

Radical Remedy Podcast. - Dr Stephanie Seneff Transcript

0:00:00 - Chloe

Hey guys, it's Dr Chloe, and this is the Radical Remedy Podcast. Today is the second episode of our three-part mini series about glyphosate and other environmental toxins that we're putting on our food and putting in our bodies and thus impacting our health. Our guest today is truly, truly, one of my greatest heroes, and it was such an incredible honour to speak with Dr Stephanie Seneff. She is a senior research scientist at MIT and she's known for her somewhat controversial theories about glyphosates and its potential impact on our health. So join us as we delve into the world of glyphosate research, discuss its controversies and explore its broader implications for public health and agriculture, and remember that we are building up to something big. In our final episode, we're going to have Caroline Allen from Beam Minerals, and she'll be here to shed light on the importance of minerals in our diets, so stay tuned for that conversation as well. Dr Stephanie Seneff, it is a tremendous honour to have you here. I've been following your work for years now. Thank you so much for joining me.

0:01:03 - Stephanie

Delighted to be here. Thank you for having me.

0:01:06 - Chloe

So we have a lot to talk about. I've been nerding out on your book Toxic Legacy All Week and I really hope that everybody goes out and buys it, because there's no way we are going to be able to go into all of the detail in this show, but I'm really, really excited to dive in. So let's get started. Why don't you give us an explanation of sort of what is glyphosate and how did it become so pervasive in our environment?

0:01:31 - Stephanie

Sure, Glyphosate is the active ingredient in the herbicide roundup. I think most people know what roundup is because it's very familiar from the hardware store, the garden store. You're going to pick up a jar of roundup and use it to kill the dandelions or the weeds in your walkway. Very convenient Kills all plants except those that have been engineered to resist it and perfectly harmless to humans, and that's what we're told. Perfectly harmless to humans, so people aren't worried about exposing their kids to it, exposing their pets to it, exposing themselves to it. They don't think it's a problem. And the government has really, really misled us on that, because my research has shown that it is extremely toxic and it's toxic in an insidious, cumulatively cumulative way that gradually erodes your health over time. So that's a problem with it because if you look over a short time, you can get by with not noticing that it's toxic because it's a slow kill I think that's a crucial part of it and you don't feel an immediate response, so you're not aware that it's poisoning you, Kind of like arsenic. You know, I get arsenic poisoning over time and eventually it takes you down. It's a slow kill, so that makes it very, very dangerous and the government thinks it's perfectly safe at least they say they do. They're, of course, bought by the industry. They don't bother to test whether glyphosate's in the food supply, but in fact others have tested and they have found high levels of glyphosate and crucial foods that are very common with the kids things like goldfish crackers and Oreo cookies and Cheerios, you know and oat cereals, oatmeal the oats have very high levels. The garbanzo beans, chickpeas which is like the legumes they're called, you know lentils, garbanzo beans, chickpeas, hummus, for example Sky high levels have been found in those foods. Canada actually tested over 8,000 different fruits, both sourced in Canada and from Europe and from Mexico.

Because of pressure from a friend of mine, Tony Neutra he's a great guy, he's Indian born but he's Canadian citizen he pressured their government for years before finally they gave in and gave him all the data and he created a book called Poison Foods of North America, a very dry book with lots of data about all these different foods. And it's very disturbing to me because,

you know, it's just that it is all over the food supply. Honey, for example. You really can't buy honey in America that's not contaminated with glyphosate. You can't keep the bees away from the glyphosate contaminated flowers, right, so very difficult to avoid it.

But certainly the certified organic label is a good thing, and Canada showed that the certified organic foods in general had sometimes zero, but also much less. So they were contaminated at times, but it was much less than what they were seeing in the non-organic foods. And they also found that foods from North America that's why he calls it Poison Foods of North America the United States and Canada had significantly higher levels on average in the food samples that were taken by the Canadian government compared to Europe, for sure, and also compared to Mexico. Mexico came out more or less in alignment with Europe, with much less glyphosate. So that's an important point. If you can't find certified organic for the thing you want to buy, buy it from Mexico, which is quite interesting. The Mexican product is likely to be healthier.

0:04:56 - Chloe
But that is wild.

