The Failed Promises and Flawed Science of Genetic Engineering

(A Special Interview with Dr. Don Huber)

By Dr. Joseph Mercola

JM: Dr. Joseph Mercola

DH: Dr. Don Huber

Introduction:

JM: Welcome, everyone. This is Dr. Mercola, and today we are honored to be joined by Dr. Don Huber, who is an award-winning, internationally recognized scientist and professor emeritus of plant pathology at Purdue University for 50 years – five decades. 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.

He's really one of the best scientists we have in the GMO movement for documenting the dangers of GMO. That's a big part of what we're going to focus on today. So, welcome and thank you for joining us. We really appreciate you coming down to Chicago to enlighten us further about some of the dangers that we're dealing with GMOs.

DH: Dr. Mercola, I'm honored to be here. I appreciate this 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 a food and health safety issue that we're really dealing with here.

JM: Now, you're really an outspoken critic of GMOs. From your perspective as really an expert scientist, what would you say are the top three things that you believe the average person needs to be aware about when it comes to GMOs?

DH: They need to recognize what we don't know perhaps as much as anything else. There are zero peer-reviewed scientific papers establishing the safety of the GMO crops or of the products that they're engineered to accept or produce.

JM: That is a pretty profound statement because if you listen to their arguments, they would tell you the exact opposite. So, why are they claiming that they've got this mountain of evidence supporting the safety?

DH: There are none. 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 have been unable to produce any.

Now, there are many papers, both clinical papers as well as peer-reviewed scientific papers, on the safety of GMO crops, the secondary effects of them, and the products that they're engineered to accept that showed just the opposite. We have some recent ones that are extremely effective in documenting what many of those health effects are. I know of none on the other side that will establish that there's a safety factor to either the genetically engineered proteins (those foreign proteins that they're producing) or the chemicals that we're consuming in ever larger quantities as a result of the genetic engineering process.

JM: Okay, the first one is that there is no science to support their statement.

DH: That's right.

JM: What are the other two?

DH: The other two would be what's happening to us health-wise. If you look at the epidemiological patterns, we have a perfect fit for over 30 human diseases in addition to the animal and plant diseases increasing that have an epidemiological pattern that's identical to our increased usage of glyphosate and the increased prevalence of genetically engineered proteins in our food.

JM: Okay. And then what would the third be?

DH: The third one would be the sustainability of our agricultural program, of our basic necessities in life: a supply of a healthy and a nutritious food. They need to be aware of the reduced nutrient content, lower nutrient density, as well as the environmental impacts, which we see with the extreme exposure to these new pesticides or new proteins, that are impacting all of our support system for agriculture.

JM: Yeah, it would seem to me that sort of a subset or an extension of that is the environmental impact. Glyphosate or this genetic modification technology is allowing the continuation of current agricultural processes that are devastating the climate of the planet. Because we have this increase in CO2 content, some people believe that the burning of fossil fuels is responsible for it, but it's actually conventional agricultural practices that are causing that. One of the reasons it's allowed to persist would be the use of these genetic engineering technologies. Would you have any comment on that?

DH: Well, an even greater impact is the fact that you can't talk about genetic engineering without talking about the chemicals that they're engineered to tolerate. And 85 percent of all our genetically engineered plants are herbicide-tolerant. They're engineered to tolerate high levels of glyphosate especially, but other herbicides also.

Now, as we see new products coming online, those products… Especially glyphosate, it's not just an herbicide. It was first patented as a mineral chelator. It immobilizes nutrients, so they're not physiologically available for all of those health functions that we really on. It's patented as a very effective antibiotic for a large number of organisms, especially for our intestinal microorganisms, our gut bacteria.

JM: So, the companies that manufacture this actually have a patent that identifies its use as an antibiotic?

DH: Right. Monsanto has patents. There are several other patents on glyphosate and glyphosate-related products as potent antibiotics. The problem is that they're potent antibiotics for the good guys both in the soil as well as in our intestines or the intestines of our animals.

As a consequence of that, when you take out Lactobacillus, Bifidobacterium, Enterococcus faecalis, and those organisms… Those are what keep us healthy either by providing accessibility to the minerals in our food or producing many of the vitamins that we need for our life. But they're also the natural biological controls to keep Clostridium, Salmonella, and E.coli from developing in our system.

You take the good guys out, and then you have the bad guys that 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 factors or all of these diseases are an expression of disrupting that intestinal microflora that keep us healthy.

JM: Now, from my perspective, the actual gene or insertion of that that provides the resistance to glyphosate, it's not as concerning to consume that. But what is concerning is that any plant that has that, which is being raised commercially, is going to be doused with this glyphosate. To me, that's a more serious concern for human health. Not addressing the Bt toxin, which is a whole separate issue.

I'm wondering if you can comment on that and the [aspect of] how much they're using. How much of this glyphosate are they using? How many hundreds of millions of tons a year is being sprayed on crops?

