

A One on One Interview with Dr. Don Huber

Part 2 (Hour 2)

By Dr. Mercola

DM: Dr. Joseph Mercola

HR: Dr. Don Huber

Introduction:

DM: Hi! This is Dr. Mercola. Today I'm joined by Dr. Don Huber, who is an expert in an area of science that relates to GMOs. He's going to help us understand some of the nasty insider tricks of what's going on with this GMO issue. He's actually gotten quite a bit of notoriety for his expertise in these areas. So welcome and thank you for joining us.

HR: Thank you, Dr. Mercola.

DM: I'm wondering if you can tell our viewers what your specific training is, and how you came to attain this knowledge and information on this very specific area of GMO toxicity.

HR: My area of training is soil-borne diseases, microbial ecology, and host-parasite relationships. In realizing that agriculture is a system and not just a bunch of little blocks that fit together, you have to understand how that system works. Realize that anytime we change one part of that system, we really change the interaction of all the other components as they work together. So each time we have a change, whether it's crop rotation, fertility (two different fertility programs), or herbicide interactions, we see those changes as they affect those components in the system.

My research over the last 55 years has been devoted to looking at those changes, how we can change them, and manage that system for more effective crop production, better disease control, improved nutrition, and safety of our food crops. When we look at such a major change you have in a genetic disruption from a genetically engineered process – as we understand it in our limited knowledge now – we see that there are opportunities and actual changes in all of those components. They fit in to the agricultural system, from the plant, the physical environment, the dynamics of the biological environment, and of course, pests and diseases as they interact together. Those have been the areas of my research over time that brought me to this point.

DM: Most of the information you're sharing is relatively new and not widely known at all. As a result, the public appreciation of this toxicity of glyphosate is really limited. I'm wondering if you can help us, the people viewing this, to put it in a proper perspective.

Perhaps, relay this toxicity from your understanding as a professional research scientist to one that they might be familiar with, which is DDT, because in many ways it's similar

with the reproductive problems and inhibiting many of the reproductive functions. If you could maybe help us understand from that perspective.

HR: There are some similarities. I'm not, again, qualified in a lot of those aspects, but I'm familiar with DDT, the fact that it's a very difficult compound to degrade. It's biologically degraded primarily by a process we call cometabolism; in other words, there are a very few organisms that can utilize this as a direct nutrient source. And there are a few organisms that can utilize glyphosate as a direct nutrient source, but again, most of the degradation appears to be by cometabolism.

In other words, an organism just happens to produce the extracellular enzymes that will degrade it, rather than the organism really getting any benefit from it. There's no stimulus in that process.

DM: Does ultraviolet light break it down, like sunlight?

HR: I don't know.

DM: Okay.

HR: Again, I haven't followed a lot of those areas.

DM: Okay.

HR: But we know that it can accumulate in some situations for a very short period of time. In other situations, it can persist for years. That'll be primarily determined by biological activity, also by the soil PH, and by clay content – how firmly it's sequestered in the soil or absorbed in the soil. The less movement of the chelated glyphosate into the clay structure in the soil, the more readily it will be available for degradation by microorganisms. Once it gets moved in, it's probably not really accessible for degradation, but then can be desorbed chemically.

The organisms that are stimulated are the pathogens. Just as this paper that I was reviewing of the presentations that was used in the meeting in Germany two weeks ago shows that Clostridium, for instance, has very tolerant and extremely high rates of glyphosate, but all of the natural biological control organisms are very sensitive relative to that concentration of glyphosate. What we see with the fusaria that cause sudden death syndrome on soybeans is that it can be stimulated by the glyphosate. It's not a real rapid degrader, but it can utilize it. It is stimulated, so we find the 500 percent increase in root colonization by these fungus. Very serious pathogen not only on soybeans; fusaria on most of our crops is a major disease organism that we have to deal with.

Dr. Cramer and others have shown up to 500 percent increase in root colonization even on the Roundup-ready crops, because there's nothing in that technology that does anything to the glyphosate. All it does is make it possible for that plant to survive and to accumulate more glyphosate. We still change the soil ecology, microbial ecology, and – as this paper from Germany is showing – our intestinal microbiology. Again, those

organisms are very sensitive to glyphosate, because they have the shikimate pathway in it.

