



Are Genetically Engineered Foods Promoting Autism?

By Jeffrey M. Smith

Executive Director, Institute for Responsible Technology

www.ResponsibleTechnology.org

“It appears there is a direct correlation between GMOs and autism.”

- Arden Anderson, DO, PhD, MPH

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Full citations and a video are available at
www.ResponsibleTechnology.org/autism

Introduction

Physician Jennifer Armstrong admits, “Twenty years ago, I didn’t even know what the word autism meant. It was rare.” But then something shifted. Whether it was the food, medicine, environment, or some combination, by 2008, an astounding 1 in 54 boys suffered from autism spectrum disorder (ASD) in the US.¹ What is it that is damaging the health and well-being of so many of our children? Don Huber, PhD, professor emeritus from Purdue University, has an idea.

In October 2011, Dr. Huber gave a talk in Germany about the physiological, neurological, and behavioral symptoms of pigs, cows, and rats fed genetically modified (GM) feed. After his lecture, a physician and autism specialist approached him and said, **“The symptoms you describe are exactly what we are finding in our autistic children.”**

The animals in those studies were fed the same GM soy and corn eaten by children and adults in the US. Both crops are outfitted with bacterial genes that allow them to survive being sprayed with herbicide, which kills plants. As a result, higher residues of toxic weed killer end up inside our food. In addition, some GM corn varieties have an even more unsettling characteristic: **their inserted genes produce an insect-killing poison called *Bacillus thuringiensis* (Bt) toxin in every cell—and in every bite.** Although the biotech seed companies like Monsanto claim that their genetically modified

organisms (GMOs) are harmless, that's *not* what the independent scientists are finding.

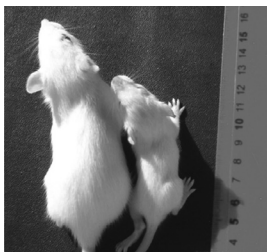
Agitated, antisocial animals

When Dr. Huber visited an ongoing research project utilizing rats, he said those animals fed non-GMO feed were “as passive as can be. You can take them out. You can put them on your lap. Treat them almost like a pet cat.” Not so with the rats eating genetically engineered food: “You can hardly catch the rats that have received the GMO feed for a month and a half to two months,” he said. “They go off by themselves. They're irritated. Crawl up the cage. . . . [They] don't get along with each other.”

Farmers are reporting the same thing with pigs raised on GMO corn. According to Dr. Huber, a farmer told him that “his pigs just seem to be always irritated. They can't get along with the other pigs.” Veterinarian Don Skow described similar odd behavior in the pigs of his client. “They would get cannibalistic. They would consume each other—ear biting and tail biting.” And when put in nurseries after weaning, he says, some “would get a condition like Alzheimer's. They would lose the ability to know where the feed was. A lot of them would die.” Although many of these odd behaviors had been dismissed as normal stress responses for confined animals, **when farmers switched to non-GMO feed and the problems went away, the real cause became obvious.**

Similar antisocial patterns that Huber described were observed by a Dutch college student more than a decade ago when comparing mice fed GMO or non-GMO soy and corn. He wrote, “The mice fed on GM food seemed less active while in their cages. The differences in activity between the two cages grew as the experiment progressed.” The differences were most striking when he moved the mice to weigh them: **“The mice from the GM cage were noticeably more distressed** by the occurrence than the other mice. Many were running round and round the basket, scrabbling desperately in the sawdust, and even frantically jumping up the sides, something I’d never seen before. They were clearly more nervous. . . . For me this was the most disconcerting evidence that GM food is not quite normal.”²

Dr. Irina Ermakova, PhD, a senior researcher at the Russian Academy of Sciences, reported to the European Congress of Psychiatry in March 2006 that male rats fed GM soy exhibited anxiety and aggression, while those fed non-GMO soy did not.³ Ermakova reported the same behavior in GM soy-fed female rats **and their offspring** in her study published in *Ecosinform*. The animals “attacked and



Babies of female rats fed GM soy were considerably smaller; more than half died within three weeks (compared to 10% of the non-GM soy controls).