DH: Well, if we look at it just from the antibiotic effect, we worry about the 29 million pounds of antibiotics: streptomycin, tetracycline, and penicillin.

JM: Sure. And most of those are in agriculture – not in agriculture, but used for the raising of animals.

DH: Right. Those are all targeting serious pathogens. We don't say anything about the 880 million pounds of glyphosate as an antibiotic that's indiscriminately used throughout the environment. You have it on roadways, right-of-ways, concrete driveway, or in your garden as well as in crop production. 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.

The other thing that we see is we're using it now as a ripening agent even for non-GMO crops. They'll go right out just before harvest time. Or if they have to ripen off a crop early, they spray that crop with glyphosate. Glyphosate is a strong antibiotic. It's a strong mineral chelator. You may have the mineral layer, but if it's chelated with glyphosate, it's not going to be available physiologically for you to use, so you're just eating another piece of gravel.

You have all of this glyphosate. It's a systemic chemical in the plant. The problem is that it's systemic and moves at that stage in plant growth right to the grain, so that our consumption continuously increases.

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The EPA is repeatedly approached by the companies that say that we have to increase the amount of glyphosate that we can have in our food, so we can have a safe product – not based on science but based on how much chemical is actually in our food. May 1, they just doubled the amount of glyphosate that can be in our food. In soybean oil, you can have 40 parts per million. Dr. Monika Kruger's research at the Leipzig University shows that a tenth of a part per million is all that it takes to kill your Lactobacillus, Bifidobacterium, and Enterococcus faecalis.

JM: So, 4,000 times the legal limit?

DH: Well, not the legal limit…

JM: The accepted limit.

DH: But the health limit.

JM: The health limit.

DH: The documented toxicity to these beneficial microorganisms, which we rely on for a happy life.

JM: Yes. That's just surprising. I guess it isn't just surprising; it's sad. It's beyond sad that we're having this decimation. Because there's an increasing appreciation even among conventional physicians about the importance of the microflora of our gut and, of course, of the soil, but they aren't connecting the dots…

DH: That's right.

JM: With this glyphosate toxicity and how it impacts our microbio. I'm wondering if you believe it's ever appropriate for the coexistence of GMOs and natural organic seeds and plants. Is there ever any indication of that? As a scientist, can you provide any justification for their use?

DH: Our knowledge of what we're doing in the genetic engineering process is so limited. We're really at a very early stage in having any understanding of what we do 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 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.

JM: But that is not the perception that the average person has or the perception that industry wants people to believe. They want you to believe it's this absolute precise

approach, it's perfectly replicated, and there are no dangers or concerns. Maybe you can expand on that to help people understand what the truth is here.

DH: This is one of the things that we learned with the sequencing of the human genome: there aren't enough genes to do all of the things that we know are done. A gene functions in relation to the environment and its relationship to other genes or other genetic components in that code. When you disrupt that and the integrity of the genetic code, you have mutations and you have many epigenetic effects that we've never looked at.

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. We also have potentially negative things 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.

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 these genes that are being inserted are extremely promiscuous. They're not stable. They may stay in and they may 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 our gut.

Our own soil microflora can pick up those same genes then and we can start producing those foreign proteins. Those are extremely allergenic. They're also much more resistant to degradation. You have the gene flow in pollen, gene flow in the soil through the microorganisms, and then the possibility of genetically engineering plants that are grown on that soil years later. We've seen this with the StarLink genes. Those genes produced a very toxic protein to humans. That was a pharmaceutical process.

JM: And this was in corn?

DH: This was in corn 10 years ago. We pulled them off the market because we realized that it had escaped. It has gotten out of the confines. We know how to get these genes in; we don't know how to remove them.

JM: That's the danger. Once you get the genie out of the bottle, you can't put it back in.

DH: No, we don't know how to put it back. Once those genes are there… We have soils now that grew StarLink, one of the five StarLink hybrids, 10 years ago, that several countries won't accept any of our corn grown on that soil because it can be contaminated with the StarLink gene, which produces this very serious toxin for human.

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 pollen spread like you have with Roundup Ready alfalfa, it's just a matter of time before those bees or the wind is going to transfer that particular

pollen to every alfalfa crop that you're going to grow. There's a high enough probability that you're going to see that genetic component in it.

We know that they're allergenic. There are a number of other factors that make us very concerned about the presence in the spread of those genes. Both the loss of biodiversity as well as the health and safety factors, which we are now finding, are a definite concern – not just from cancer but kidney, liver failure, and then the allergenic capacity that we have throughout – if our own microflora picks up that genetic capability.

JM: Is it our own microflora, or is it actually human cells that are able to transfer those genes into our own genetics? Has that been documented?

DH: It can be both. Especially with generation two genetic engineering, the gene silencing, that section of the nucleic acid can actually be picked up by our own genetics or attached to our own genetics and then start shutting down our own physiology in that process.

JM: This is not well-known.

DH: No, but it's well-documented in the scientific literature.