DM: This glyphosate is being used as a weed killer – a classic weed killer, herbicide – but from what you said, it actually serves as a fertilizer for some pathogenic bacteria. It makes the bad bacteria grow more and it kills the good bacteria, very similar in some ways to what an antibiotic would do.

HR: There can be some type of a relationship. It's not always a matter of whether an organism is present or absent in the soil, whether it's going to cause a disease. It's a matter of what that biological balance is that normally keeps it in check. When you take one side of that balance out, then it's a matter of just having free rein for the disease organism. But with glyphosate, we also see an additional stimulation of virulence, so that we see that increased ability to cause disease, as well as the loss of the natural biological controls.

DM: Now I'm going to pose you a difficult question here, just out of personal curiosity, but I suspect many would also be interested. Virtually, no one I know would like to be hit with a baseball bat or a hammer. *[Laughs]*

HR: *[Laughs]*

DM: There is no good answer, but if you had your choice and you had to use one of these toxins – DDT or glyphosate? From what you understand of both, what would you rather use?

HR: Oh—no question. I would take DDT.

DM: DDT? You say that very unequivocally.

HR: Well, I know of both. I have looked and tried the Alabama studies and other studies with DDT. I was in a position to look at that. Again, a lot of these materials can have a very beneficial use. I'm certainly not anti-chemical. But we have to use some common sense. What we have with glyphosate is the most abused chemical we have ever had in the history of man.

DM: God, that's a very profound statement.

HR: When you use the millions of pounds that are applied (at the broad spectrum of facts) that it has on the ecology – on our ecology that we're dependent on for subsistence – and then we don't pay any attention at all to the fact there's a purpose and there's an abuse, and we're on a rampant abuse. When we're gone with the genetic-engineered products that permit us to apply more and more of the compound, the abuse is accelerated with the limited knowledge that we have.

When future historians write about our time, they're not going to write about the tons of chemicals that we did or didn't apply. When it comes to glyphosate, they're going to write about our willingness to sacrifice our children and to jeopardize our existence

while threatening and jeopardizing the very basis of our existence and that sustainability of our agriculture.

DM: God, it's such a massively profound statement. It just resonates with truth. I totally believe what you said. God...

HR: It doesn't mean that it's not reversible.

DM: Yeah. I know, but it's just...

HR: But it means that we need to recognize what the concerns are, what's happening, and then we need to change. As a scientist, when we get into the situation, you see a disease that's a very wimpy disease like Goss's wilt. For 30 years since it was known, it has been very localized, very limited in its ability to cause damage. All of a sudden, you see the thing essentially throughout all of our production areas, a major factor reducing the quality and the quantity of the food that we need for our population or for the world's population. We're doing everything that we can to make it more difficult to produce that quality and that quantity of food in the things that we're doing.

You have to say, "What's changed?" As scientists, we do that all the time. We look at correlations. We look at other things. We try and figure out what that key point is that's changed. What we see as a key point is in these products that we have moved with without having the basic understanding of what they're doing, then have a massive experience based on flawed science and failed promises just to support the bottomline of a few large companies.

DM: Maybe, you can comment on the fact that it seems to be accelerating. It's not getting better. It's getting worse. Not only do we have the introduction of new crops that are genetically resistant to glyphosate, but the glyphosate itself, the main purpose is as an herbicide. It's preventing the weeds, but the weeds are becoming resistant, so they become superweeds. They not only have to apply more glyphosate, but they're applying other herbicides.

I'm wondering if you can comment on that and perhaps, as an extension of that, the rate of the acceleration of the use and how much more of these toxic chemicals are being spread.

HR: To start with, you have to realize that glyphosate doesn't kill weeds directly. Not if you apply enough of it, which you can. What we see with the resistant weeds is that they're resistant to the pathogens, because glyphosate as a chelator just gives the plant a bad case of AIDS. It doesn't kill it directly. It's the soilborne pathogens that directly kill it. Glyphosate turns off the immune system in the plant. As an analogy, it's not quite the same as in an animal, but it turns off those natural defense mechanisms. The plant becomes very susceptible to these soilborne pathogens that are always there.

