

## **Intestinal disease, immune disease and GMOs**

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Could crops that are genetically engineered as pesticide producers be a factor in the explosion of intestinal and immune disorders in the U.S.?

### **GE engineering for insect resistant (IR) crops**

Sections of the DNA from the bacteria known as [Bacillus thuringiensis](#) (Bt) are isolated and inserted into the plant cells by a process known as genetic transformation. The entire plant is then regenerated from the transgenic plant cells. There are thousands of different Bt strains that produce proteins toxic to insect pests. Particular strains are chosen to target specific plant pests. The resulting plant contains the Bt toxin in its cells. [When the plant is eaten](#) by the target insect the toxin binds to receptors in the insect's gut, causing the gut wall to break down and allowing toxins and normal gut bacteria to enter the body. As the toxins and bacteria proliferate in the body, the insect dies.

Could it be coincidence that this is the exact description of "Leaky Gut syndrome"?

### **Leaky Gut syndrome**

According to [Dr. Andrew Weil](#), "Leaky gut syndrome is not generally recognized by conventional physicians, but evidence is accumulating that it is a real condition that affects the lining of the intestines. The theory is that leaky gut syndrome (also called increased intestinal permeability), is the result of damage to the intestinal lining, making it less able to protect the internal environment as well as to filter needed nutrients and other biological substances. As a consequence, some bacteria and their toxins, incompletely digested proteins and fats, and waste not normally absorbed may "leak" out of the intestines into the blood stream. This triggers an autoimmune reaction, which can lead to gastrointestinal problems such as abdominal bloating, excessive gas and cramps, fatigue, food sensitivities, joint pain, skin rashes, and autoimmunity."

### **Can Leaky Gut be caused by the Bt crops?**

According to the producers of the Bt insecticide crops, the portion of the Bt DNA that is used does not survive the digestive process in humans. This may be true for the bare DNA strands, but the Bt proteins do survive. [Aris](#) et al. found these Bt toxins in the blood of pregnant women and their fetuses which they reported in the journal of Reproductive Toxicology (2011). Even so, say the manufacturers, there is no cause to worry because the toxins are selective and only bind to receptors in the insect gut. Humans don't have these receptors.

According to [Dr. Arpad Pusztai](#), who was involved in the pioneering research on the Bt potato, "There is no [such thing as] absolute selectivity!" Furthermore, he says that the very process of genetic modification causes unknown and uncontrollable mutations in the plant. There is "no means of directing the gene transfer ... You are shooting blindfold ... genetic insertion causes mutations ... You can't say where it [the genetic bit] landed ... you don't know how things were reshuffled." The plant's own genes are affected and we don't really know how. Pusztai calls this, "insertional mutagenesis," mutation of an organism caused by the insertion of DNA into the organism's preexisting DNA.

Pusztai did an experiment with rats where he fed one group a food mixture that contained the Bt toxin alone and the other group were fed the the same mixture except it contained the Bt potato. The potato mixture contained 800 times less of the Bt toxin. The rats who were fed the Bt toxin alone were fine, as advertised. But the rats who were fed the Bt potato were not. They were smaller, their livers were smaller, but their stomachs and small intestines were larger. The toxin in the potato was different than

the toxin alone. Puztai published his work ([Lancet, 1999](#)) and when his employment contract expired it was not renewed.

The intestinal lining of livestock in the U.S. is so poor these days that meat processors import sausage casings from New Zealand. [According to Dr. Huber](#), “When you look at the intestine of those pigs fed the GMO feed, the lining is deteriorated and the critical microbial balance is drastically changed.”

### **Intestinal disease and Bt corn**

The first Bt corn, cotton and potato were [approved by the FDA](#) as food crops in 1995. The corn was genetically engineered to be resistant to the European Corn Borer (ECB). Since then there have been numerous approvals for Bt corn, cotton, potato and, in 2010 for soy. In 2002 the FDA approved another Bt corn variety engineered as an insecticide against the corn rootworm. The Bt potato never really took hold, apparently because the fast-food producers refused to buy it.

The Center for Disease Control ([CDC](#)) maintains the National Hospital Discharge Survey. Records were accessed for discharges with any diagnosis listed for a variety of intestinal ailments from 1990-2010. [Dr. Charles Benbrook](#) of the Washington State University published a report showing that pesticide use has increased since the advent of GMOs. He obtained data from the USDA and Monsanto reports to estimate percentages of GE corn and cotton that were planted in Bt varieties.

