Toxicology Expert Speaks Out About Roundup and GMOs

Story at-a-glance -

- There are NO peer-reviewed scientific papers establishing the safety of GMO crops. There are, however, both clinical and peer-reviewed scientific papers showing the hazards of GMO crops, including harmful secondary effects
- Epidemiological patterns show there's an identical rise in over 30 human diseases alongside our increased usage of glyphosate and the increased prevalence of genetically engineered proteins in our food
- Glyphosate is not "just" an herbicide. It was originally patented as a mineral chelator. It immobilizes nutrients, making them unavailable for your body. It's also patented as a potent antibiotic that can devastate human gut bacteria
- The EPA recently doubled the amount of glyphosate allowed in food. Soybean oil is now allowed to contain a whopping 400 times the limit at which it can impact your health

By Dr. Mercola

Dr. Don Huber is likely the leading GMO expert in the world. He is an award-winning, internationally recognized scientist, and professor of plant pathology at Purdue University for the past 35 years.

His agriculture research is focused on the epidemiology and control of soil-borne plant pathogens, with specific emphasis on microbial ecology, cultural and biological controls, and the physiology of host-parasite relationships.

His research over the past few decades has led him to become very outspoken against genetically modified organisms (GMO) and genetically engineered (GE) foods and the use of Roundup in agriculture in general.

He's really one of the best scientists we have in the GMO movement for documenting the dangers of genetically engineered foods.

> *"I appreciate the opportunity to share a little bit of my research and the research of many other scientists who are expressing concern; recognizing that we've missed the boat in much of this discussion and much of the process, because it's really a food and health safety issue that we're dealing with here,"* he says.

Three Things You Need to Know About GMOs

There's a lot of confusion about the *basic validity* of concerns about genetically engineered (GE) foods. Many have been deceived into thinking that there's really no difference between GE foods and conventional fare, and all these worries are just paranoid fear-mongering.

According to Dr. Huber, the following three facts are some of the most important that everyone needs to understand about GMOs:

1. Despite what the media and so-called "experts" proclaim, there are NO peer-reviewed scientific papers establishing the safety of GMO crops.

   According to Dr. Huber, so far, no one has been able to establish that there's a safety factor to either the genetically engineered proteins (i.e. the foreign proteins produced by the genetically modified plant) or the chemicals we're consuming in ever larger quantities as a result of the genetic engineering process.

   There *are,* however, both clinical and peer-reviewed scientific papers showing the hazards of GMO crops, including harmful secondary effects.

   > *"A group of us met with top USDA administrators. They assured us that they based all their decisions on peer-reviewed science. When we asked them if they would share any of that, they were unable to produce any,"* he says.

2. Epidemiological patterns show there's an identical rise in over 30 human diseases correlated with our increased usage of glyphosate and the increased prevalence of genetically engineered proteins in our food.

3. Genetically engineered foods, as well as conventional crops that are heavily sprayed with glyphosate (the active ingredient in Monsanto's herbicide Roundup), have lower nutrient density than organic foods. They also contain high amounts of pesticides with documented harmful health effects, along with novel, highly allergenic, proteins.

Little-Known Facts About Glyphosate

You can't really discuss genetic engineering without also addressing the chemicals these plants are engineered to tolerate. About 85 percent of all genetically engineered plants are herbicide-tolerant—designed to tolerate very high levels of herbicides, glyphosate in particular. These are the so-called Roundup Ready crops.

It's important to realize that glyphosate is not "just" an herbicide. As explained by Dr. Huber, it was first patented as a mineral chelator. It *immobilizes nutrients*, so they're not physiologically available for your body.

> *"You may have the mineral [in the plant], but if it's chelated with glyphosate, it's not going to be available physiologically for you to use, so you're just eating a piece of gravel,"* Dr. Huber says.

Naturally, health effects are bound to occur if you're consistently eating foods from which your body cannot extract critical nutrients and minerals. Mineral deficiencies can lead to developmental and mental health issues, for example. Glyphosate is *also* patented as an *antibiotic*—and a very effective one at that— against a large number of beneficial organisms. Unfortunately, like all antibiotics, it also kills vitally important beneficial soil bacteria and human gut bacteria.