JM: Geez, that alone is enough cause for concern. Now, I just want to take a slight detour because you had mentioned the bees, and one of the emerging concerns is colony collapse disorder. There are a number of theories as to why that's happening. But I don't really believe I've read or heard anything about the possibility of glyphosate being a variable on that equation. I'm wondering if you can expand on that.

DH: Well, there are three characteristics that we find with colony collapse: (1) the bees are mineral-deficient, especially for the micronutrients. (2) Another one is that there's plenty of food present but they're not able to utilize it or to digest it. (3) The other is that they're devoid of the Lactobacillus and the Bifidobacterium, which are components of their digestive system.

JM: These are all established?

DH: Those are all established characteristics of colony collapse disorder. Now, the bees also become disoriented, so you have an endocrine hormone disruption. There are probably many factors that add into this. Certainly, the neonicotinoid insecticides, which are endocrine hormone disruptors, have been demonstrated to make a bee disoriented, so it can't find its way back to the hive. Glyphosate also is a very strong endocrine hormone disruptor. It does the same thing. In addition to that…

JM: How does it work as a hormone disruptor?

DH: It's toxic to that. It's probably working, again, through its chelation of the micronutrients.

JM: Okay, so it's a metal chelator.

DH: Because all of those enzymes, all of those systems, require metal ions as co-factors for enzyme function.

JM: Okay, it's one of the consequences of its primary function.

DH: Right.

JM: Okay.

DH: You have a less functional system to start with.

JM: Which is a concern, too.

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I mean, you just mentioned previously, if this actually gets integrated into our own DNA, we can have the same type of problem. The bees might be the canary in the coal mine for us.

DH: Correct. Well, the other canary in the coal mine are the frogs and amphibians. They're disappearing throughout the world just like the bees are. They rely on that synergy between the microorganisms and their digestive system also.

Glyphosate impacts the bees in all three of those ways. It's extremely toxic to the Lactobacillus and Bifidobacteria, which they have to have to digest honey and bee bread. Without those, there's plenty of honey in the hive but they aren't able to utilize it and digest it. They're starved when they go out to find more honey or pollen.

Then with the endocrine hormone disruption, they also have a hard time getting back to the hive. When they get to that flower, the flower is also deprived of those micronutrients that it would normally have because you have a lower nutrient density, because of the chelating and physiological effects of glyphosate on the plant.

It's one of the contributing factors, I believe, that answers… It's the only one that answers three of the conditions that we see with colony collapse. There are probably many other factors. Certainly, the neonicotinoid insecticides, which are endocrine hormone disruptors, are involved also.

There is a study with glyphosate in the drinking water at levels that we find common in our water system in the United States, in fact at levels that you would even find in the air during glyphosate application or agricultural areas, showing a 30 percent mortality in the bees – just from the glyphosate in the drinking water. Those were levels that are comparable to what we're consuming either as we breathe or as we drink water, let alone what we're taking and consuming in our food products.

JM: We have challenges coming to us on all ends. It's certainly hitting the bees.

DH: Right.

JM: If the bees are decimated, then it's going to be difficult to have many agricultural products that we're used to because they're primary pollinators. But then we also have the direct toxicity from what's taking the bees, the reptiles, and the amphibians out. If someone wasn't concerned about this prior to watching this interview, I would imagine, hopefully, they would be concerned now. I'm wondering if you could provide us with some proactive steps that an individual person can take to help fight the spread of GMOs.

DH: Well, again, the issue isn't just the right to know; the issue is the health and safety. We have a foreign protein…

JM: Can I just stop you there for a moment? I believe that. I totally agree with that. But the reason why we take this approach is that for the average person who's not aware of this, this could be more acceptable, more palatable, and is an easier argument to win than the scientific one. We don't have the science like you do.

DH: Well, you have to know that it's there in order to make a choice.

JM: Right.

DH: Right now we don't have a choice because those products are in so much of our food. You have to know that it's there if you're going to have any option to make it change. A consumer needs to be very concerned. They need to be active in the labeling aspects to say, "Well, okay, if you want to choose to consume those products, that should be your right. But if I don't want to consume them, because I know there's a health and safety factor involved…"

My children show that. When I take them off of the commercial products that were on the grocery store shelf and I search for those materials that have a lower quantity or that are free, my kids behaved better. That's a common statement, a common observation. You don't have to have science to show the difference between consumption of the genetic engineered and the organic or the non-engineered. That's a given.

They need to be active in the labeling aspects. They also need to be active in the requirement for safety studies. These haven't been done. When we had the term "substantially equivalent," it gave all the chemical companies essentially just a waiver on doing any of the safety tests.

JM: This is what the FDA did in the early '90s when they were originally given the opportunity to provide approval from GMOs.

DH: Yeah. 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 used commonly in South America and Asia as a suicide chemical because when you chelate all those minerals, you shut the system down. But it's not an acute toxin. It's like tobacco.

JM: I was going to say the same thing. Sure.