bit each other and the worker.”⁴

Far more shocking, however, was that more than 50% of the offspring from the GMO-fed group died within three weeks when compared with a 10% death rate among the group fed natural soy. The GM group also had high rates of infertility and had smaller members. (*See photo, p.5*)

Autism and gastrointestinal problems

A disproportionate number of autistic children have digestive ailments, suggesting that it plays a significant role in the disease.⁵ A Harvard study in 2010, for example, stated that “Gastrointestinal disorders and associated symptoms are commonly reported.”⁶ An earlier Harvard and MassGeneral Hospital study⁷ found that most autistic children whom they examined had some type of GI symptom, food allergy, or absorption problem. A 2006 study found that “A history of GI symptoms was elicited in 70% of children with ASD compared with 28% of children with typical development.”⁸

The relationship between digestive health and autism is controversial. What is undeniable, however, is that numerous healthcare practitioners report greater success when they address the gastrointestinal disorder as part of their autism treatment protocol. For some, gastrointestinal intervention is their *primary* intervention.

Distressed intestines

The many GI disorders in autistic kids⁹ include inflammation, intestinal permeability,¹⁰ and imbalances in the intestinal bacteria.¹¹ **These also appear to plague animals fed GMOs.** According to Dr. Huber, for example, “When you look at the intestine on those pigs fed the GMO feed, the lining is deteriorated and the critical microbial balance is drastically changed.”

We’ll first examine the damage to the gastrointestinal tract.

According to some butchers who’ve done the comparison, the small intestines in GMO-fed livestock are typically thin and can tear easily as they’re removed from the carcass. The same organ from a non-GMO fed animal, they say, is much stronger. In fact, meat processors in the US typically import intestinal sausage casings from New Zealand, since the quality of the intestines in US livestock is too poor.

Dan Skow, who has treated farm animals for more than 40 years, confirms that after GMOs were introduced in the mid-1990s, he saw a much higher incidence of ileitis, which is inflammation or infection in the ileum (lower part of the small intestine). “Looking at microscopic slides of the intestinal tract,” he says, “there’s definitely something [that] has changed. Whether or not we can actually pinpoint that to the GMO grain thing, I personally think it is.”

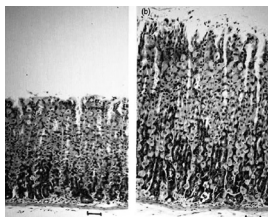
Howard Vlieger, an Iowa agricultural consultant, also discovered problems. He asked a slaughterhouse to set aside the stomachs of two sets of pigs he sent for slaughter—one group was fed GMOs and the other non-GMOs. The stomachs of the GMO-fed group were inflamed and ulcerated.

Danish farmer Ib Borup Pedersen also found dramatic changes in his 450-pig operation after switching from GMO soy to non-GMO soy in April 2011. In the previous two years, he had lost 36 sows from ulcers and bloat. Since non-GMO soy was introduced, he had no deaths from these digestive ailments. In the previous year, two pigs died of loss of appetite. None died since the change. And within two days of switching to non-GMO soy, his massive problems with diarrhea virtually disappeared. Both diarrhea and bloat are common symptoms of autistic children.

(In addition to improved digestion, the overall health of Pedersen's pigs improved, antibiotic use dropped by more than half, milk production increased, conception rate was significantly higher, and average litter size was up.)

One of the earliest indications that GMOs might cause GI tract distress was a 1999 study published in the *Lancet*. After rats were fed experimental GMO potatoes for just 10 days, the cells of the stomach lining and intestines were significantly altered.¹²

When California pediatrician Michelle Perro reviewed the study in 2011 and saw the photos of the increased cellular growth and abnormal architecture, she thought to herself, “Uh oh – we’ve got some problems.” Based on her experience treating children for 30 years, she said, “You can extrapolate that **the same thing may be occurring in babies clinically**. They are not digesting their food. They are malabsorbing...And I’m seeing that commonly now.” Digestive issues are skyrocketing among her patients.



The stomach lining of rats fed GM potatoes showed excessive cell growth, a condition that may lead to cancer. Rats also had damaged organs and immune systems.

“They are not digesting their food. They are malabsorbing...And I’m seeing that commonly now.”