> *"Lactobacillus, Bifidobacterium, Enterococcus faecalis—these are organisms that keep you healthy either by providing accessibility to the minerals in your food or producing many of the vitamins that you need for life. They're also the natural biological defenses to keep Clostridium, Salmonella, and E.coli from developing in your system,"* Dr. Huber explains.

> *"When you take the good bacteria out, then the bad bacteria fill that void, because there aren't any voids in nature. We have all of these gut-related problems, whether it's autism, leaky gut, C. difficile diarrhea, gluten intolerance, or any of the other problems. All of these diseases are an expression of disruption of that intestinal microflora that keeps you healthy."*

Glyphosate was first patented as a chelator in 1964 by Stauffer Chemical Co. It was patented by Monsanto and introduced as an herbicide in 1974. And then in 1996, Roundup Ready crops hit the market. There's been a steep increase in the usage of Roundup since then, because you can apply it multiple times without damaging your crop. Making matters worse, they're now also using glyphosate as a ripening agent—even for non-GMO crops. It's applied right before harvest time to ripen off the crop.

> *"We have about a five-fold increase in glyphosate usage on many of our GMO crops. With the Roundup Ready-resistant weeds, we see that rate going up exponentially,"* he says.

Did You Know? EPA Just Increased Allowable Limits of Glyphosate in Your Food

Despite well-understood health risks, the US Environmental Protection Agency (EPA) is repeatedly approached by agricultural and biotech companies asking for increased limits of this pernicious toxin in your food.

> *"The companies say we have to increase the amount of glyphosate that we can have in your food, so we can have a 'safe' product – not based on science but based on how much chemical is actually in our food!"* Dr.Huber says.

On May 1, the EPA went ahead and doubled the amount of glyphosate allowed in food... Soybean oil may now contain as much as 40 parts per million (ppm) of glyphosate. Meanwhile, research by Dr. Monika Krueger at Leipzig University shows that *a tenth of a part per million* is all that it takes to kill your *Lactobacillus*, *Bifidobacterium*, and *Enterococcus faecalis*! So soybean oil is now allowed to contain a whopping *400 times* the known limit at which it can impact your health.

Can GMOs Coexist with Conventional Crops?

On September 20, agriculture secretary Tom Vilsack announced that the Department of Agriculture (USDA) will soon publish a notice in the *Federal Register* asking for public comments on how agricultural coexistence in the US might be strengthened. At the time of this writing, the USDA has not yet published that notice, but you can search the *Federal Register* for the latest notices here.[1]

According to the media release:[2]

> *"The Advisory Committee on Biotechnology and 21st Century Agriculture recommended that USDA support agricultural coexistence by strengthening education and outreach on this vital issue... In response, with this notice, we are asking all those with a vested interest in coexistence to help us learn more about what coexistence means to them, how they are already contributing to it, and what more is needed to achieve coexistence. With this input, we can continue the dialogue begun by the AC21 group[3] and find practical solutions that will help all sectors of American agriculture be successful.*
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> *... Coexistence is defined as the concurrent cultivation of crops produced through diverse agricultural systems including traditionally produced, organic, identity preserved, and genetically engineered crops. USDA supports all forms of agriculture and wants each sector to be as successful as possible providing products to markets in the United States and abroad."*

Vilsack wants comments... How about we start with the suggestion that "Biotech Government of the Year shouldn't be running the show." He says the USDA supports ALL agriculture, yet the USDA primarily subsidizes junk food crops—corn and soy—and cave in to the multi-million dollar lobbying of the biotech industry. Meanwhile, the USDA has all but wiped out raw milk, heritage hogs, and most small farmers. So, really, the only agriculture the USDA support is the chemical variety. When asked whether he believes that it's ever appropriate or possible for GMOs to coexist with conventional and organic crops, Dr. Huber replies:

> *"We know how to get these genes in; we don't know how to remove them,"* he says. *"I don't see any opportunity for coexistence with the current technology that we have because of that promiscuous nature of the genes. If you have a gene that is spread by pollen, like Roundup Ready alfalfa, it's just a matter of time before bees or the wind is going to transfer that particular pollen to every alfalfa crop that you're going to grow. There's a very high probability that you're going to see that genetic component in it."*