When we have a resistant plant, we have selected them for resistance to that pathogen. When we add more glyphosate that finally kills it (because we can finally suppress the defenses in that plant), then we have also stimulated the pathogen. But we have also drastically altered that microflora – from a beneficial standpoint – that we rely on for

sustainability of our agriculture. So we have destroyed the natural biological controls, we have impaired the ability of the plants to obtain nutrients for the health of the soil, and we have stimulated our disease organisms in that whole process.

We have never once considered the judicial use. You go in and you look at the advertising. It says it's very effective on the cracks on your concrete driveways, your garden, or the rest of the world. We never considered any common sense that we used to use in the registration of most of our pesticides, and say, "How quick will it be degraded, under what conditions? What's the degradation process? What's the overall impact on the environment and its safety?" We used to do those things almost as a natural process and evaluation. We don't do that anymore. We have given glyphosate pretty much a pass on any of those considerations, because "it was considered safe."

The other thing is the genetic engineering. Whoever came up with the term (I know who did), but how they came up with the term "substantially equivalent" I can't understand. There's nothing substantially equivalent about genetic engineering in a normal sexual breeding process.

Dr. Patrick Brown at the University of California stated it very well in his document in 2000, when he said that it's more like a virus infection than it is a normal sexual breeding program where you're inserting a gene just like a virus does. In fact, we even have to have virus-coated protein genes and a number of other things to get it to express itself. You don't have the normal controls and regulatory genetics that go along with that natural sexual process in the genetic engineering that we would normally have to keep all of those things in a balanced and controlled state.

DM: It sounds like one of the foundational elements that allowed the problem to get to the point where it is today is this underlying assumption of the safety of glyphosate. Can you comment on how it is perceived to be safe? I mean it seems a ludicrous assumption, yet it's the working basis of modern agriculture it seems.

HR: Part of it was the failure to understand what the product is – that's as a strong chelator. They only look for what the mechanism was by which it would kill plants, and that took some time. It wasn't easy to find and to identify the EPSPs enzyme as the inhibitor, because it inhibited a lot of other enzymes also. It's not just a single-target type event. As I read some of the early documents, it stated that it inhibits the EPSPs enzyme actual herbicide mode of action unknown.

In 1984, it was very well-documented that the way it kills weeds and plants is by compromising the defense mechanisms and making them very susceptible to these soilborne organisms. In sterile soil, it doesn't kill. It will stun, because it grows regulators. It suppresses that defense mechanism that also produces lignin and some of the other secondary metabolites and hormones, but doesn't kill. Most of our herbicides attack a primary mechanism so that when you shut that enzyme down, then you get cell death or death of the plant.

With glyphosate, it isn't. It's a debilitating type of situation more like AIDS than it is a direct killer. So there wasn't a clear-cut direct mechanism that was obvious in its use.

Also, since humans and animals don't have the shikimate pathway, it was assumed that this is a pathway that's only in plants and microorganisms. Therefore, it's going to be safe for us.

It was also assumed that the foreign proteins – whether it's BT, the protein from glyphosate, that new EPSPs gene from the Agrobacterium – would readily be degraded in the gut, you can put them in the little beaker with hydrochloric acid, and you control that they'd probably be denatured. That's different, though, with what you have in your stomach or your intestines. It's a flawed science.

We don't really understand even what functional genetics are with a normal sexual breeding program, let alone when it's disrupted by inserting a foreign gene. We know that we insert a foreign gene, we disrupt all kinds of things in the process. It's not just a simple matter of shooting a silver bullet and it does the job. When you change anything in agriculture or in the system, you change a lot of other things.

Typically, going back to the question on herbicides, when we would apply an herbicide, we would tell our growers, "You rotate the chemistry, just like you rotate the crop." Therefore, when you had an effect on a specific group of organisms, you have an opportunity for that nature to rebalance and to reestablish that beneficial and functional relationship. We haven't done that with glyphosate. We just continually hammered for 30 years in one direction on those beneficial organisms. Again, as I indicated earlier, they no longer exist in the environment. We see that we have to start adding them now in order to make crop productivity and nutritional value.

DM: So glyphosate existed prior to the introduction of genetically modified crops?

HR: Yes. It was introduced in 1984.

DM: Which was about 10 years before? It wouldn't make sense because...

HR: Actually, excuse me – in 1974.