She’s not alone. According to US hospital discharges and ambulatory admissions records data, inflammatory bowel disease in the US population skyrocketed by 40% since the introduction of GMOs. Dr. Perro strongly suspects that GMOs are a major contributor.

Family practitioner Myrto Ashe agrees: “We know food allergies are on the rise and also diseases related

to common foods, like celiac disease. Patients report that dairy products make them wheeze, or tomatoes give them joint pains. It's as though our food is harming us," she says. "Something is happening. And if the intestines are playing a big role, and I'm getting the sense they are, then any change in our diet becomes a suspect."

Holes in our gut

A connection to GMOs became an increasing concern when Dr. Ashe was asked to give a presentation on the health risks of GMOs to a mothers' group in California. "To prepare for this," she said, "I reviewed a lot of literature and tried to see what mechanisms are supported by the most solid scientific research. And to me, it was this intestinal permeability."

Dr. Ashe explains: "Once intestinal permeability increases, then it's possible for larger bits of food to go through—bits that really should have been digested fully before getting assimilated. Once these go into the bloodstream, the body can react to them, and this reaction is an immune reaction...I think anything that can increase intestinal permeability is a huge danger. The same diseases that research suggests are connected to intestinal permeability are the diseases that seem to be on the rise."

Numerous doctors point to holes in the gut walls as responsible for a long list of diseases and disorders.

Although this notion is not yet at the forefront of mainstream medical understanding for these diseases, there have been books, medical conferences, and professional practices all devoted to the concept.

Physician Gary Gordon puts it simply: “If you buy a brand new car and it says that it’s meant to run on gas and you go and put diesel in it, you could expect it won’t go very far...**By making your intestine leaky, we are permitting building blocks to go into our body that are the wrong fuel.**”

Pesticide-producing corn may be the culprit

When considering intestinal permeability, concern about the Bt-toxin in GMO crops looms large. This poison is designed to create holes (pores) in the digestive tract of insects. That is how it kills them.¹³

The Environmental Protection Agency (EPA), which labels Bt corn and Bt cotton plants as registered pesticides, insists that Bt-toxin will have absolutely no influence on human or mammalian cells.

But research published in the *Journal of Applied Toxicology*¹⁴ this past February proves them wrong. Researchers “documented that modified **Bt toxins [from GM plants] are not inert on human cells, but can exert toxicity.**” In high concentrations (generally higher than that produced in average Bt corn), Bt-toxin disrupts the membrane in just 24 hours, causing certain fluid to leak through the cell walls. The authors specifically note, “This may be due to

pore formation like in insect cells.” Thus, **Bt-toxin may indeed create small holes in our intestines.**

Dr. Gordon warns, “If [Bt-toxin] is causing an increased propensity for our intestine to become permeable or leaky and for foods to be presented to our bloodstream in a premature fashion, the havoc that it will cause will be across the entire spectrum of disease, from premature aging and Alzheimer’s to Parkinson’s to autism to cancer to asthma.”

Numerous professionals believe that Bt toxin produced in corn is already accelerating many diseases in the US. Arden Andersen, DO, PhD, MPH, believes Bt toxin is specifically implicated in the development of autism.

Compromised flora

In addition to structural deformities in the digestive tract of autistic kids, many also point to intestinal flora that’s gone wild. The bacteria living inside us play an important role in digestion, immunity, detoxification, and even the production of nutrients. In fact, the number of these bacterial cells in our digestive system is about 10 times the number of cells in our entire body. There’s an emerging health field dedicated to restoring the proper balance of intestinal microorganisms.

There is also growing evidence that animals fed GMOs have an improper balance. Dr. Huber says

the pigs fed GMOs have a “very dramatic difference in the microflora.” He says it “has a terrible odor to it compared to the normal microflora because of that changed bio environment.” Some farmers that butcher their own livestock also report that GMO-fed pigs and cows have a horrible stench and discolored organs.

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Dan Skow says that the balance of the good bacteria inside livestock has been thrown way off. “Now what set this off and why these disruptions of the balance to the microscopic flora in the intestinal tract? I’m personally suspicious—there’s a lot of impact from the GMOs.” Dr. Skow, like many others, is not willing to make an ironclad determination that GMOs are the causative factor. “There needs to be a lot more work to verify this,” he says. But that hasn’t stopped him from strongly urging his clients to switch to non-GMO animal feed. And when they do, he sees a difference in both the health and behavior of their livestock.