0:04:58 - Stephanie

Yeah. So the government says it's safe, and they say that because the industry supposedly showed that it was safe in studies that they did way back when. So glyphosate was actually spent around for a long time. It was first introduced on the market in the mid-1970s, like 1974 in the United States, and so the industry claimed they made some rules about how to evaluate whether a chemical was toxic or not and they did some really no-no things Like, for example, they mix it up with other things in formulations Like Roundup contains other stuff in there that's also toxic. And in fact, as Sarah Lienen is a researcher in France who really became aware and made a big noise out of the fact that the other ingredients in Roundup are very acutely toxic, even much more so than glyphosate, and they can cause damage all by themselves, even if the glyphosate's not there, and they allow the glyphosate to get into the cells. So they basically helped the glyphosate to be more toxic than it would otherwise be and they are intrinsically toxic themselves.

The other ingredients which were never evaluated for toxicity, and glyphosate was evaluated on rats. You know rat experiments that the industry did way back when, probably 1960s, where they exposed the rats to glyphosate in isolation, which is very different from glyphosate in context of the formulations. They never looked at glyphosate in the context of the formulations and they also looked for only a few months. They had a rule that if you didn't see toxicity at the end of three months, you were good to go. You didn't have to look any longer than three months to see toxicity in animal studies. And when Serolini did a long-term study, which was really a very big breakthrough, I think, in the awareness of its toxicity this was in 2012, I believe and published a paper together with colleagues and they had done the same basically reproduced the study that the industry had done sort of same number of rats and had the control group, and then they had various combinations that they exposed the rats to. They had several different groups, one of which was just the GMO crop without the glyphosate and one was just the glyphosate without the GMO crop, and then the combination of the two and that sort of thing.

All of the treated groups came out bad compared to the control group, which didn't get, which didn't get any of it, but they looked fine after three months. They couldn't really see any obvious difference after three months. By four months they started to show symptoms and by the end of their lifespan the females had massive mammary tumors. The males had significant damage to their kidneys and their livers. Both genders had reproductive issues, and so it was really pretty much and they died early, they died prematurely, and this was a small dose, so that's why it took time for the appearance of trouble, but they demonstrated that the same

dose that the industry had used to prove that it was safe proved that it was not safe for these rats, and that was a real breakthrough.

Because I think then, after the other thing that they said is, if you don't see damage at high doses, then you don't need to look at lower doses. And I think they also said that because they were aware that when you look at low doses, they turn out to be more toxic than high doses. It's quite interesting. That's a characteristic feature of endocrine disruptors, and now it's been pretty much proven that glyphosate is an endocrine disruptor, which means that a very low dose is actually more toxic than a higher dose. And that's probably because at a low dose it starts to simulate actual endocrine signals, so it basically emulates estrogen, for example. So it's called an endocrine disruptor when it pretends to be some kind of hormone that then disrupts your whole hormonal system because you're getting this strange hormone showing up that isn't supposed to be there and there's a lot of chemicals that are endocrine disruptors, but there's.

Glyphosate is now pretty conclusively shown and there's a recent review paper came out in the last few years that did a deep dive into all the papers that had shown that glyphosate was an endocrine disruptor and they found issues with the thyroid hormone and so we looked at estrogen and testosterone and lots of different issues showed up in the course, causing things like obesity and reproductive issues and thyroid disorder and all these kinds of things, and also teratogenic, causing damaged fetuses that has severe genetic mutations being caused by the glyphosate as well. So basically, it is much more toxic than we think it is and our government doesn't want us to know. That is basically what it comes down to.

0:09:51 - Chloe

Yeah, well, it is truly alarming when you go into all the different details and the different pathways which with glyphosate is affecting, and you do such a beautiful job laying that out in your book. I'm so interested. I'm an acupuncturist and a doctor of Chinese medicine, so one of the things that, as a practitioner, our field is really known for is working with fertility and helping people get pregnant, which is one of the greatest joys of my profession, to be honest, and and it is pretty alarming to see the levels of infertility I think in your book you mentioned that it's one out of seven couples are currently in Birtle and I think two to three percent of babies born in the states these years are born through IVF, which I think that there's a whole lot of information that's sort of lacking in terms of the research on how that's going to impact the children who are growing up. So it's all very, very interesting.

One thing I want to go back to is sort of the introduction of Roundup. So I know it came out in like the 70s, but at that point it was sort of a pervasive. It would kill everything that it was touching pretty much. So farmers had to be very selective with how they were using it. But then, as I understand it in the 90s, was when they brought out the Roundup Ready crops, these GMM crops that everybody claimed was going to save the world and eliminate world hunger, but allowed it so that the farmers can just spray glyphosate all over the crops and only the weeds would pass away, because all of the Roundup Ready crops would be able to thrive with the glyphosate. Could you explain a little bit why farmers would spray their crops with glyphosate right before they're harvesting the crops?