DM: Yes, so they would have to have time to utilize it and understand to do the science to get the crops to be introduced. I'm wondering if you could comment on your perception of the increased use of glyphosate. I mean, is it doubling every few years?

HR: In 2007, USDA asked for permission not to have to record how much we use.

DM: *[Laughs]*

HR: It was going up so rapidly that it was embarrassing, I think, for anybody to realize how much of this organic phosphate was being put out – or phosphite, which even has a different chemical category than the phosphates that we have. It's embarrassing to see how much of it is being applied, especially now we can see all of these other side effects from a direct effect on beneficial microorganisms. We're seeing the effect on organisms in the intestinal tract just from the residue in the food and feeds.

Yet we still recently had the FDA increasing the residue levels that were permitted in some of our food crops. They reduced it in meat, so that, I think, it went from three parts

per million down to 1/10. They didn't give any explanation for that, not a word or any toxicology data. But why would you reduce it in the meat if you're going to increase it in the feed or food that's going into our animals or into our food chain?

DM: The potential implications of the long-term consequences you have alluded to earlier... I'm wondering if you can do a worst-case scenario and integrate within your answer any potential remediation efforts. Are we going to reach some type of critical threshold at which point there's really no way to remediate these things? We're looking at the extinction of large numbers of animal species and even the extinction of our species. What's the worst-case scenario in your projection?

HR: I really don't deal with worst-case scenarios.

DM: [Laughs]

HR: Because I'm more of an optimist.

DM: Yeah.

HR: And 20 years of my research was designed on how we remediate with the downside of glyphosate, as far as the nutrient availability and the disease's predisposition. I really focus very heavily on that area. I don't think that you have to very far to realize that if we can continue in the same direction, we are going to see the same effect or even a greater effect because in health, just like in plant diseases, we usually recognize that only after there's been a (01:21:30) period. When we recognize we're only at a small part of that overall period, we only see a small part of the iceberg.

I think that's where we are now, where we're just starting to see the impact on reproductive fertility. Also the disease potential, because our plant diseases have continued to increase just like our animal diseases. You can hardly pick up the paper anymore without seeing that a human disease is involved. *USA Today* in today's paper mentions that salmonella rates. We'd recall 20 percent of our total egg production here last year or early this year because of salmonella. You have to say, "What's changed?" The newspaper said that when they looked at the egg-producing facilities, "They had chicken manure and they had rodent droppings."

While my kids were growing up, they always had (01:22:43) headed chickens as 4-H Project. I have never seen a chicken that didn't have chicken drop. They have manure. Any time you have feed, even with three or four cats around and whatnot, you're going to have some rodents. That's not the reason.

I think with the data that was shown from this German paper now with the *Clostridium*, showing that it's a problem. It also shows that *E. coli* and some of these other organisms have high tolerance for glyphosate compared to the natural biological controls that it may not be the salmonella's presence or absence that maintains our food's security and safety, but the presence or absence of these natural biological control organisms.

Salmonella, Clostridium, and a lot of these disease organisms are ubiquitous. They're everywhere. Our health is dependent on keeping them in check. If we're eliminating that check either through residues in our food or through direct impact in our environment, we're going to continue to see what we're seeing today. You look at Alzheimer's, thyroid problems, autism, Parkinson's – any of those diseases that have a tie with either the endocrine system or the nutrient availability. We're going to see those increases.

Just six weeks ago, I was in Australia and had an opportunity to review a study that's ongoing there. It's a takeoff from a study or a continuation of a study that was conducted in Iowa with pigs and cattle. They're doing it with mice so that they can define what the toxins are and the natural toxins in the genetically engineered crops. But they're using these one or two-pound, big, white rats that some people like to call a pet but my wife would like to hit with a broom.

DM: *[Laughs]*

HR: But you can reach in to the non-GMO fed rats and pull it out. Put it on your lap and it can be patted just like a cat. Try and reach in to the cage where the rats are being fed the genetically engineered feed. Here they have limited just specifically to one. The rats are irritated. They don't get along together. They always go off into their own little world. They do backflips. They crawl up and run the cage. They can't get any piece, can't settle down. We see all of that increase very typical of what you'd see with autism. Then you start looking and then you say, "Well, are there any other similarities?"