The StarLink Case—Proof Positive GMOs Can't 'Coexist' with Natural Plants

According to Dr. Huber, our knowledge of what we're doing in the genetic engineering process is extremely limited. Contrary to popular belief, we're still only in the initial stages of understanding what we're doing in that whole process:

> *"We do know that it's more like a virus infection than it is a breeding program. In other words, you're throwing genes in, but you're not moving all of the regulatory and control mechanisms with those genes so that they're only going to function at a time when the plant needs it or under conditions when it needs it. It's a flawed science to think that you have one gene or one little group of genes and it's going to do this particular function and not the other things."*

Clearly, that's not the general perception. Most people are still under the illusion that genetic engineering is a very precise approach. That's certainly what the industry wants you to believe. But as Dr. Huber points out, we learned some very important facts from sequencing of the human genome: There aren't nearly enough genes to do all of the things we know are done within the human body.

This is related to the profoundly important relationships that epigenetics controls. We found out that a gene actually functions *in relation to the environment* and its *relationship to other genes or other genetic components* in that code. When you disrupt those relationships and the integrity of the genetic code, you end up with mutations and epigenetic effects that we've yet to explore.

> *"We know they occur because for every one of those successful expressions that you get from genetic engineering, you have over a million other things that take place that are negative,"* he says. *"We also have potentially negative [effects] with the one that succeeded in expressing a particular protein that you want for genetic engineering. But nobody even* ***looks*** *for all of those other epigenetic effects that occur.*
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> *One of the things that we do know, since we don't have the regulatory genes that would normally be part of those components from a regular breeding program, is that the genes that are being inserted are extremely promiscuous. They're not stable. They may stay in and be transferred through a regular breeding program after they're introduced. But we know that they can be transferred to soil microorganisms when the stubble or the grain is digested and decomposed in the soil—or in your gut."*

In the latter case, your gut flora can then pick up those same genes, and can start producing those foreign proteins, which are extremely allergenic. A perfect example of this was the StarLink corn, which produced a protein that turned out to be very toxic to humans. StarLink was grown 10 years ago for a pharmaceutical process. It was pulled off the market when they realized it had escaped from its confines and had the ability to contaminate corn destined for food production.

We know that GE crops decimate agricultural variety—countless varieties have been wiped out in order to foster a few monocultures. Now, if GMOs are removed, will there really be less food variety?

This ridiculous concept was recently brought forth by *Scientific American*.[4] The erroneous and illogical claims made in the editorial mirrors claims made by Monsanto—such as the idea that GMO labels could destroy the market for genetically engineered foods in a country where 70 percent of processed foods already contain them. This, they want you to believe, would result in "less variety and higher costs." Look, we're primarily talking about ingredients like corn syrup and soy! And food companies do not appear to have any major problems supplying Europe, where GMOs have to be labeled, with products that do not contain genetically engineered corn and soy.

It's funny how times have changed at *Scientific American*, as they now tow the biotech line like a well greased PR firm. It wasn't all that long ago that they had the right idea, questioning the logic and safety of restricting GE crop research to the seed companies that make them.[5]

Could YOU Be Altering Your OWN Genes When You Eat GMOs?

As discussed by Dr. Huber, research clearly shows that the novel proteins created in genetically engineered plants are highly allergenic, with the capability to promote diseases like cancer and liver or kidney failure. But Dr. Huber points out that there are other factors involved as well, which have some scientists concerned about the spread of those genes into the human gut... Not only do GMOs alter your intestinal microflora, but research shows that human cells are also able to transfer those novel genes, thereby affecting the human genome.

> *"Especially with generation two genetic engineering, called gene silencing—that section of the nucleic acid can actually be picked up or attached to your own genes, and then start shutting down your own physiology in that process... It's well-documented in the scientific literature."*

Indeed, last year, University of Canterbury Professor Jack Heinemann released results from genetic research he conducted on this type of GE wheat, which showed without "any doubt" that molecules created in the wheat, which are intended to silence wheat genes to change its carbohydrate content, may match human genes and potentially silence them. If that's not a concern, I don't know what is! University Professor Judy Carman agreed with Heinemann's analysis, stating in *Digital Journal*:[6]

> *"If this silences the same gene in us that it silences in the wheat -- well, children who are born with this enzyme not working tend to die by the age of about five."*

Heinemann reported that his research revealed over 770 pages of potential matches between two GM genes in the wheat and the human genome. Over a dozen matches were "extensive and identical and sufficient to cause silencing in experimental systems," he said. Experts warned that eating the wheat could lead to significant changes in the way glucose and carbohydrates are stored

in the human body, which could be potentially deadly for children and lead to serious illness in adults.