The German physician who approached Dr. Huber is also convinced enough to make changes in his autistic patients. When he understood the connection with altered gut bacteria, he responded: “I now know exactly where I have to look, and why

when I could modify the diet of an autistic child 10 years ago and have a very excellent response for remediation and recovery, why I'm not getting that response now. We are no longer able to change that microflora back—because we're continuing to feed GMO-contaminated food to our children.”

Botulism

There are several ways that GMOs might be causing problems in our gut bacteria, all of which are unsettling. The first is that most of the genetically engineered crops are “herbicide tolerant”; they end up with much higher levels of poisonous weed killer concentrated in the food portion of the plant. The two main weed killers, Roundup and Liberty, both have antibacterial properties. In other words, they can kill bacteria. According to Dr. Huber, the active ingredient in Roundup (glyphosate) is even patented as a microbiocide to kill intestinal microorganisms. This can have serious consequences.

Dr. Huber describes German research demonstrating that even tiny amounts of Roundup in a cow's diet can kill beneficial bacteria that normally control the growth of botulism. He and others believe that the overuse of Roundup, especially on Roundup Ready crops, is the likely reason for an apparent rise in botulism poisoning in livestock – and possibly humans.¹⁵ (And low levels of botulism are also implicated as a possible contributor to sudden infant death syndrome.)¹⁶

Dead sheep, buffalo, and cows

A second reason why GMO crops may interfere with gut bacteria has been proposed by renowned Indian biologist P. M. Bhargava, PhD. In India, farmers allow sheep, goats, and buffalo to graze on cotton plants after harvest. While the animals had no negative reactions year after year, when genetically engineered Bt cotton was introduced into the country, the results were tragic. Thousands of animals died. Numerous others suffer from a variety of disorders.¹⁷

These animals are called ruminants. They all have a compartment in their digestive tract where specialized bacteria break down the cellulose before it travels on to be digested and assimilated.

Dr. Bhargava believes that the Bt-toxin produced in every cell of the cotton plant kills the cellulose-digesting bacteria normally found in the rumen. This would explain why autopsies of the dead sheep revealed shriveled intestines. According to Bhargava, since the cellulose was never broken down, the food never made it into the intestines.

Similar evidence was found in a village near Warangal, India. All 13 of their buffaloes died after grazing for just a single day on Bt cotton plants. When I interviewed the villager who assisted with the autopsy of one of the animals, he reported that there was still undigested food in the rumen—three to four days after consumption.

US agriculture consultant Marc Tainio reports another story that might be related. His client was raising miniature cattle, only three feet high. When the client switched to GMO corn feed, the animals “weren’t able to process the food correctly, and they would bloat up and die.” The farmer quickly lost about 90% of his herd. He was able to save the rest by switching back to non-GMO corn.

If Bt-toxin kills rumen bacteria, it may not be a problem for us humans since we don’t have rumens. On the other hand, we do have gut bacteria, and the Bt toxin may interact with those bacteria in some way to cause harm. This appears to be the case in insects: a study demonstrated that Bt-toxin *only* killed certain insects when their gut bacteria were present. When the bacteria were removed by administering antibiotics, the toxin was no longer lethal. The authors suggest that Bt-toxin can cause “otherwise benign gut bacteria to exert pathogenic effects.”¹⁸ The mechanics of how this happens, and whether it also impacts humans, is not known.

GMOs “stick to the ribs”

The only human GMO feeding study ever published does show interactions with our intestinal flora. The implications of this research are quite serious. British scientists found that part of the **DNA inserted into GMO crops can actually transfer into the DNA of our gut bacteria.**¹⁹ Specifically, part of the Roundup Ready gene normally found in Monsanto’s soybeans

had taken up residence within the intestinal flora of three out of seven subjects tested. The transfer did not occur in the lab. It had apparently taken place after consuming GM soy in some previous meal(s). And these subjects lived in the UK, where the intake of GM soy is a small fraction of what is eaten in the US.