When I was in Germany two weeks ago, I met a doctor that specializes in working with children with autism. I mentioned the study in Iowa, where they had compared GMO and non-GMO. You look at the stomachs of the GMO-fed – they have all of the severe allergy responses, the inflammation and the reddening. But then when they looked at the intestine, they said that the intestinal lining is all deteriorating, not the same. The smell of the intestinal contents is very rank. The biology has been drastically changed. This doctor said, "That's exactly what we're seeing with our children with autism."

You need some research, but certainly, the indicators are there. The research up until very recently hasn't been done and those who wanted to do it have been prohibited from publishing or from doing that research. We see those that have dared to come out and raised some concerns have been very severely impacted professionally as well as in their own personal lives in that persecution that they have had to endure.

We've got to change. We've got to recognize that what we have now isn't normal. We got to get back to safe, sufficient, and sustainable production and health for our agriculture community, if we're going to be healthy in that process also.

DM: I couldn't agree more. You have mentioned that you did work for the last 20 years in remediation efforts. I'm wondering if you could comment on how one would remediate against this deluge of glyphosate that's been introduced into our environment.

HR: Of course, one of the important things is understanding what glyphosate is as a strong chelator to immobilize nutrients. One of the things that we see if we'll compensate for that is the effect of the gene if you're using Roundup-ready, or the effect

of the gene and the chemistry of glyphosate – if you're using both of them or just using the glyphosate. How do we compensate for that reduced availability?

We can do that in plants with foliar applications of our micronutrients. Usually it takes eight to 10 days after the glyphosate is applied before we have any benefit from the foliar application of manganese, zinc, or copper because the glyphosate is still very active in that plant and will still chelate and immobilize this so that it's not beneficial. It may be in the plant when you do a soil or a tissue test. It'll say, "I'm in full sufficiency." But when you actually look at the plant, we're seeing deficiency of manganese, for instance, in levels that are twice as high as what we use to consider fully sufficient physiologically. But we can add those, we can compensate.

A lot of the sources of our nutrients aren't all equal in their beneficial effect on that physiologic process because they're not all-soluble, translocated across the membranes, or even mobile in the plant enough to fully compensate for it. Especially with a mineral like manganese, it doesn't move down into the plant. It only moves upward. We need to look at those techniques, so that we can make the plant fully sufficient. When we do it, we can compensate. We restore the disease resistance.

Then we again have nutritious and healthy food that can be produced. Without doing that, then we see that very marked reduction in nutritional value even when the quantity is produced. Often we're seeing now with SDS and with Goss's wilt and with Fusarium head scab, the mycotoxins in our cereals that we can't compensate for all of those effects because of the dynamics of the soil biology – unless we also address that. That's a more difficult one.

Most of the products that I have evaluated over the years to beef up the soil biology, most of those organisms are very sensitive to glyphosate. Even when we add them, we have to wait until the glyphosate is very firmly chelated in the soil, or else we have a toxic entity that totals what we're trying to do. If we do that – and we have to do it now on a regular basis for our legumes – we have to add the inoculum. For years we haven't had to, because the nitrogen-fixing organisms were able to establish in the soil and develop in that environment so all we had to do was plant the seed. Since 30 years of glyphosate has taken amount of that environment and has reduced their efficiency, we have to add them again.

We can do that. But before you can do anything, you have to recognize that there's a problem. This one has kind of snuck up on us. If you want to put it with the old Greek mythology, it says it's a Trojan killer. Because it's slow, it's an indirect effect. It's not direct in those end effects that we're observing. So you have to go back, look at the correlations, and look at where the ties are to get back at the cause.

That's much like what the veterinarians did with this new entity that they first placed after they establish that was the cause of the reproductive failure. They went to the feeds and said, "Where's this thing coming from?" That's when they found the soybean mill at high concentrations.

We find the Fusaria and the fungus cause a sudden death syndrome that can carry that into the plant. In the plant, it multiplies, grows very well. If it's a living entity, it reproduces anyway. Again, we're not sure how to classify it and where to put it at this point. We're working very hard to get that name. But again, the veterinarians that's where they found it. We found that it's very synergistic with most other organisms in the environment, and in some situations it may have a beneficial role just like a lot of other organisms do. In the environment that we're putting it in or that we're creating, it's an extremely detrimental entity for us to have to deal with.