0:11:36 - Stephanie

Because that's alarming to me. That's really alarming and I didn't realize that at first. I had actually done quite a bit of studying of glyphosate before I realized that they were using it as a desiccant, and it was really because of the wheat problem that I picked up on that, because I was thinking gee, celiac disease. There's all this stuff about gluten in town, all these places, sections showing up in the grocery stores, all these gluten-free foods. What is this? What's going on here? You know, I was like that seems weird and I knew wheat wasn't a GMO crop. I

knew it wasn't a GMO crop so I couldn't figure out why it would be a problem. And then I realized that I found out that it was being sprayed right before harvest.

I think that's pretty routine in a lot of places and probably pretty heavily done in the United States and Canada, and that's done to kill the crops, so it's actually intentionally wanting to kill it as it dies.

In its last gasp it goes to seed. So it helps to synchronize the production of seed, because you can have some parts of your field are not quite ready when the other ones are ready, and so if you harvest everything at once, you're going to miss out on an opportunity to get the seed from those crops that are premature, that aren't quite ready yet. So you'd have to kind of harvest different parts at different times. That would get complicated. So by virtue of it's my understanding that by spraying the crop with the gifus it kills it and it allows it to go to seed, which increases the yield, you know exactly when to grab the seed and then, by virtue of killing the crop quickly, it makes it easier to clear the residue to prepare for next year's crop. That's what I've been told. Of course it's also a head start on killing weeds for next year's crop as well. So it feels like a convenient thing to do and if you assume glyphosate is harmless to humans, you don't think about whether that might be a problem.

0:13:28 - Chloe

Yeah, it just seems amazing to assume that that would be harmless to humans.

0:13:35 - Stephanie

But I know that. Certainly I've always been very suspicious of any poisons. I've been very careful with insecticides as well. But I never used glyphosate on my yard, even long before I was aware of the specific dangers of glyphosate. Just, I don't use poisons. I'm always very careful about that. I don't spray insects in my house with. I have never done that. So I just common sense tells me, just stay away from poisons, especially when you've got young children.

0:14:04 - Chloe

So yeah, well and I feel very fortunate personally as an herbalist there's always an herbal alternative for sort of homeopathic or herbal spray or essential oil that you can do to do a similar job that's less toxic. But, yeah, it is fascinating to think that it doesn't affect the body. However, what it is affecting is many of the microbes that are in our gut and in our body, and I believe that you said that. About what was it About? 54% of the species found in the gut carriaglyphosate, susceptible version of this one synthase that you've been focusing on. Could you explain a little bit about the shikimate pathway and the EPSP synthase?

0:14:56 - Stephanie

Thank you. Yes, very interesting, and that's where they focus. Of course, researchers would want to understand why, using the glyphosate, it was sort of accidental that they discovered that it kills plants. I think it was just an accidental discovery, and then of course they didn't know why. So they needed to figure that out. And so researchers discovered that it severely suppresses an enzyme called EPSP synthase, and that enzyme is pretty much universally present in plants, which is why it affects all plants, and that enzyme is a part of a pathway called the shikimate pathway.

It's a biological pathway, so the pathway involves several different enzymes, of which that's a central one, and the pathway produces products, and among those products are the aromatic amino acids. There are three of the amino acids that are the building blocks of all proteins in all of life, and the aromatic amino acids are among the subgroup that are called the essential for humans, because our cells can't make them, so our cells are unable to make those amino acids. There's tryptophan, tyrosine, phenylalanine, and so we depend upon either our food or

our gut microbes to supply those critical amino acids to the host, to us, and so when? And many of the microbes, so the microbes also all, I think most of them have that enzyme, epsp synthase, but some of them have a version of it that's not susceptible to glyphosate and that's actually very, very interesting because that gives you a hint as to how glyphosate disrupts it, and I talked about that a lot in my book. You probably remember the chapter where I showed that was pretty amazing that and they know this, the industry knows this very well you can actually take the version of EPSP synthase from some animal.