DH: The companies use the same rhetoric to sell GMOs as the tobacco companies used to do. You know what they say, “Well, no one’s died from consuming it, it’s not an acute toxin.” It’s a 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.

As Samsel and Seneff in their last paper from Massachusetts Institute of Technology showed or concluded, glyphosate is probably the most toxic chronic toxin we have in our environment or have ever had. It’s just that you don’t get killed or die today with it; you have to suffer through that process of gluten intolerance, leaky gut, Crohn’s, Alzheimer’s, autism, or all of those factors that are related to the health of our gut, which we’re seeing now on an epidemic scale in our society.

JM: Yes, that’s an important paper that Dr. Seneff published. We’ve interviewed her twice. But I’m wondering if you could just highlight, from your perspective, some of the important points of that paper or that research, which she just published.

DH: Well, the thing that Samsel and Seneff did was take the biochemistry that we know are associated with all of these diseases that we’re seeing now. They referred to them as the “modern diseases.” But these are the diseases that we see increasing almost in exponential rate in our society. They took the biochemistry, which is well-documented for all of those diseases, and then connected the dots showing that the glyphosate is the key reason why we’re seeing this exponential growth or the epidemic of all of these diseases.

If you look at the curves, those curves are already cast in stone from a medical standpoint because our medical records are always six to 10 years or 12 years behind in projecting the epidemiological data. But it’s very important that they connected the biochemistry with the action of the glyphosate to give us that full understanding of why these things are happening rather than just saying, “We don’t understand why they’re happening, but we recognize that they are.”

JM: Now, obviously, the use of glyphosate has increased exponentially since the introduction of genetically modified foods. But I’m unfamiliar with when it was first introduced as an herbicide. Can you comment on that?

DH: It 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, we had the genetically engineered crops to tolerate glyphosate, the Roundup Ready crops. Our usage has gone at a steady rate up to 1996. It’s been a very steep increase since that because you can put it on multiple times without damaging your crop. You don’t have to worry about all those early spring decisions. You can take care of all your other problems and then you put it on whenever you want. If you got a stray weed, you go out again. It’s supposed to be a very safe product.

With resistant weeds, people think that it’s the glyphosate that’s killing the weed. It’s well-documented that it’s not. Glyphosate makes the plant susceptible to disease. As a

consequence of that, many of these soil-borne disease organisms were able to colonize. They do the killing.

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The glyphosate only suppresses the growth of the plant, which makes it susceptible to those organisms. With resistant weeds, those weeds are resistant to the pathogens. They're healthier weeds as a result of selecting for them with the high glyphosate usage that we've been doing. They put on more of the glyphosate. Sometimes they'll get better weed control at higher rates, but it's because they're killing more of the organisms in the soil that would normally control those disease organisms, and they're increasing the virulence or the ability of those organisms in the soil rather than to attack the plant.

JM: I always thought some of the resistance of the superweeds were related to the transfer of the resistance to the glyphosate directly to the genetics of the weeds.

DH: If it's resistant to glyphosate, with the transfer of the genes, all you do doesn't mean that when you put the rest of that glyphosate on, you've maintained the resistance of the plant, so that it's resistant to these pathogens. Jessica Schaffer, in her Ph.D. thesis at Purdue University a year and a half ago, documented very well that you can destroy the herbicidal activity of glyphosate by just using a fungicide, because you protect the plant from those soil-borne pathogens.

JM: Interesting.

DH: She also documented that the resistance to glyphosate isn't to the chemical, again, but you have a resistance to the pathogen that would normally do the killing.

JM: That's an important distinction. Now, you have other peers at Purdue University and not all of them agree with you. Is that correct?

DH: Right.

JM: I'm wondering if you can explain to us why some of them are actually taking Monsanto's side on the safety of glyphosate and its effects on the environment.

DH: Most of it is they're not informed of the health and safety issues. We tend to get tunnel vision and focus on those particular aspects of our own research. Their program is weed control. They tend to get focused in those areas and are just not informed as far as the overall impact of glyphosate in these genetically engineered materials on the ecology and the health and safety factors that are involved. They bought the rhetoric from the companies.

I don't think there's any question, but some of them also have a conflict of interest either from the religion of genetic engineering, thinking that it's going to solve all the problems or simplify the tasks that they have to address (weed control) or the fact that you can't be against something that's new. You have to support technology.

I'm not against new things and technology, but we also have to recognize that there are always side effects. If you don't recognize the side effects in technology and address those, it's a losing proposition for everybody. We gain in science only as we recognize that we have to address the system as a whole rather than just to have that tunnel vision for our particular objective.

JM: So, you've been doing this for a long time, about 50 years or so. I'm wondering if you could, for those who haven't seen or read about you before, provide us a little bit about your background and maybe give us an update on what happened with your letter to the secretary of the USDA, Tom Vilsack. What's the status of that?