If it's not a living entity – DNA sequencing should tell us that – then it raises another question of “What do you do? How do you reverse it?” Again, it's new to science. We don't know. We don't have a lot of that basic information, because we haven't had to confront it before.

DM: But it seems to me that if you put back the normal mechanisms that existed in the soil prior to the introduction of glyphosate, those healthy organisms should balance it out.

HR: This is what's being done with the animals. The veterinarians changed the feed, pulled them off the GMO feed, and get them back on to healthy ration. They also have to modify the ration. They cut the protein level down. They modified the nutrient level to get that back. It looks like that's starting to work for them.

With pigs, it may take three to eight months to restore fertility. With cattle, 10 to 18 months. It looks like you have to go to a full gestation period. The thing is it doesn't look like it's a highly infectious entity, which is good news. But it's in very high concentrations in a lot of our food and feed sources – high enough that it persists and its effect lasts for some time.

What the direct role of glyphosate is – again, in the crop – we don't know that direct effect, except in making those plants more susceptible to the diseases. It's in those situations that we see very high concentration of this entity that then goes into the food and feed supply.

If we change that – at least in the early stages – it looks like it's going to be reversible. A number of veterinarians commented to me that when they apply the synthetic vitamins and minerals, they're not nearly as effective as the plant ones. If we have to complement what's in the plant, because it's not there anymore, then we really need to look at how we make that complementation fully effective.

A lot of research that needs to be done hasn't been done. It's ongoing. Again, you asked me what's the worst-case scenario was. I think that there's enough innovation and enough inspiration that can come, if we're willing to receive it.

DM: Which is true.

HR: But it's just like an advice that I give to my kids. If they take it, I think it'll benefit them.

DM: *[Laughs]*

HR: If they don't take it, then we make the choices, but we don't choose the consequences.

DM: Yes. It's good to know that it's reversible. It's very good to know, and with your comment on being aware of this research, the challenge is... First of all, I certainly applaud your incredible efforts and all the decades of hard efforts in research you put into understanding this problem, because you're really at the leading edge of understanding the catastrophe that can be a result of the use of all this glyphosate. You're seeking actively to engage the regulatory authorities in the United States and have them do what they should have done with respect to safety.

But my fear is that there's such a massive conflict of interest. There are large sums of money being generated. You have addressed this. There's this prejudice within the academic community to not even study this. The necessary science that should have been done, which takes years to begin, with of course, is not going to be done for years – at the earliest, most likely. By then, we may have approached the limit where it's going to be “too little, too late.” The long-term consequences may be even more severe and may be more difficult to remediate. At least, that's my analysis.

We're seeking with our efforts and an initiative of Health Liberty that we're putting together on our site to reproduce what they have done in Europe, where all they did was require these genetically modified foods to be labeled. People are smart enough to understand that this is not something they want to mess with. So they avoid them and the industry essentially removes from the shelves because there's not a demand from the consumers. We fight it with the populace. We're engaging in a process and working with a number of other leading organizations and the organic consumer movement to have a valid initiative in California to essentially require this, if it passes. We're hopeful that it will.

I'm also excited that we have had this interview, because you have given so much wisdom of what the real central issues are. We're going to be using this in our campaign to really make this the fighting ground, because I think we have lost in the government regulatory agency. In my view, it's almost impossible. I hope I'm wrong, but I'm trying to be a practical activist here. It seems that we need to direct our efforts towards California, where can get it initiated to require all products that are genetically engineered to be labeled. Once that passes, I think it's the beginning of the end. I'm really excited about that. What I heard from you really inspires me more to be more aggressive with this effort.

HR: The consumers should know what they're eating.

DM: That's all it is! We just want to know what it is!

HR: And give them a choice.

DM: Yeah.

HR: Look at what we're seeing. I had that scientific paper, a study from the outskirts of Quebec, of those women that didn't have farming exposure, yet 93 percent of them contain the BT toxin in their blood system. Eighty percent of them passed that onto their developing children through the placental barrier, which isn't a barrier for that. It's not a barrier for the endocrine-disrupting chemicals like glyphosate. It goes right through that barrier just like what DDT or DDE did. It's not a barrier for that. Those effects in that early developmental stage are lifelong – not just life long, but even for generations.