Glyphosate—Another Culprit in Bee Die-Offs?

Glyphosate may also play a role in bee colony collapse disorder. As stated by Dr. Huber, there are three established characteristics of colony collapse disorder that suggests glyphosate may be (at least in part) responsible:

1. The bees are mineral-deficient, especially in micronutrients
2. There's plenty of food present but they're not able to utilize it or to digest it
3. Dead bees are devoid of the *Lactobacillus* and the *Bifidobacterium*, which are components of their digestive system

The bees also become disoriented, suggesting endocrine hormone disruption. Neonicotinoid insecticides, which are endocrine hormone disruptors, have been demonstrated to make a bee disoriented and unable to find its way back to the hive. Glyphosate is also a very strong endocrine hormone disruptor.

Dr. Huber cites a study on glyphosate in drinking water at levels that are commonly found in US water systems, showing a 30 percent mortality in bees exposed to it. And that's just from common levels of glyphosate in drinking water...

Glyphosate Is a Cumulative Chronic Toxin

Americans are in a tough spot right now, as there's no telling which foods might contain genetically engineered ingredients tainted with high amounts of Roundup. Labeling would at least tell you that much, and give you the freedom to choose another product.

> *"A consumer needs to be very concerned. They need to be active in the labeling aspects,"* Dr. Huber says. *"They also need to be active in the requirement for safety studies. These haven't been done. When the EPA employed the term 'substantially equivalent,' it gave the chemical companies essentially a waiver on doing any of the safety tests. The only thing that they've ever tested for is acute toxicity. Well, we know that glyphosate, for instance, isn't an acute toxin. It's a serious chronic toxin. That's been well-established in peer-reviewed scientific articles. We have more of those coming along all the time. There is no question that it's a chronic toxin."*

According to Dr. Huber, glyphosate at a mere 0.5 ppm is toxic to your endocrine hormone system, which includes your pituitary, thyroid, and reproductive hormones. Ten ppm is cytotoxic to kidney cells; one ppm is toxic to your liver, and 0.1-10 ppm are toxic to a whole series of human cellular functions or cells directly. Dr. Huber has even likened glyphosate to DDT in terms of toxicity.

Consider that, and then consider that we are currently using some 880 million pounds—that's nearly ONE BILLION pounds—of glyphosate annually on crops grown worldwide.

As Dr. Seneff and Samsel reveal in a recent study conducted at the Massachusetts Institute of Technology, glyphosate is probably the most harmful chronic toxin we've ever encountered, both in our environment and on our dinner plates. Their findings show that two of the key problems caused by glyphosate in the diet are nutritional deficiencies, and systemic toxicity.

> *"It's just that you don't get killed or die today from it; you have to suffer through the process of gluten intolerance, leaky gut, Crohn's, Alzheimer's, autism, or any of those diseases that are related to the health of your gut, which we're seeing now on an epidemic scale in our society,"* he says.

Why Is the USDA Ignoring This Health Threat?

Two years ago, in 2011, Dr. Huber wrote a letter to USDA Secretary Tom Vilsack, informing him of many of the safety concerns surrounding genetically engineered crops, along with yet *another* groundbreaking finding that could spell absolute *disaster* for your entire food supply. He warned Vilsack about the emergence of a brand new electron microscope-sized organism associated with something called Sudden Death Syndrome (SDS) in soy.

It's also found in a large variety of livestock given GE feed who experience both spontaneous abortions and infertility. This includes cattle, horses, sheep, pigs, and poultry. Might it affect humans in the same way? Dr. Huber urged the USDA to investigate the matter and suspend approval of GE alfalfa until proper studies have been completed.