DH: Well, I became aware of the interactions of glyphosate from an environmental standpoint when I was seeing an increase in certain plant diseases, which I thought I knew a lot about. It just didn't fit. The plant disease root and crown rot of wheat we call take-all, for instance (because it's a very serious disease), was increased every time wheat followed an application of glyphosate on a previous crop. Or in those days, back in the mid '70s, when we would use it as weed control, as a burn-down herbicide, take-all was more severe. That was also recognized by David Hornby at Rothamsted in England and a number of other people and scientists.

JM: Well before the introduction of GMOs?

DH: Yes. We recognized that there was something going on that was different from what we had observed with any of the other knowledge on this. Searching for that reason, I found that it was because of the toxicity of glyphosate to some of these soil microorganisms that we're dependent on to make manganese and other nutrients available for plant update. That then led to a series of studies. I have 20 years of my research all on how do we offset this effect.

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. This wasn't new from that standpoint. But the thing that was different was its biocidal effect. It's not only a chelator, but it's also a strong antibiotic to these beneficial organisms. How do you compensate for that? How do you restore biological activities?

Much of my research, which was focused on the glyphosate, was focused on the biology and restoration of those mineral nutrients. I did a lot on fertility, full-year fertility, to avoid the soil aspects and the mobilization. But on recovering that nutrient density (which plant needed if it was going to be able to function and do the photosynthesis to store that sun's energy as sugar), especially then looking at the micronutrients, that's a problem for the seed production for the next year's crop. If it doesn't have those micronutrients, it's going to be a pretty weak, spindly, and disease-susceptible plant. I saw all of that coming together with about 20 years' research.

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 the various names for our threat pathogens committee and recognized what the potential was with Roundup Ready

alfalfa. And then we were seeing the infertility program, which the American Stock Growers' Association testified before Congress, was threatening the animal industry.

I saw all of that tied together with the genetically engineered crops and the application of glyphosate. I felt an obligation to alert the secretary and to ask for his help in getting the research done before we further jeopardize not only our fourth most important crop, but also our entire animal production because of the presence and prevalence of this new entity or the abortogenic entity, which we find in high concentration in our genetically engineered or high-glyphosate intense growth conditions, that brings about either infertility, pseudo-pregnancy, or miscarriage for cattle, horses, sheep, pigs, poultry, and humans.

We find it in all that it's a very serious problem both having just enough animals to replace those that we're using. At the same time, we see it as a potential cause for some of the extended symptoms of the plant diseases: the Goss's wilt, sudden death syndrome, and fusarium – diseases that are also in an epidemic mode right now.

In looking at those, I felt an obligation to not only address and alert the secretary, but also to ask that we do the research before we compromise this fourth most important economic crop. It's by far the most important forage crop that we have for our animals. The evidence was clear enough that there's a correlation. There's a tie here.

Before we jump off the cliff, let's make sure we have our ducks in order and don't get into a situation like we did with Goss's wilt on corn that used to be limited to three or four counties in Nebraska and Iowa but now is throughout North America and in the world – anywhere we send those contaminated seeds that are grown in the Midwest.

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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 a 130 or so peer-reviewed scientific articles to support that with top administrators in USDA and also some of the other agencies. They assured us that if we could do the work, they would be willing to look at it. Well, they haven't looked at any of the other peer-reviewed science, but we had counted on that as at least some support from the USDA scientists.

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."

JM: Oh, we'll invite him here. He can definitely share that wisdom he's going to…

DH: A great scientist with 20 years of research. You'll hear that from others. A young scientist could never do this kind of research. We've even taken private money to them to support some studies. They were excited about it because they could see the tie. All of them have essentially been told, "Thou shall not."

JM: Yes, because of the pernicious influence of the corporate entities. I'm wondering if you could review again one of the shocking revelations in our last interview: the toxicity of glyphosate relative to some of these other herbicides like DDT, which is well-recognized. The average person on the street knows how toxic DDT is. But from your perspective as a scientist who specializes in this area, your impression, at least from my memory last time, is that glyphosate is far more toxic than DDT. Can you expand on that?

DH: Glyphosate. There's a whole list of scientific papers, peer-reviewed papers, that show and document the toxicity of glyphosate at very low levels. We have to separate acute toxicity from chronic toxicity.

Most of these at very low levels are acute types of toxicity to particular functions like the endocrine hormone system: .5 parts per million is toxic to the endocrine hormone system, or your pituitary, thyroid, and reproductive hormones. Ten parts per million is cytotoxic to kidney cells; One part per million to liver and those. I don't remember all the exact levels, but .1 to 10 parts per million are toxic to a whole series of human cellular functions or cells directly.

You have to get many times higher than that to get acute toxicity from DDT. You can show individual aspects there, but not a whole series. If you look at the chronic aspect, the chronic toxicity, as Samsel and Seneff have done, you see an extremely alarming array of diseases, conditions, and toxicity that none of the other herbicides or pesticides will approach.

JM: Including DDT.