The study was published in *Nature Biotechnology* in 2004. It was condensed from a larger, more detailed study. The published version left out a significant fact: the gut bacteria that contained part of the Roundup Ready gene was not killed when exposed to Roundup's active ingredient, glyphosate. These people had Roundup Ready gut bacteria! This suggests that the transferred genes may continue to function inside us. In other words, **we may have GM proteins continuously produced inside our intestines long after we stop eating GMOs.**

There are insufficient studies on the GMO soybeans' Roundup Ready protein to know what exactly its impacts might be on our health. One study, recommended by the World Health Organization (WHO) as part of its recommended allergen screening protocol for GMOs, looks to see if any portion of the protein's amino acid sequence is similar to a sequence that is known to elicit an allergic response. Unfortunately, Roundup Ready soybeans fail the WHO test.* The protein has a section that is quite similar to that of a dust mite

*Since the WHO criteria were just suggestions, Monsanto chose not to remove their soy after this risk was discovered.

allergen. Therefore, if people who are allergic to dust are also reactive to the Roundup Ready protein, their immune system may be continuously triggered if that protein is produced within their intestines.

Living Pesticide Factories Inside Us

A more dangerous scenario would be if the Bt-gene produced in Monsanto's corn were to transfer to our gut bacteria. If so, it might convert our intestinal flora into living pesticide factories. With the inside of our intestines continuously exposed, Bt-toxin might erode the integrity of our GI tract, leading to widespread gut permeability and dysfunction.

In addition, many studies implicate Bt-toxin as an allergen. In its natural state derived from soil bacteria, Bt-toxin has triggered immune responses in farm workers²⁰ and allergic- and flu-like symptoms in hundreds of exposed citizens.²¹ It also evoked immune responses²² (and intestinal tissue damage)²³ in mice. Similarly, an Italian government study showed that mice fed Bt-corn had dramatic immune responses.²⁴ And thousands of Indian farm workers who harvest Bt cotton are also experiencing allergic- and flu-like symptoms.²⁵

Thus, Bt-toxin production within our intestines might simultaneously trigger immune responses, compromise our digestive tract, and expose the blood to undigested food (which may further trigger immune responses).

And now the bad news:

a 2011 Canadian study conducted at Sherbrooke Hospital discovered that 93% of the pregnant women they tested had



Bt-toxin from Monsanto's corn in their blood. **And so did 80% of their unborn fetuses.**

The toxin is likely to wash out of our blood fairly quickly. If that is the case, how can we explain why more than 9 out of 10 women had it circulating? It must be that the intake of Bt-toxin must be very frequent. But Canadians don't eat *that* many corn chips and tortillas. They *do* eat lots of corn derivatives like corn syrup, but these highly processed foods no longer have the Bt-toxin present.

The authors of the study speculate that the source of the Bt-toxin in the blood must have been the meat and dairy of animals fed Bt corn. This assumes that the Bt-toxin protein remains intact through the animals' entire digestive process *and* then again through the humans' digestive process after they eat the meat or dairy.

A more plausible explanation may be that Bt-toxin genes transfer from corn chips or tortillas into our gut bacteria. The active genes then produce the poison on a continuous basis inside the intestinal tract, which then gets into our blood. And for pregnant mothers, the toxin then travels through the placenta into their fetuses.

Precaution

There are numerous theories about autism. Many blame vaccines, others say it's genetic. The theories are not necessarily mutually exclusive as autism may be caused by several factors.

The link between autism and GMO consumption is by no means verified. Numerous studies would be required to confirm or disprove such a connection. But those won't happen anytime soon.

Scientists who discover adverse health dangers are routinely attacked and often gagged or fired. The journal *Nature* describes these “strikes...launched from within the scientific community” as sometimes “emotional and personal,” and which can even “accuse scientists of misconduct.”²⁷ And according to insiders around the world, they successfully suppress the much needed research.