Just take any version of it you know from some planter or microbe that has a glycine at the place where it binds phosphate of PEP. So phosphoregulpyruvate is a substrate. The enzyme binds the phosphate of PEP at a particular site that has an amino acid sequence there. That's characteristic, and that amino acid sequence includes a particular glycine residue. Glycine is one of the amino acids. If that glycine is swapped out for alanine which is a minimal change it's just added one extra methyl group they're identical except for one extra methyl group in alanine the enzyme becomes completely insensitive to glyphosate, and this is characteristic, I think, of any version of that enzyme that you take out that glycine, replace it with alanine and now it's completely insensitive to glyphosate. That is an absolutely huge hint as to how glyphosate is disrupting that enzyme, in my opinion, and although what they say is that glyphosate pretends to be PEP, so it gets in as a substrate and blocks the PEP by being stuck in the active site, the phosphoric pyruvate. So it basically substitutes for PEP and blocks it. That's what they say, but I think they're wrong.

I think the way that it disrupts that enzyme is by actually substituting for glycine in the protein itself. It actually gets assembled into the protein by mistake because the assembly process thinks it's glycine and that makes sense because it is a glycine molecule. It's a complete glycine. That's why it's called gly, right, it's a complete glycine molecule, except that it has an extra thing attached to it. It's nitrogen atom, a methylphosphonate unit attached to it. It's nitrogen atom and that methylphosphonate is a bulky thing. That's going to get in the way of things. But because it's a place where it binds phosphate, that particular protein has to have room for the methylphosphonate unit, which is what replaces the phosphate of PEP and prevents PEP from binding. So once you've got glyphosate stuck into the amino acid chain, it's got its methylphosphonate sticking out into the whole and now PEP can't get close and the enzyme can't work, and I think that's what's going on, that it's disrupting the enzyme stability to bind to PEP because it's replacing glycine in the enzyme and then disrupting its ability to its job, dr Fowler.

0:18:58 - Chloe

It's wild. I remember reading your research on your hypothesis that glyphosate was replacing glycine years ago and just blew my mind Then. It still does now, Dr Fowler.

0:19:11 - Stephanie

Yeah, it's a fascinating thing to try out, and I remember actually answering Samson was the one I had been toying with the idea and I dismissed it because I thought, because it had extra stuff on its nitrogen, that it wouldn't work. But then Anthony Samson was collaborating with me and he's a really good chemist and he said no, no, Stephanie, you should take a look. I think maybe that's what's happening. And so once I did take a look, I was just like, oh my God, this must be it, because it made so much sense in terms of when you look at the proteins that you can predict would be affected beyond APSP synthase. I think there are many. I know there are many other proteins because studies have been done on E coli that show all kinds of proteins that get suppressed by glyphosate. And so the easiest way to explain how one chemical can be so corrosive, how it can have caused so many problems so many seemingly very different problems are caused by glyphosate in health, and that's what people say. How can one chemical cause so many things? That's how they sort of deny that this is possible. And this is

how it could, because you find the particular proteins and that have what I call a glyphosate susceptibility motif, and I talked about that in my book.

Not just that, there's a glycine, a highly conserved glycine, at a place that's essential for the protein that you know. If you change that glycine, that protein's in trouble. It critically depends on that glycine and that glycine binds phosphate or possibly sulphate. The binds to not negatively charged SO₄ or PO₄ anion. So those are very specific things. And then I can even give the additional constraint that if the left neighbour is a small amino acid like glycine or alanine, that will help out too, because you need to have that room.

So I've kind of characterized which proteins would be suspected to be susceptible. And then when you look at all the diseases that are going up dramatically, what's causing those diseases? It's like a giant x-ray puzzle. But it works remarkably well that you can identify the particular proteins that are likely to be susceptible. And then you can find some for which it's been shown because there are other proteins besides EPSB synthase that the studies have shown that glyphosate suppresses them and those other proteins also have this characteristic feature. So it's kind of doing a massive connect the dots activity to figure all that out. But once you do you're just kind of like, oh my God, this makes so much sense. It is so terrifying.

0:21:33 - Chloe

Well, and that's one of the things that I find so interesting about studying medicine is, you know, the Western paradigm of medicine is sort of you look at this one pathway, you know you're looking at this one outcome. You look at this one vitamin, this one toxin, whatever, and you don't look at the greater picture of what. You know what's going on downstream from that. How does that actually work and how does that have different implications throughout the body? I mean, with the shikimate pathway and with all that it's, you know it's not only affecting these essential amino acids but it's also affecting the gut and how that's functioning, which is absolutely essential to all sorts of health.

I can tell you, clinically, what I see is that health is determined 100% or nearly 100% by somebody's gut health. I see that all of the time. My son, Remy, who has a rare genetic disorder I was telling you Remy has epilepsy and he will only have seizures, normally with the full moon, often a parasite connection, but he will always have diarrhea if he's having seizures and he will always have seizures if he's having diarrhea. So I am very particular about his gut and it's very wild to see the direct correlation in connection between the gut, brain access, and it always blows me away that I can go to the top neurologists all over the world and they can tell me that they see all of the time that the gut and the brain are closely interconnected.