DH: Including DDT. DDT had a very positive function as far as reducing malaria. It probably saved more lives than any other chemical we have in history because of its ability for that one disease. Now, West Nile and other diseases' exposure levels, the probability of contracting them would be about 2,000 times less with some of those DDT residues because it's specific in some of those areas.

With glyphosate, its primary claim to fame is to benefit the bottomline of a commercial enterprise. I know that, as you have Roundup Ready crops, the only reason for Roundup Ready crops is that you can apply glyphosate directly to it, so that you sell more glyphosate. You also have a monopoly on the seed and the patent on the seed. It's not to increase yield because it has never increased yield. It's not to increase nutrient; it actually reduces nutrient density.

It reduces yield. In 8,200 trials, paired university trials comparing the parent with the oxygenic Roundup Ready crop, there was a six percent reduction in yield. In fact, Dr. Charles Benbrook asked the question in one of his papers. He said, "Why would farmers be willing to take a six percent or up to a 12 percent yield reduction to apply this chemical?" Well, the answer was simple: it simplifies weed control. [It's a] potent herbicide. But then you have to look at all of the collateral damage that it's doing.

We're producing those crops to provide a nutrient source for our own diets and our animals' diets. If you're also introducing and have a high level, thousands of times

higher than all of the toxicity studies indicate and then a chronic one that builds up just like tobacco and smoke does, you're defeating the whole purpose.

But we're not going to feed the world with genetic engineering because it goes just the opposite. It increases disease susceptibility of the plant. It reduces yield potential. There's never been a genetically engineered plant that increases the intrinsic yield of a plant. All of that's done by traditional breeding programs of getting better gene expression.

We're only expressing 25 or 30 percent of the genetic potential for yield in any of our crops now. 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 that whole process that's required for yield and quality. Both of those are very involved processes. They're not things that you can approach from a silver bullet-type approach.

We can increase all of the nutrient density. 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 then have all the collateral damage in order to improve the human lot in those long-term effects.

JM: You know, it's interesting that you're convinced and you've got data to support that genetically modified foods actually decrease crop yield. Yet that is exactly the precise opposite of what their propaganda is. If you quiz the average person on the street, who pretty much for the most part accepts that propaganda, they will tell you that the reason they're in favor of GMOs is it's going to feed the world. How can they get away with this massive nonsense?

DH: Well, in court, they were told that it was fraud to claim yield increase, just as the courts have repeatedly ruled that it's also fraud to claim biodegradability of glyphosate, yet we still see it on their label. Some of those things are propaganda. If you drink the Kool-Aid, that's what you come up with.

JM: Okay.

DH: But that's not the scientific facts.

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JM: I've not read about this, but it would seem that a flaw in the logic of the biotech industry in their design of these crops – the two primary crops, soy and corn – is that most farmers who raise these crops tend to rotate them every year, but both of those crops are resistant to glyphosate. The following year when they're rotating the crop, they've got these seeds left over from the previous crop that are growing and actually are perceived as weeds. This presents this conundrum, this challenge, to how to address that. It doesn't seem to really be a good solution. It seems to be a serious design flaw in their strategy. I'm wondering if you could comment on that.

DH: Well, that's true. Roundup Ready corn in a soybean field is a weed. To address that, the company's approach is, well, add more resistance to more chemicals. They want 2,4-D resistance, dicamba resistance, and a number of other pesticide resistance because the objective of genetic engineering, again, is to maintain proprietary control on the seed. In other words, to have a monopoly on seed source. That's the only reason for hybridization. It is so that you have to go back to the seed company for your seed.

We can do just as much progress with a self-pollinated program, but you're not forced to go back to the company for seed. The company then doesn't get a return for its investment over the year. The approach with these new crops or with having that rogue crop, you might say, or Roundup Ready crop in a soybean field: let's add more genes for resistance, so that we can add more chemicals to the food that we're going to eat. That's the end product.

It does another thing. To start with, I might mention that in the past, when we rotated crops, we also rotated herbicide, so that we didn't have just one herbicide that may be an antibiotic effect. We had a number of herbicides that had different effect or would affect different organisms. Persistence was different. Degradation was different. We would have a healing process that would take place in the environment between those crops. None of that occurs now.

For 35 years, we have hammered one particular group of organisms' ecological system with the Roundup Ready program, so that we've drastically changed the ecology. You see that in soil structure. You see it in our crop diseases. And of course, now we're seeing it in our animal and human diseases also as a reflection on what's changed in the soil and in the crop that supports it.

Another reason for my writing that letter to Secretary Vilsack was that when you have all of your crop, 98 percent of our soybeans, with one particular genetic trait, it makes us extremely vulnerable to a biological warfare event or to just normal mutagenic event. We experienced that in 1970 and 1971 with the Northern corn set in corn leaf blight epidemic. In that situation, we had 70 percent of our corn that all had Texas male-sterile gene. That was the only difference; otherwise they were comparable.