But that hasn't stopped numerous healthcare professionals from prescribing non-GMO diets to their patients. Indeed, the American Academy of Environmental Medicine urges *all* doctors to do so. And they also recommend that practitioners distribute educational materials that describe the risks and suggest ways to avoid GMOs.²⁸

The LIA (Lyme Induced Autism) Foundation, which looks at Lyme disease and autism, has similarly urged the elimination of 100% of all GMOs from the diets of those suffering from these diseases.²⁹ Numerous autism

education programs also caution against GMOs.

Whether or not GMOs are ultimately linked to autism, animal feeding studies already implicate them in numerous other disorders. Under the sway of the biotech industry, most governments ignore these findings. And no government yet monitors the health impacts of GMO consumption on the health of their citizens.

There are nine GM food crops: soy, corn, cotton (used for cottonseed oil), canola, sugar beets (used in most US sugar), Hawaiian and Chinese papaya, some zucchini and yellow crook neck squash, and alfalfa (used for hay). To make it easier to avoid GMOs, the Institute for Responsible Technology (IRT) offers a list of thousands of products that have been verified as non-GMO at www.NonGMOShoppingGuide.com or via a free iPhone app ShopNoGMO. To avoid GMOs, you can use the guide, look for non-GMO labels, buy organic products, or avoid any of the at-risk crops or their derivatives (which are also listed in the Guide).

To better understand the impacts of GMOs on health, the Institute is collecting case studies of humans, livestock, and pets taken off (or put on) a GMO diet. The stories collected so far are compelling. Please share yours by emailing healthy@responsibletechnology.org.

The first case study related to autism is summarized below, and it provides some good news.

Safe eating.

Case Study

Laura's son Phillip is autistic. And her experience tells her that dietary interventions—including avoiding GMOs—are the key to recovery. She first noticed a huge improvement when she took her son off of gluten (a protein in wheat and other grains) and casein (a protein in milk). Then she started converting his diet to organic. “Once we moved to organics,” she said, “I really believe that it helped him . . . it's like another layer was removed that prevented him from really being interested in other children and connecting with other children –playing.”

By introducing organic foods, not only did Laura start using foods that were free of synthetic chemicals, but organic producers are also prohibited from using GMOs. After switching to a mostly organic diet, she estimated that her son was 80% recovered.

“For the longest time, we were stuck in kind of a plateau,” she said, “where he had about an 80 percent recovery.” When people asked her what she did to bring that about, she would respond, “Well, he's gluten free, he's casein free, and we are 80 percent organic.” After about the third or fourth time she used those same words, she made the connection. **“I'm using the same number...like 80 percent recovered, 80 percent organic.” At that point, she realized she needed to go 100% organic.**

“It made a huge difference.” She said that in just six months “he has become much more social, much more caring, empathetic, [and] plays with other children.” And his recovery rate? “We call it pretty darn close to 100%...We know that it has to do with what he is eating and what he is not eating.” Laura is now careful to never feed him any GMOs. And she and her husband also follow a non-GMO diet.

It is clear that this single experience is not sufficient to draw wider conclusions. Please share yours. Email healthy@responsibletechnology.org.

Full citations and a video are available at

www.ResponsibleTechnology.org/autism

International bestselling author and filmmaker **Jeffrey M. Smith** is the executive director of the **Institute for Responsible Technology** (www.ResponsibleTechnology.org) and a leading spokesperson on the



health dangers of GMOs. His books include *Seeds of Deception* and *Genetic Roulette*, and his films include *Hidden Dangers in Kids' Meals*, *Your Milk on Drugs—Just Say No!*, and a new documentary due out in early summer 2012. For a list of thousands of products that have been verified as non-GMO, go to www.NonGMOShoppingGuide.com, or download the iPhone app **ShopNoGMO**.

Are Genetically Engineered Foods Promoting Autism?

The incidence of autism skyrocketed in the US since genetically modified organisms (GMOs) were introduced in the mid-1990s. Many animals fed genetically engineered soy and corn appear to suffer from behavioral and digestive issues found in autistic children. And healthcare professionals and parents report that removal of GMOs from the diet may reverse these symptoms.

International bestselling author and filmmaker Jeffrey M. Smith explores the evidence on the possible links between GMOs and autism, and presents compelling data that will have you thinking twice about what you're feeding to your family.



For more information about the dangers of GMO foods, visit www.ResponsibleTechnology.org

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