> *"We know that all herbicides are chelators, mineral chelators. That's how they compromise the plant's physiology: they tie up a particular nutrient and shut down a physiologic pathway,"* he says. *"This wasn't new from that standpoint. But the thing that was different [with glyphosate] was its biocidal effect. It's not only a chelator, but it's also a strong antibiotic to beneficial microorganisms. How do you compensate for that? How do you restore biological activities?*
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> *Much of my research, which was focused on glyphosate, was focused on the biology and restoration of those mineral nutrients. I served on the National Plant Disease Recovery Program. I was chairman at that time and also for the USDA. I've also served for 40 years on our various threat pathogens committees and recognized what the potential problems were with Roundup Ready alfalfa."*

The American Stock Growers' Association also testified before Congress, saying that infertility was threatening the animal industry. Dr. Huber saw how all of these issues were connected—via genetically engineered crops and the application of glyphosate. He felt an obligation to alert the USDA secretary and to ask for his help in getting the research done before further jeopardizing not

only our fourth most important crop, but also our entire animal production because of the prevalence of this new abortogenic entity, found in high concentrations in GE or high-glyphosate intense growth conditions.

His warnings were ignored, and GE alfalfa was deregulated that same year. Why is the USDA ignoring warnings from a scientist with *50 years* of experience with plant pathology, soil-borne diseases, microbial ecology, and host-parasite relationships?

> *"A group of us met with the top administrators. I've never met with the secretary personally. But we did have the privilege of meeting and sharing our concerns and 130 or so peer-reviewed scientific articles that support our position with top administrators in USDA and some of the other agencies. They assured us that if we could do the work, they would be willing to look at it.*
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> *Well, they haven't looked at any of the other peer-reviewed science... And the USDA scientists, who have a tremendous amount of knowledge on the impact of glyphosate, have all been muzzled. They're not permitted to say anything about it. I got a phone call from one a few weeks ago. He said, 'I'll be retiring fairly soon. I plan on moving off and sharing that stage with you because I have a lot that I want to say. I just can't say it right now.'"*

GMOs Are Not the Solution to Feed a Burgeoning Population

There is simply no question and there is irrefutable evidence that genetic engineering is not the solution to feed a growing world population. Rather, it actually increases disease susceptibility of plants by impairing their immune response. It also reduces, not increases, yield potential. There's never been a genetically engineered plant that increases the intrinsic yield of a plant. Improved plant yield is accomplished through traditional breeding programs that promote improved gene expression.

> *"We're only expressing 25 or 30 percent of the genetic potential for yield in any of our crops now,"* Dr. Huber says*. "There's tremendous potential there. It's a matter of using that traditional breeding as we've done for many years and getting better expression – not throwing in additional genes to act like a virus and disrupt the integrity of the whole process that's required for yield and quality.*
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> *We can increase all of the nutrient density with traditional breeding. In fact, the Brazilians are doing that. They've just released new varieties of soybean with higher vitamin A, and corn with higher vitamin A and vitamin C. We can do all of that with traditional breeding. We've been doing it for years. You don't need to disrupt the genetic integrity and introduce all the collateral damage with its long-term effects."*

I can personally attest to this fact as well. High-performance agriculture is one of my new passions, so much so it's turning into something of a second career—to learn and understand how to optimize plant growth and the environment. I've been applying what I've learned in my own garden for a few months now, and I've been able to personally witness the maximization of genetic potential that is possible. For example, by using compost tea and mineral amendments, the leaves on some plants, like my lime trees and oleanders, are literally 300 to 400 percent bigger than the typical leaf of these plants. It's truly extraordinary! You wouldn't even imagine that plants could grow that big.

Part of the problem is that we've gotten used to less than mediocrity, when it comes to plant performance. According to John Kempf,[7] an Amish farmer and one of the leaders in the field of high-performance agriculture, farmers and food producers routinely harvest only about *10 to 15 percent* of the inherent genetic capacity of any given crop. In a nutshell, the foundation of health – whether we're talking about plants, soils, animals, or people – it really boils down to two things:

1. Having adequate mineral nutrition, and
2. Having that nutrition, in the case of plants, be supplied by an active soil microbial community, or having a strong soil biology

Genetically engineered crops decimate both. How could it possibly be the answer to rising food demands?