Now we have 98 or 85 percent of our crops that are all containing the Roundup Ready gene system, which, in addition to having a single gene effect, that single gene is to increase disease susceptibility. If you don't have increased disease susceptibility for the weed, you don't have a good herbicide because it's not a direct killing effect like you would have with a lot of the other herbicides. 2, 4-D targets primary mechanisms.

You have that system that is not only making us vulnerable for future problems, which we know occur all the time. In fact, every eight years, we have to have a new variety of wheat for rust control because of mutations. We see it with a fight off with potato late blight pathogen now with the mating sources. We see new strains developing all the time. That's just part of nature. We can anticipate it.

Here, we've put all of our eggs in one genetic basket. The difference between 70 and 71 is that we still had 30 percent of our seed companies that didn't have it in their seed.

They were able to come back in a year and maintain our production. Here, we have one or two companies that control all of the seed or the larger share of it and all of them having this single genetic trait that leaves us extremely vulnerable for any kind of modification of our environment.

The approach of the company is to exacerbate that, to make it worse. The logical approach and the approach from history for us: let's get out of this. Let's get it down to what we used to require for other pesticides. If it took four years or five years for a product to degrade in the soil and be completely gone, you couldn't apply that pesticide to more than 20 percent of the potential acreage. We apply it to 100 percent of the acreage now. We have a very poor memory.

[We're] extremely vulnerable not just to the deteriorating condition of our soil because we haven't permitted it to heal in the biology, but also from all of the other collateral damage that we're seeing all the time that's growing in intensity. We just haven't recognized it.

JM: Let me just ask a question about remediating glyphosate applications. Because as this information becomes more widely known, there are going to be a number of enlightened gardeners and hopefully commercial agricultural communities that recognize this and seek to remediate their land. We know that it's a metal sequestrant. But I'm wondering if you could recommend a strategy.

I've interviewed other enlightened agricultural experts. Some of their processes are to do this assessment, a soil assessment, which actually measures the mineral of the soil, then add the minerals back and also use soil microbes and compost tea applications. I'm wondering if the addition of this type of targeted remineralization of the soil with the beneficial microbes, which are actually decimated by the glyphosate indirectly, is sufficient to remediate the soil. If so, about how intense and how long does it take to remediate?

DH: We can compensate for some of the damage mineral-wise. Biologically, that takes longer than it does just to apply a full-year application or something to a plant to address its needs. But glyphosate is a very difficult compound to degrade. It's an organic phosphite – PO3 rather than PO4 – which makes it more difficult to degrade. That's why the courts have ruled that you can't claim biodegradability of it because it's not generally a predictable entity.

There are several groups who have some biological cocktails or cocktail teas that appear to be working quite well. I've seen several of those. [Inaudible 59:44] at the University of Utah had trials in the Midwest. I've seen some of those excellent degradations of glyphosate. When you get the glyphosate degraded, you also find that your old corn stalks, which have been building up for six or seven years, also start to be decomposed.

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There's a group in Texas that has a product that's looking quite good. There are several others. Certainly, building soil structure is important to support the plant. Without some

of these other cocktails, we don't see accelerated degradation. Glyphosate's been building up in some soils for 25 or 30 years. It's half-life. In a sandy soil – saturated moisture, a high-biological activity – it may be three or four months.

JM: Oh, that quick.

DH: In a good agricultural soil, it may be 20 or 22 years. The problem that we're running into now more common than in the past with that high-residual glyphosate is that when they put their phosphate fertilizer on or some other practices that they do, they can release all that detoxified glyphosate and then it becomes an active product to damage the plant that's growing maybe 15 or 20 years after you thought the glyphosate was gone.

Glyphosate, again, is a strong chelator. It's detoxified quite readily in the soil by combining with calcium, magnesium, iron, manganese, copper, zinc, or any of the other positively charged cations – not necessarily degraded. But some of these compost teas are looking extremely good and effective in that process.

JM: Well, that's encouraging.

DH: Degradation of glyphosate is much by the same mechanism generally as DDT. It's primarily cool metabolism rather than direct utilization of nutrients especially.

JM: Okay. Well, thank you for that insight. I'd like to help you decimate another one of biotech's propagandas, which is that the use of genetically modified crops is going to dramatically somehow reduce the use of herbicides or pesticides. We know. We've discussed earlier. I believe you said that they are using nearly one billion pounds of glyphosate in the U.S. Is that the U.S. alone?

DH: I don't…

JM: Or is that worldwide?

DH: I think that's worldwide.

JM: It's 880 million.

DH: It's 880 million.

JM: So, nearly a billion pounds a year of, from your perspective, one of the most toxic herbicide out there, far more toxic than DDT. That alone… I mean, just with that, how could they substantiate that claim?

But it gets even worse, because aside from glyphosate resistance, the other one that's used primarily in corn and others (you're an expert on this) is the Bt toxin. It ostensibly appears to be a great idea: this is Bt toxin. It's natural. It's been around for ages. Why not integrate that into plants?