0:22:57 - Stephanie

I know In fact the gut can be called the second brain. I think there was a book about that, the second brain. It may be the first brain because it has actually very big neurological connectivity, as you said, with the brain, but also it actually has apparently a neurological system that resembles more I've heard this the one in the brain than the one in the rest of the body. Like, the rest of the body is kind of secondary, just kind of boring stuff, but the gut has all this communication with the brain and, of course, the fact that the gut microbes have so much more DNA. I think their DNA, then their amount of unique DNA in the gut is like 100 times more than what is in our cells. Our cells are very impoverished in the amount of proteins they can produce. Compared to the amount of proteins the different unique proteins that gut microbiome collectively can produce is huge. It's so much more powerful than the measly little number that we can produce. They were really surprised when they figured out the human genome to find out how small it was. I know they were really shocked that there were so few genes and so few proteins that were being made by the human cells and so we depend on them for all kinds of things. We don't realize that until we find out. Once our guts microbes get damaged, we start to see all these symptoms that we didn't see before, and we finally chase it

back to the gut microbes and then we realize that they're doing these things that we didn't know they were doing, and so it becomes more and more evident that they are really powerful.

I sometimes like to think of us as sort of a host for the. Our purpose in life is to be a host for the gut microbes. We're housing them and giving them a nice environment to live in. Of course we're poisoning them, so that's not so nice anymore, but that's what humans are supposed to do, you know, is to keep the gut microbes healthy Kind of questionable. Who's helping whom, I think, if they're so important to be healthy in order for the entire earth to be healthy. You know, and of course the same thing happens with the soil microbiome as well. There's a microbiome in the soil, and when that's disturbed, then the plants are not healthy, and that's what's happening with the glyphosate as well.

0:25:04 - Chloe

Yeah, the, the ecology of it all is truly terrifying. Who was a Dr? Pearl butter compared your book to silent spring, which I would have to agree with. That was the first book that led me along this path when I was in college, like 20 years ago, and I haven't turned back yet. And that's definitely stands on her shoulders in a beautiful way.

0:25:27 - Stephanie

Yes, I read that book when I was 14 years old. I remember that left a deep impression on me, probably influenced where I am today, but for sure you know.

0:25:37 - Chloe

Yeah, well, and it's. It's so fascinating to see how the microbiome and the ecology of our bodies reflect the ecology of the earth, and if we're not taking care of either, you know, the other one is doomed to fail as well. So hopefully we can wise enough a little bit and we will definitely get to some of the ways in which we can help impact, you know, our health and and mitigate the risks to ourselves and to the environment a little bit later on, but I still want to nerd out a little bit further, so I also wanted to talk about so you have a couple of chapters on phosphorylation and this and sulphate. Both of these seem very fascinating in terms of, especially with phosphorylation, what do you see the role of glyphosate is in the phosphorylation process and how that might affect ATP and mitochondrial dysfunction, because I see that a lot clinically as well, especially in the world of special needs, kids with low tone and whatnot.

0:26:34 - Stephanie

Yeah, I think that mitochondrial damage is central to what glyphosate does to cells to make them to break them and of course, many, many diseases are associated with mitochondrial dysfunction. So mitochondria are these little organelles inside the cells that produce the energy for the cell in the form of ATP. As you mentioned, atp is adenosine triphosphate, so that's got three phosphates attached to it and whenever you see phosphates you've got to think of trouble, because glyphosate messes up proteins that bind to phosphate. So it would make sense that it would mess up proteins that bind to ATP and in fact the binding site, atp, has a unique signature motif. They talk about these motifs.

It's quite fascinating to look at the code, the biological code of life, which is so interesting. I learned a lot about that as a consequence of digging into all this glyphosate idea of glyphosate substituting for glycine. What would it mean? When I start looking at the patterns? And I think it's a GXXGXG motif. So three glycines with two wildcards between them, gxxgxxg. They use this pattern, x meaning anything. Any amino acid can go there, including glycine. So it could be GXXGXG, it could all be G and that would qualify as the motif. But of course it often does have additional glycines besides those three, but those three are crucial At the binding site to ATP. All the enzymes pretty much all the enzymes that bind ATP, have that, and so any enzyme that binds ATP has my definition of a glyphosate susceptibility motif, meaning that glyphosate could

easily slip in in place of any of those three glycines, and if it does that it's going to mess up that protein very badly. And so I have a whole chapter devoted to the chapter I think I don't know if it's chapter five that describes my evidence to support the idea that glyphosate substitutes for glycine. And then chapter six I'm not sure if that's right, but that goes into the phosphate a whole chapter devoted to phosphate and proteins that bind phosphate and what that means in terms of how it's going to disrupt things for metabolism.