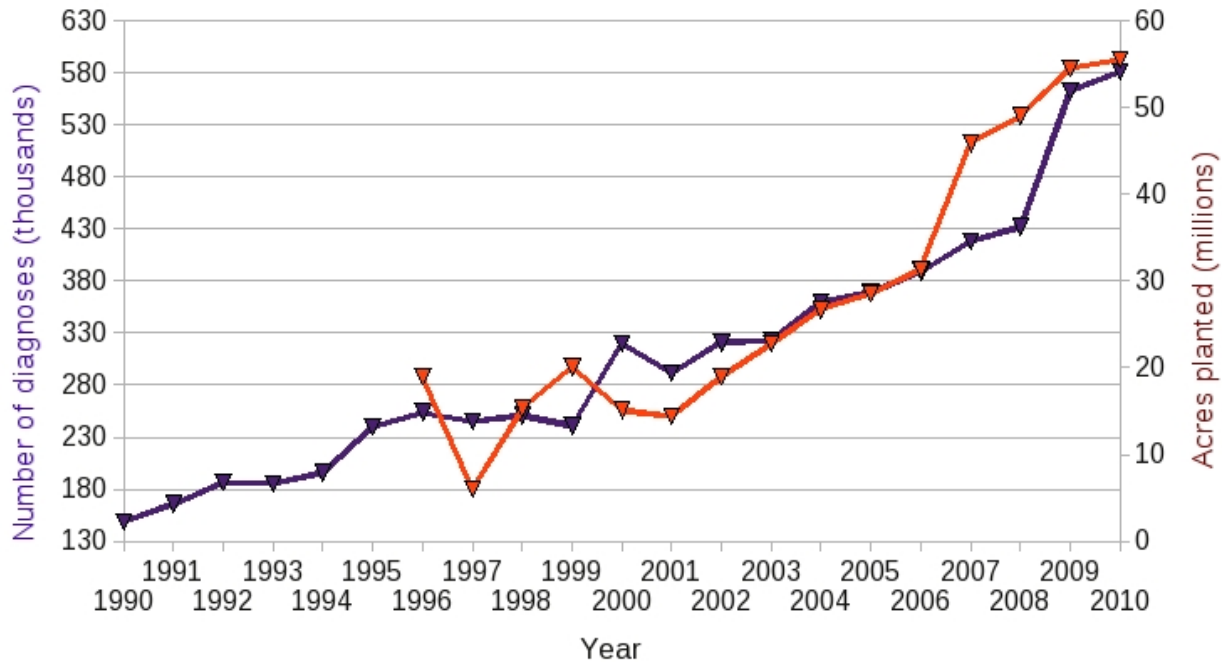
These data are plotted in the graphs below. The first graph is a plot of hospital discharge diagnoses of inflammatory bowel disease (IBD -- Crohn's and ulcerative colitis) against the number of acres of Bt corn planted (ECB-targeted). The diagnoses for IBD begins rising in 1995 and rises and drops along with the availability of Bt corn with a one year delay (two years around 2007-8). The incidence of IBD also showed a [high peak](#) around 1978. In an analysis similar to this one, [Qin](#) showed that it was strongly correlated with saccharine consumption at that time.

W/ 2 yr delay  
 R = 0.9545,  
 p <= 2.755e-05

Hospital discharge diagnoses (any) of  
 Inflammatory Bowel Disease  
 (Crohn's and Ulcerative Colitis)

■ Inflammatory Bowel  
 Disease (thousands)  
 ▲ Acres planted in Bt corn  
 for ECB (million)

plotted against acres planted of Bt corn (ECB)



The second graph depicts the number of hospital discharges listing peritonitis diagnoses plotted against the number of acres of Bt corn planted (ECB). The correlation in time in this graph is not as clear as in the previous, but they are marching along in the same direction at approximately the same time.

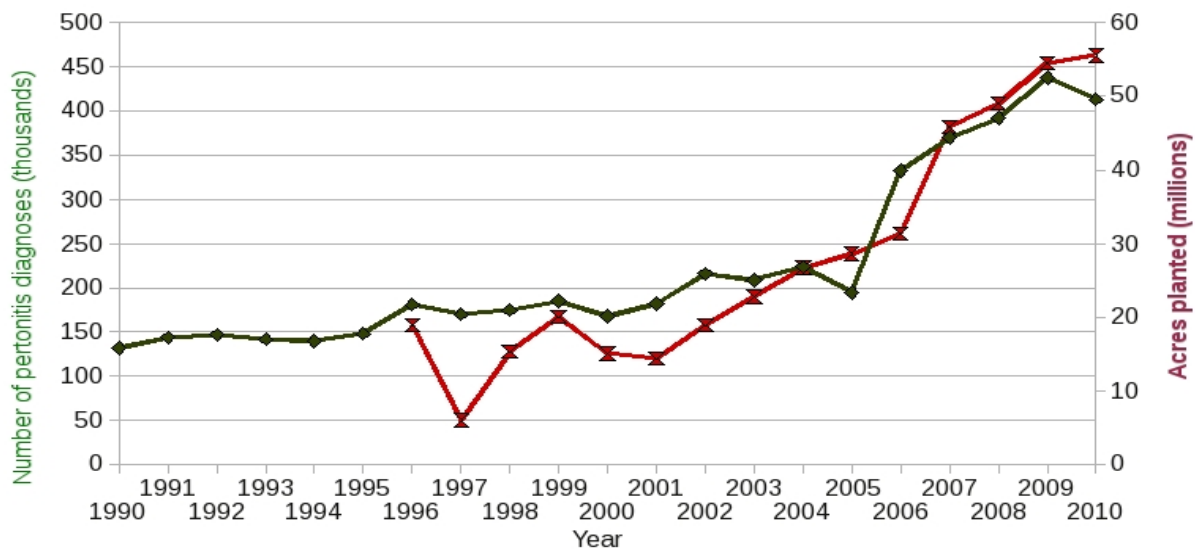
[Perforation of part of the gastrointestinal tract](#) is the most common cause of peritonitis.