Well, the difference is that when it's used in nature, it degrades very rapidly and it's not consumed by individuals. But when you integrate it into the plant, it's consumed by

individuals. But here's the other kicker: it's never counted as part of the equation of the use. I'm wondering if you can comment on that, give us a broader perspective, and really blow a hole on the argument, which is one of their main justifications for the use of these biotech crops.

DH: Well, it's just another one of their failed promises. I mean, you can go down that entire list of promises of genetic engineering: yield improvement, greater drought tolerance, and insect resistance, every one of those scientifically has been proven false. When you look at the pesticide exposure – not the pesticide production, but pesticide exposure – that's where the health and safety factor comes in. Our exposure to Bt in a natural environment, where you had it in the Bacillus thuringiensis, this little bacterium that was in the soil and that would attack the insect, we never had an exposure to it.

JM: Zero.

DH: When you use it in organic agriculture as a natural biological control, you never have any exposure to it unless you're going to eat that infected insect. My wife certainly isn't ready to do that. There's no practical exposure. When you have the plant generating it, it's producing that extreme toxin in every cell of the plant, concentrating it in those tissues that we're going to be consuming or that our animals are going to be consuming. Our exposure level is millions of times greater than it would be from a natural product usage.

You just can't even compare the two aspects because in one case with the genetic engineered plants, you're putting it on your food. In the other one, you're putting it on the soil. If it is on the food, you can wash it off. You can remove it. When you cook your food, you kill the bacteria. They contain a very small amount. It takes 200 billion bacteria to make a gram. How many grams of corn are you eating? You look at that difference in the intake level. And then you look at the toxicity of the protein itself that's producing that, and you'll just see a confounding or mushrooming type of an effect from a health and safety standpoint.

JM: Let's address another common confusion, which is the two most common applications: the Bt toxin and the glyphosate. The Bt toxin is actually integrated into the cellular structure of the plant when it's there. There's no amount of washing and it's physically impossible to get that out of the plant. If you're going to eat that, you're going to get it. But I think there's some confusion about the glyphosate. Is it a similar process, where it's actually integrated into the cellular structure? The plant picks it up and integrates it. You can't wash it enough times. You cannot wash it off. It's in there.

DH: Right. We shouldn't call these "genetically engineered plants"; we should call them "chemical receptors" or "chemical accumulators." With glyphosate especially, it accumulates in those growth points of the plant. That's your root tip, shoot tip, and the seed of the plant. We eat the seeds. Many of them will eat the young leaves and growing leaves, also the parts that are most succulent. We actually have an accumulation of glyphosate and also of Bt in many of those tissues.

No way to wash it off. No way to remove it or extract it from those tissues. It's a matter of going into our bodies. That's why in the studies where they're majoring glyphosate in neuron, you find extremely high levels of glyphosate well above what you would anticipate even in the plants. We tend to be accumulating some of those toxins or chemical products as they are consumed in our regular dietary intake.

JM: Okay.

DH: If I were to summarize my feelings, my research, and the research that I see in the peer-reviewed scientific articles, looking at our health factors, to start with, the things that we're seeing in our soil, plants, homes, and our barns aren't normal. You go back 40 years – I have the privilege of doing that – they're not normal. A lot of our young scientists think they are. Consequently, they don't understand and appreciate how we used to grow our plants and produce them in the quality that they used to be.

Our health factors alone are overwhelming our health facilities and our capability of meeting the needs of our people.

I think that future historians may well look back upon our time, write not about how many pounds of pesticides we did or didn't apply, but about how willing we were to sacrifice our children and future generations all for this experimental process that we call genetic engineering, which is based on failed promises and flawed science, just to benefit the bottomline of a commercial enterprise.

JM: Wow. Well, I can't thank you enough and express my deepest appreciations for all you've done and continue to do in really providing a mountain of evidence to battle the propaganda that the biotech companies are throwing at us and the consumers. Because you've got the credentials, the science, and the studies behind you to back this up, that really it's going to be a powerful tool that we have to defeat this intrusion on to the health of our soil and our population.

DH: Well, if you look at the epidemiological data, we've essentially lost an entire generation health-wise because our medical figures are always delayed.

When you look at those figures that Nancy Swanson has put together, Dr. Swanson, in her study… You look at autism, Alzheimer's, chronic fatigue, clostridium, leaky gut, and all of those 35 diseases that are all tied to the genetically engineered crops and glyphosate that is applied to them, you see how it's going up at this rate right now, that's going to continue. That's cast in stone for at least 12 years because we're that far behind in our medical records.

When people project and we've gone from one to two autistic children per 100, 000 in a 1960 to 1970 period, and then we were up to one in 216 in North America. Two years ago, one in 88. Now we're at one in 50. The projection is that in seven years, one in two. Now, that's a crime. When the CDC comes out and says that this generation has a shorter life expectancy than the previous generation, that's never happened in history before. You have to ask: Why? What's changed?