You see what that disruption does when you have that effect, so why not give them a choice? Those who want it, that's fine. But for those who really honor that need to protect the future – regardless of what they want to do to themselves, it's a matter of protecting the future. That's why I made that comment. The future historians aren't going to judge us by how many tons or pounds of pesticides we apply or don't apply, but how willing we are to sacrifice our children and the next generations, as well as jeopardize the very basis of our own existence, all based upon failed promises and flawed science.

The only benefit is that it affects the bottomline of a few companies. There's no nutritional value. It makes some decisions in farming easy for a time until it catches up with us, as it is doing now. Then as you said, pesticide use goes up, exposure goes up, our production is lost, and our quality tumbles.

What's happening is that it has become a self-fulfilling prophecy for those who say, "We can't provide and produce enough food for an expanding world population." Somebody said that in 1758. We have been able to provide that source of an abundant and nutritious food in the past, so there's no reason why we can't in the future.

If you look at the genetic potential of our crops, it's dramatic. It's amazing. We're only harvesting 25 to 30 percent of that because of stresses. When you add another stress, you don't harvest more. We harvest less. That's what we're seeing in the genetic engineering process. I didn't mean to get on the soapbox.

DM: No, I loved the "soapbox" part.

HR: Again, it's a Trojan killer. It's a subtle one. I mean, it has provided a powerful and simple tool for weed control that we have always had to struggle with.

DM: Yeah.

HR: It's simple, easy to use, and removes a lot of management decisions. Anything we use is going to have some effect. It's just that we have never managed any of the side effects. When the National Academy of Science said that it's substantially equivalent, we just automatically said that there are never going to be any side effects from this. We never anticipated any unintended consequences.

It's just like you put a gene in that functions. Of course, we know with the Human Genome Project that there aren't enough genes to do everything. One gene– it's not a gene function relationship. It's how those genes work together. And when you disturb that, you disturb all kinds of things. Our knowledge of that is so premature, so infantile.

That to assume that we have silver bullets that you can just put in a revolver and spin the chamber for whatever stress or problem you have just doesn't work.

In fact, if you look at all the promises, you can see how they all failed. You look at drought resistance – it takes twice as much water to produce a pound of a Roundup-ready crop soybean plant treated with glyphosate, as it does with soybean plant that's not treated with glyphosate. You reduce a lot of your efficiency, because you reduce the efficiency of all of those keys that go in the ignition for these engines that are sitting out here in the plant that do the work for you. You look at the quality and nutrient levels go down – half the amount of manganese, up to 70 percent less zinc.

Look at your copper, your iron, magnesium, and your other nutrients. Again, one of those that chelates very well is immobilized. Not only does it affect the health of the plant and the reproductive ability of that plant, but that's what we eat. Isaiah said 800 years ago that all flesh is grass. That's our source. That's the source for our animals. But we need that in the seed just to produce a healthy plant. So we have to start looking now at mineral supplementations and seed treatments, just because our soil biology isn't going to provide it. The whole system has changed. If we want to change it for the better, we have to recognize what that change is and be willing to change again to compensate or to rectify.

I guess when George Romney was chairman of the Citizen's Constitutional Commission in Michigan, he was asked what his feelings for science were, and he hit it right on. He said, "With every scientific advance, we find that there are challenges and problems. We use science, we solve those problems, and that moves us up to a little higher level." He said that when we get into problems with science is when we assume that there aren't going to be any challenges. When we put our heads in the sand and ignore those challenges, and then it starts to detriment. That's a paraphrase. It's not a direct quote, but essentially that's my concept and essentially that's what we have seen with everything. We make advances slowly. We do a lot of it by mistake. We have to recognize those mistakes. Then we can correct them and move on to better the human condition through that process. Learn such a thing as standing still.

DM: Sure.

HR: We have to keep moving.

DM: Yes. It's professional scientific arrogance over the last 30 to 40 years with glyphosate, which is just starting to emerge now. I guess it's the time for you to expect or to see a problem, because it's not going to happen immediately. It's just like smoking cigarette isn't going to kill you from lung cancer in a month, a week, or a year. It's going to take some time.