Hospital discharge diagnosis (any) of Peritonitis

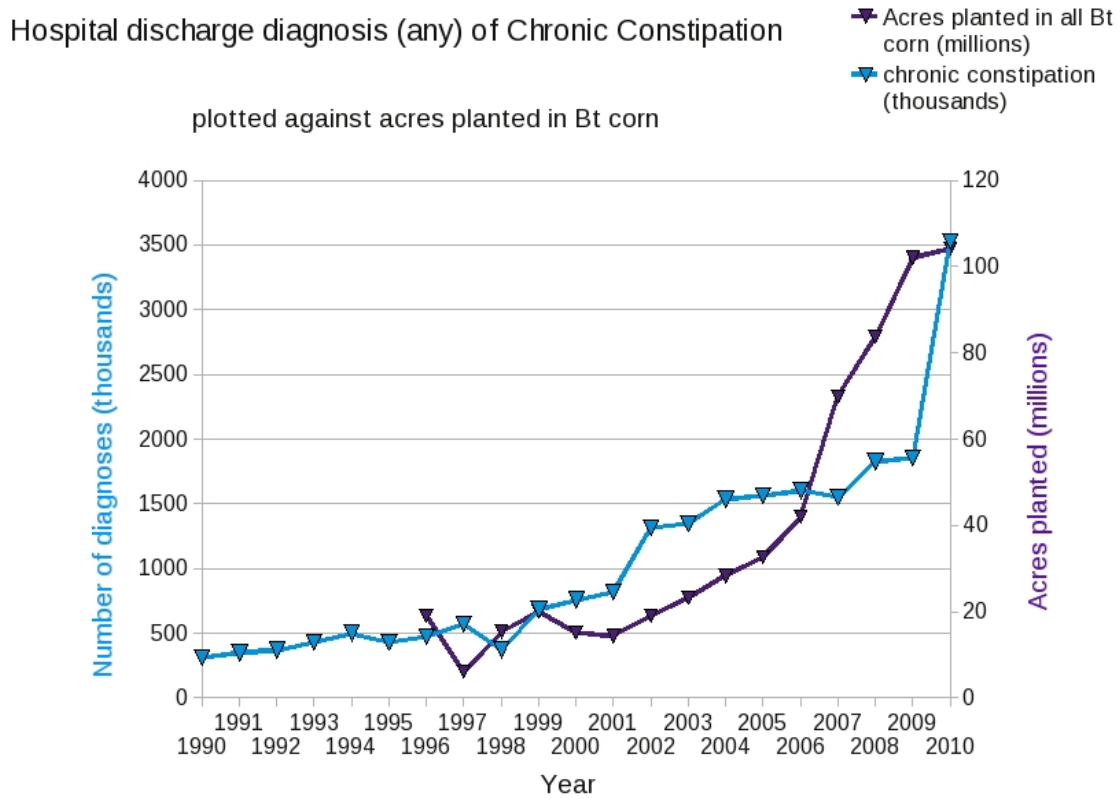
R = 0.955, p  
 <= 4.69e-06

plotted against Bt corn (ECB) acres planted

■ Acres planted in Bt corn for ECB  
 (million)  
 ▲ peritonitis



The third graph shows the the number of diagnoses for chronic constipation plotted against Bt corn planted (ECB and rootworm targeted). Chronic constipation jumped 90% from 2009 to 2010.