But especially the mitochondria are central because they're making that ATP, so they're obviously binding phosphate. There's another one that's called NADPH and that's even NAD has phosphate. Nad is nicotinamide diphosphate two phosphates and NADP has three phosphates. So those are also energy-carrying molecules, sort of like ATP. And proteins that bind NAD are very likely to be disrupted by glyphosate as well, and there's lots of them, because they're very much involved in metabolism and they're very central to the mitochondria and the whole citric acid cycle. Those proteins are very important to make that work.

So one of them is, for example, succinate dehydrogenase. Succinate dehydrogenase is an enzyme in the mitochondria, is central to the citric acid cycle and also central to the oxidative phosphorylation. That's what makes the ATP. It works in both of those pathways. It's the only enzyme known that works in both of those pathways. Deficiencies in succinate dehydrogenase so people who have genetic mutations make it broken. That's a high risk for various kinds of cancer and the cancer is a consequence of disrupted activities in the mitochondria.

And succinate dehydrogenase has been shown experimentally to get suppressed by glyphosate and it fits my glyphosate susceptibility motif. So it's just one example. There's other ones. Pepck is another one, phosphoenolpyruvate carboxykinase. I'm particularly interested in that one and I talked quite a bit about it in my book, because it exactly matches the pattern of EPSP synthase. So we know that glyphosate suppresses EPSP synthase and PEPCK binds PEP, the same one that EPSP synthase binds phosphoenolpyruvate. They both bind PEP and they both bind PEP at a site where there's a highly conserved glycine. So it's basically the exact same model that you would expect PEPCK to be suppressed by glyphosate because of this resemblance to EPSP synthase. Now no studies have shown.

I could not find any studies that showed the glyphosate suppresses PEPCK, but I think it's just because of what it looked, because I think it would, and if it does it would explain a lot of things. So it makes sense. It would explain. Basically it would prevent the liver from being able to convert fats and proteins to sugar under situations where the blood sugar is low. So what happens when you get into a crisis? You're exercising a lot and you're not eating, blood sugar drops too low. Normally the liver kicks in and says, oh my God, I got to make sugar and they can do that efficiently using PEPCK. But if that protein is busted it can't do that and then you can get into a coma because your blood sugar gets too low and that even might be a source of sudden infant death syndrome. I did a whole study on sudden infant death syndrome, connecting it to glyphosate in multiple ways and that's one of the ways that it would cause it. Once you get too low blood sugar, you go into a coma and you can die. And particularly the infant is susceptible because it hasn't yet learned that PEPCK is in trouble. Once the body starts to adjust and say, oh my God, pepck isn't working.

We need to raise the level of blood sugar systemically. So basically, I think what happens is the body adjusts. It says, oh my God, I got to take into account, pepck is not going to come right back with that sugar, so we better make the set point higher. There's a whole bunch of ability on the body to regulate things and take a look at this and that and the other and decide what to do. Really fascinating the degree of control in those regulatory pathways. So what I think is happening is a blood sugar level is raised all the time in order to protect you from this dangerous situation where your blood sugar gets too low and the PEPCK is not working and that leads to sort of this high blood sugar which becomes a precursor to diabetes. So then

eventually it develops into diabetes, but it starts with this PEPCK being broken, I think. And of course, glyphosate diabetes is one of the many, many diseases. Here's prevalence is going up exactly in step with the rise in glyphosate usage on core crops.

0:32:58 - Chloe

Well, and diabetes is now considered. What is the term? Like the second Alzheimer's or something? Oh, is that?

0:33:07 - Stephanie

right, like Alzheimer's too. No, that fact, Alzheimer's is sort of a diabetes like condition. Yes, I wrote about that actually.

