

## **Are Genetically Modified Foods a Gut-Wrenching Combination?**

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<http://responsibletechnology.org/glutenintroduction>

This is a summary report; the full report is available at

[http://action.responsibletechnology.org/p/salsa/web/common/public/signup?signup\\_page\\_KEY=8290](http://action.responsibletechnology.org/p/salsa/web/common/public/signup?signup_page_KEY=8290)

Gluten sensitivity is currently estimated to affect as many as 18 million Americans.[1] Reactions to gluten, a protein found in wheat, rye, and barley, are becoming increasingly common. Gluten sensitivity can range in severity from mild discomfort, such as gas and bloating, to celiac disease, a serious autoimmune condition that can, if undiagnosed, result in a 4-fold increase in death.[2] Genetics alone cannot explain the rapid rise in gluten-related disorders, and experts believe that there must be an environmental trigger. There continues to be much debate about what that environmental trigger may be.

Some assert that a higher gluten content of modern wheat is to blame for the rising prevalence of gluten-related disorders.[3] But a 2013 review of data commissioned by the United States Department of Agriculture found no evidence to support this.[4] Others blame increased consumption of wheat overall,[4] age of wheat introduction,[5] cesarean birth,[6] breastfeeding duration,[7] or alterations in intestinal microflora.[8] All of these do offer some explanation, but they cannot completely account for the drastic increase in gluten sensitivities that we have seen in recent years.

Another possible environmental trigger may be the introduction of genetically modified organisms (GMOs) to the American food supply, which occurred in the mid-1990s. GMOs are created by a laboratory process that transfers genetic material into the DNA of an organism. There are nine genetically modified (GM) food crops currently on the market: soy, corn, cotton (oil), canola (oil), sugar from sugar beets, zucchini, yellow squash, Hawaiian papaya, and alfalfa. Notice that wheat is not one of these. Although wheat has been hybridized through natural breeding techniques over the years, it is not in fact a GMO.

Most GM crops are engineered to tolerate a weed killer called Roundup®, whose active ingredient is glyphosate. These crops, known as Roundup-Ready crops, accumulate high levels of glyphosate that remain in the food. Corn and cotton varieties are also engineered to produce an insecticide called Bt-toxin. The Bt-toxin is produced in every cell of genetically engineered corn and ends up in corn chips, corn tortillas, and other ingredients derived from corn. A recent analysis of research (see full report) suggests that Bt-toxin, glyphosate, and other components of GMOs, are linked to five conditions that may either initiate or exacerbate gluten-related disorders:

- Intestinal permeability
- Imbalanced gut bacteria
- Immune activation and allergies
- Impaired digestion
- Damage to the intestinal wall

## Intestinal permeability

Gluten-related disorders are commonly accompanied by and possibly triggered by intestinal permeability, which is commonly referred to as “leaky gut.”[9] Leaky gut occurs when gaps form between intestinal cells and large particles from the digestive tract enter the bloodstream, potentially triggering immune or allergic reactions. **The Bt-toxin produced by genetically modified corn kills insects by punching holes in their digestive tracts, and a 2012 study confirmed that it punctures holes in human cells as well.**[10] Bt-toxin is present in every kernel of Bt corn, survives human digestion, and has been detected in the blood of 93% of pregnant women tested and 80% of their unborn fetuses.[11] This “hole-punching toxin” may be a critical piece of the puzzle in understanding gluten-related disorders.

## Imbalanced gut bacteria

Gluten-sensitive individuals, and especially those with celiac disease, also commonly have an imbalance in their gut flora.[12,13,14,15] The reason that cesarean section increases risk[6] and breastfeeding decreases risk[7] for gluten sensitivity is likely due to their respective effects on microbial balance in the infant’s gut.[16] Glyphosate used on GM crops is not only an herbicide, but also a potent antibiotic. **Even with minimal exposure, glyphosate can significantly reduce the population of beneficial gut bacteria and promote the overgrowth of harmful strains.**[17,18] An overgrowth of harmful bacteria can promote inflammation, leaky gut, and immune reactions, all of which are linked to gluten-related disorders.