HR: It's a very subtle effect, but such a broad-spectrum impact to affect everything that we need to survive. It affects us directly through nutrition and disease. It affects our production capability and that ability to have an abundant source of safe nutritional food at an economic price. It affects our soil biology, our sustainability, as well as a direct onslaught that we always have to deal with from pests and disease organisms.

Again, agriculture is a system that supports the larger system that we're a part of. We need to recognize how all those pieces fit together and optimize them for the best rather than denigrate them to our detriment.

DM: I couldn't agree more. You provided us with a lot of information about a very important topic that I think, hopefully, will inspire many and motivate them to become active on this issue, because it is so important not only to themselves, to their family, but the future generations. Are there any items that we didn't discuss that you like to comment on, or any closing words?

HR: What I've shared with you isn't just my word. There are a lot of other scientists who have contributed. I have used their data. I have cited them in my response to the USDA. And my publications on this – mine is just a very small part of that research. Everybody has contributed very critical parts to it. I'm more of the messenger, so the research can continue on and we can get the answers that we need, rather than me being the prime researcher. I feel like I have made my contribution. I continue in that area. I have a lot of curiosity that isn't satisfied yet and a lot of understanding that I'm trying to find the answers for.

I really appreciate a very dedicated team of scientists and people that I have the privilege of working and associating with in this area internationally as well as domestically. It's been a tremendous inspiration to see their dedication and hard work, in spite of many of the oppositions and pressures that have been put on them to change their direction. It's great to see them moving forward and willing to sacrifice a lot of time and energy and to give up opportunities to research in other areas, because they feel the critical need and they see those problems that we need to address.

DM: I want to thank you for all you've done and for all the other researchers that you mentioned, who are also contributing to this. Really, it's individuals like yourself (who unfortunately, from my perception, seem to be a minority) who have maintained their integrity. That's the reason why they went to this discipline – to begin with – because most tend to be corrupted and with a massive conflict of interest. They fail to do their mission and they're suffering the results from that.

It is really people like you – dedicated and committed with integrity – that really do the hard science that most of us don't know how to do or don't have the time and resource to do and are able to find the truth, the reality that was going on here, so that we can take some preventive action and really prevent loads of human suffering. I think ultimately that's the foundation of it, to really prevent suffering. We're really heading down a nasty road, unless we take some serious course of corrections really quickly. Thank you for all your time.

HR: My colleagues have criticized me for having this new entity, not being published, not for peer review. That will come as soon as a name can be put on it. All the veterinarians and others have felt very strongly that if we released the information it's known and there's a fairly broad base of knowledge that's known, if we release that without knowing exactly what it is and a few more interactions, it would do more damage than good. It will be released. It will be published. It'll be available for peer

review when that name can be put on it. So it is out there. That's a very critical component.

That's another reason why I'd asked that letter be confidential and not be released, because we needed to have that, so that there can be an understanding rather than speculations. If we did it now, if we release names of those who are working on it... Some of those had to go international, because we couldn't do the research here. So it's an international group of scientists that are involved.

But as soon as that name can be tacked to it, it'll all be there for peer review, recognize that critical aspect to it, that that's probably a justifiable complaint without understanding the consequences.

DM: Sure. But it's still the stealth toxic entity that you referred to... In my view, it's a relatively small component of the whole picture.

HR: True.

DM: So even if that didn't exist, there is more than enough evidence to eliminate this toxin from our environment.

HR: Yeah.

DM: I mean it's just a profound evidence to do that. I appreciate your diligence in seeking to do what you need to to confirm the validity of this, but I would answer you critics that it's almost irrelevant because it's just a small part of the equation.

HR: Well, as far as the validity of entity for reproductive failure, that's well-established and easy to document. Those veterinarians that have contacted me as the result of the leaking of that letter, I have been able to put them in contact with veterinarians who can help them and verify it. I have been able to do that. That's not a question. It's just that until you can put it in the overall perspective, because it's more than just a reproductive failure in the animals. We're seeing a lot more effects, and you have to know: Where does it come from? What is its role in the environment, as far as leading to this and the product that we're struggling with?

DM: Okay. Thank you again. I appreciate you coming in and educating and enlightening us with the reality with what we're facing with glyphosate contamination in our environment. I appreciate all you're doing.

HR: Thank you.

DM: All right.

[END]