0:33:16 - Chloe

Yeah, and I know that you talk a lot also about how glyphosate is impacting neurological conditions. Obviously, there's a dramatic increase in neurodevelopmental disorders. I mentioned to you before that my son, Remy, has a quote, unquote de novo genetic mutation, which, for anybody listening, that means that it didn't come from me or Remy's dad, but it just happened in utero at some point. However, we've been exposed to numerous toxins. Both Ryan and I had been on chemotherapy as a various points in our lives and I have always suspected that there was something else at play. And in autism also, clearly it seems that there is a multifactorial attack upon the developing fetuses, their toxics, the toxic load, the Nero immune system, all of it. But it does seem, especially from your research, like glyphosate is playing an important role in terms of the attack upon the body. So, while you tell me a little bit more about how you think that glyphosate is impacting some of these neurological and developmental disorders, Right.

0:34:24 - Stephanie

In fact it's an interesting story with autism. That's actually where I started my history. For many years I was developing computer software that would allow computers to engage in conversation natural conversation with humans precursors to Amazon Echo and the Siri platform and it was long about 2007 timeframe. I was watching the autism rates go up every year and I was worried. I mean they would say, oh, we're just diagnosing it more, don't worry about it. But I was worried and I thought it must be something in the environment. They'd say it's a genetic disease. But why is it going up if it's genetic Doesn't make sense. And so I started looking at autism in 2007. I did a lot of reading about autism and I was looking at different chemicals to see different factors and looking for something that was going up and trying to figure that out. And I looked for five years before I came upon glyphosate and during those five years I had identified a problem with sulfation pathways. I was rare From work by a woman named Rosemary Waring.

She was really quite progressive. I feel she was very insightful and she had been looking at autism back in the 1990s when it was relatively rare. She dealt with autistic patients and she did metabolic analysis and she found extraordinary abnormal sulphate, sulphur metabolites in the urine of these autistic kids, way, way out of line, way too much sulphite. They were fleshing sulphite and other sulphur containing molecules. They just their urine was really messed up as far as sulphur and then at the same time they had low. So they had high sulphate in the urine and especially high sulphite, and then they had anthiosulphate as well and then they had very low free sulphate in their blood. It was abnormally low. So they were dumping sulphate even though it was deficient, which is really interesting and I was so baffled by that. Why would they be doing that Didn't quite compute to me and so, but I was aware then that sulphate was a problem with these autistic kids and I'd written about it even before I knew about glyphosate.

But once I started looking at glyphosate I became quickly aware, given this glyphosate susceptibility motif problem, that the enzymes that handle sulphur in the body, many of them

have that glyphosate susceptibility motif critical, critical, path-based segments of those enzymes that have glycines that are highly conserved at places that bind phosphate, and so in particular, sulfo-trans-rays is a very, very interesting enzyme. Sulfo-trans-rays, those enzymes are crucial to so many important pathways in biology and what they do. They take sulphite off of what's called the universal sulphate donor, which is a molecule called PAPS Phosphoguanazole-Phosphosulfate, paps Making that molecule is also hard in the presence of glyphosate because the enzymes that make it also have glyphosate susceptibility motifs. So you might have a deficiency in PAPS, but I think especially you have a deficiency in the enzyme that takes the sulphate off of PAPS and sticks it onto other molecules. Both of those are going to be problematic. In fact, paps, it comes from ATP. It's basically a modified ATP molecule with an extra sulphate stuck onto it Very, very interesting. And that's the universal sulphate donor, and the enzyme that makes that PAPS synthase, I think, is also going to be affected by glyphosate.

So glyphosate basically interferes with the ability to attach sulphate to anything, to anything, and that becomes really, really problematic for many, many reasons. One of them is just detoxifying fat soluble toxins, because they need to be sulphated in order to become water soluble and then they can just be released from the liver into the blood and they can go over to the kidneys and go out through the urine. So the liver has a big responsibility to turn fat soluble toxic molecules into water soluble toxic molecules so they can be gotten rid of, and sulphate is an important way that they do that, that it does that and that's getting disrupted by glyphosate and so things like there's a peak resol, that's a fat soluble toxin produced by plasmodia microbes, and peak resol has been linked to glyphosate peak resol levels in the blood, I mean it has been linked to autism, and peak resol needs sulfation in order to be detoxified. Another example is Tylenol, and so Tylenol has actually been recently linked to autism. Not even recently, from way back actually, people have been talking about the possibility that Tylenol to be taken by the mom during pregnancy, or Tylenol being given to the child, is linked to increased risk to autism. So the pregnancy would cause the child to be increased risk of autism, and Tylenol depends upon sulfation also for detoxification.

