEN AVOIDANCE

Depending on the individual, follow-up may include a diet review for hidden gluten/cross-contact, repeat celiac antibodies, and reassessment of iron/ferritin, folate, B12, vitamin D, calcium/bone health and other nutritional concerns. Persistent symptoms deserve investigation rather than automatically eliminating more foods.

CROSS-CONTACT COUNTS

Cross-contact means a naturally gluten-free food picks up gluten from crumbs, flour dust, shared fryers, toasters, cutting boards, colanders, condiment jars or preparation surfaces. In the U.S., foods labeled “gluten-free” must contain less than 20 parts per million (ppm) of gluten.

WHAT ABOUT DIGESTIVE ENZYMES?

Some enzymes can help break down food proteins and may provide digestive support with accidental gluten exposure. But they do not make gluten safe for celiac disease.

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