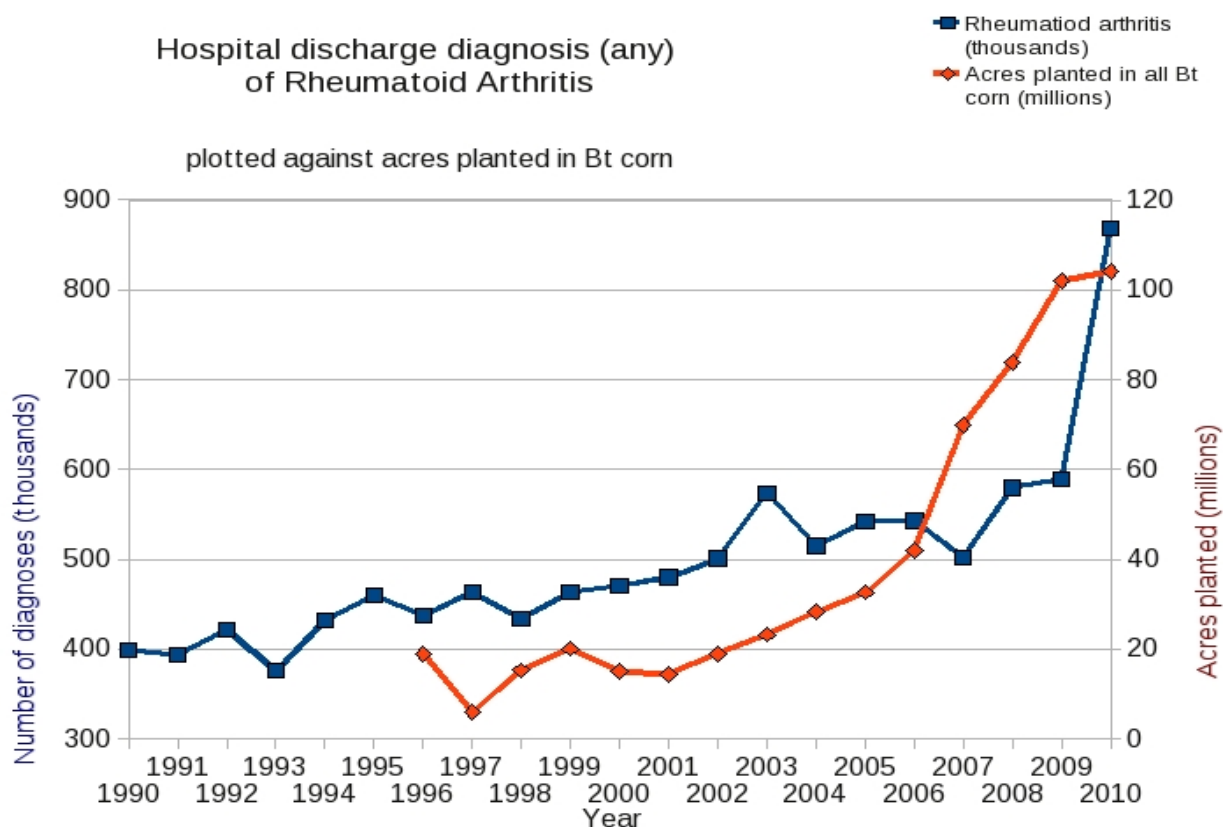


The fourth graph is a plot of hospital diagnoses of functional bowel disorder (chronic constipation, irritable bowel and undetermined) against the number of acres of all Bt corn. This graph also seems to track well.

The fifth graph shows the number of deaths due to intestinal infections plotted against the number of acres of all Bt corn planted.

### Leaky gut and immune response

If toxins and bacteria are leaking into the abdominal cavity, the body will respond as if it is under attack. In addition, according to [Dr. Pusztai](#), “The body will regard any genetically modified substance coming into the digestive system as foreign [because of its mutated DNA].” The body responds to foreign substances by triggering an immune response. This can be instant, as in an allergic reaction, or it can be a slower, cell-mediated response. Food allergies and immune diseases of all kinds are also soaring. Incidence and prevalence data trends are unavailable because many were rare until recently (fibromyalgia, celiacs disease). Other [immune diseases that are on the rise](#) are: asthma, eczema, lupus, Addison's disease, Grave's disease, rheumatoid arthritis, multiple sclerosis, psoriasis, and psoriatic arthritis. The final graph is a plot of the hospital discharge diagnoses of rheumatoid arthritis along with the number of acres of Bt corn planted. Rheumatoid arthritis is rising slowly, while the number of Bt crops is rising rapidly, but there is a large increase from 2007 to 2010 of rheumatoid arthritis diagnoses. Chronic immune disorders take a long time to develop and there are likely other factors.



Acknowledgment: Jon Abrahamson helped with data mining for this article.

#### Data sources:

Death data: [CDC compressed mortality files](#)

Hospital discharge data: CDC; [1991-2001](#) [2006-2010](#)

Bt corn data: [Charles Benbrook spreadsheet](#)