## Immune activation and allergies

Many people do not develop reactivity to gluten until later in life, which supports the notion that it can be triggered by environmental factors. The only study to date that has been able to effectively trigger an immunological shift to gluten sensitivity was done in mice in 2011.[19] The study showed that retinoic acid, a metabolite of vitamin A, activated a specific immune response to gluten under inflammatory conditions in the gut. It turns out that glyphosate, the primary herbicide used on GM crops, increases retinoic acid activity.[20] **If glyphosate activates retinoic acid, and retinoic acid activates gluten sensitivity, eating GMOs soaked with glyphosate may play a role in the onset of gluten-related disorders.**

Bt-toxin may also activate the immune system. When mice were exposed to Bt-toxin, they not only mounted an immune response to it directly, but they subsequently reacted to foods that had not formerly triggered a response.[21] **There was something about the Bt-toxin that primed the immune system to become reactive to other, once benign, foods.** If humans exposed to Bt-toxin react in a similar manner, eating GM corn could directly lead to the development of gluten or other food sensitivities.

## Impaired digestion

Decreased digestive enzymes can create undigested food particles, contribute to the overgrowth of harmful bacteria, and promote symptoms of gluten-related disorders. Studies of mice eating Roundup Ready soy and fish exposed to glyphosate show that these compounds reduce digestive enzymes.[22,23] All soybeans contain trypsin inhibitor, which blocks an important enzyme needed to digest protein, but Roundup Ready® soybeans contain as much as seven times more

than non-GMO soy.[24,25] The results of these studies suggest that genetically engineered foods may lead to serious digestive compromise.

### **Damage to the intestinal wall**

A common result of gluten sensitivity is damage to the lining of the intestinal tract. Celiac disease results in flattening of the microvilli lining the walls of the intestine. Both Bt-toxin and glyphosate have produced structural damage to microvilli in animal studies; animals exposed to these substances developed microvilli that were broken off, discontinuous, or shortened.[26,23]

### **Stay Away from GMOs**

A clear explanation for the rising rate of gluten-related disorders remains elusive. Multiple factors interact, with no clear or original cause. But genetically modified foods and their primary chemical residue, glyphosate, may be an important piece of the puzzle. Whether GMOs are indeed a causative factor in the escalating trend of gluten sensitivity or merely an obstacle to cure is yet to be determined.

Many clinicians already prescribe non-GMO diets for their gluten-sensitive patients. Physicians and patients have reported improvement in their symptoms after eliminating GMOs from their diets. Internist, Emily Linder MD, says, “Based on my clinical experience, when I remove genetically modified foods as part of the treatment for gluten sensitivity, recovery is faster and more complete. I believe that GMOs in our diet contribute to the rise in gluten sensitivity in the U.S. population.”

Unfortunately, many people who discover they are gluten-sensitive actually increase their intake of GMOs because they switch from wheat products to corn products. With 88% of the U.S. corn crop genetically engineered, avoidance of GMOs in the gluten-free community presents a unique challenge to consumers.

**The best way to avoid GMOs is to consult the [NonGMOShoppingGuide.com](http://NonGMOShoppingGuide.com) or download the free iPhone app [ShopNoGMO](#).** Look for products with either the “Non-GMO Project Verified” or the “Certified Organic” seal. Avoid ingredients derived from the foods most likely to be genetically modified. These include soy, corn, cottonseed, canola, sugar, papaya from Hawaii or China, zucchini, and yellow squash.

If you have seen improvement in a gluten-related condition after eliminating GMOs from your diet, please email [healthy@responsibletechnology.org](mailto:healthy@responsibletechnology.org) to share your story.

Read the report: Can Genetically-Engineered Foods Explain the Exploding Gluten Sensitivity?  
[http://action.responsibletechnology.org/p/salsa/web/common/public/signup?signup\\_page\\_KEY=8290](http://action.responsibletechnology.org/p/salsa/web/common/public/signup?signup_page_KEY=8290)

If you have a friend or relative suffering from gluten sensitivity, ask them if they eat GMOs and send this webpage to them!

Help us to reclaim a non-GMO food supply!

*(references: next two pages)*

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