Also mercury, of course. Mercury is another one that's been linked to autism. Sulfation is the important way to detoxify mercury. So all of these things become more toxic in the presence of glyphosate because of glyphosate disruption of those sulfation pathways. And then, critically, you have all the neurotransmitters. So you have the tryptophan, pyrazine and phenylalanine that come out of the chicle-made pathway. They're going to be reduced because glyphosate's messing up the gut microbes' ability to make them and tryptophan is converted to serotonin, which is a very important neurotransmitter in the brain, serotonin mostly made in the gut from tryptophan. So tryptophan is deficient than serotonin is deficient and on top of that, serotonin is then sulphated, sulphated is attached to serotonin and it's shipped to the brain as serotonin sulphated and I think it's supplying sulphate to the brain. It's one of the suppliers of sulphate to the brain. So basically, there's all these different, that's both these polyphenols they're called, and all the things that come from the tryptophan. The tryptophan, the tyrosine, phenylalanine, are sulphated, those are sulphated and then their derivatives are sulphated and then they produce all these hormones that are sulphated and neurotransmitters that are sulphated. So thyroid hormone is sulphated and serotonin, malatone they're all sulphated. And then there's also the cholesterol and vitamin D, which are almost the same thing, and they're also sulphated. So all these things and hormones that come from them, testosterone and estrogen they're also sulphated. So all these things are sulphated and there's a reason for that that people don't realize, I think, which is to transport sulphate and deliver it to all the tissues. Free.

Sulphate is a problem in the blood because it will gel water. Sulphate is very good at turning water into gel oil and that's a crucial role that it plays in the body and every place that it's attached it can build gel water around it, which is actually makes what's called exclusion zone water. It excludes, and so the blood vessels line themselves with sulphate in order to build this

jello, which also has a very slick surface, so the red blood cells can slide through the capillaries very easily. So the sulphate plays a critical role in making the gel and the gel plays a critical role in keeping things out, making the vessel secure and in allowing the red blood cells to flow freely. So it's going to mess up blood circulation if there's not enough sulphate and it's going to cause things to get past the barrier because the sulphate builds this a water, a gel, water layer. That is a barrier. It's like a vascular barrier. So that barrier becomes compromised when there's not enough sulphate and then, critically in the brain, critically in the brain, there's heparin sulphate and that is in the cerebral spinal fluid.

Heparin sulphate is super, super important for the development of the brain.

The neuron, the whole neuron, neurite outgrowth, the whole thing that happens in maturation of the brain in utero depends upon this heparin sulphate and, continuing on into early life, the heparin sulphate is crucial for the brain development, and heparin sulphate deficiency in the brain ventricles has been shown to be a problem in both humans and mice.

In mouse models of autism, the autistic mice have low heparin sulphate. Autistic humans postmortem have low heparin sulphate in the brain ventricles and this gets to the pineal gland and the pineal gland is a super important gland that makes melatonin in the evening to help you sleep, and every one of those melatonin molecules that it makes is attached to sulphate before it's shipped out into the cerebral spinal fluid. So again, sulphate sulfation deficiency in the pineal gland is going to cause an inability for the pineal gland to release melatonin, sulphate. And melatonin comes from serotonin, which comes from tryptophan, which comes from the chicamate pathway. So that's another problem. So you got all these problems coming at you. The melatonin and the sulphate are both compromised. Bi-glyph is a sleep disorder, is going up dramatically exactly in step with the rising glyphs. It's a usage on poor crops. It all makes sense, you know, it all makes sense.

0:43:34 - Chloe

It's wild and it's crazy to think what is it? I think 54% of children have a chronic health disorder. These days, you know the levels of neuro developmental disorders are skyrocketing. But also in adults we're seeing these disorders. You know all of the autoimmune disorders, fatty liver disease going up. We've got all of these neurodegenerative disorders going rampant and it's terrifying to look at the trajectory of health in our society and there are so many rabbit holes.

I really want to go down with you and I know that we have limited time. I am going to ask you a question that's been a personal curiosity for me for quite a while. In your book and you sort of mentioned it a little bit before you talked about the maternal immune activation during pregnancy and how maternal immune activation during pregnancy can increase the odds of the fetus developing or the child developing autistic-like traits. I know that there's been research showing that maternal immune activation during pregnancy can also increase the odds of the child developing schizophrenia and other neurological disorders. I was just curious what mechanism of action any, if you thought that that was working on how that might be working.

I remember when I was pregnant with my son Remy, they started pushing the Tdap vaccine during pregnancy and that was one of the sort of things that got me questioning some of the decisions. And you know it was the first year that they had released it to the public and they were recommending it for all pregnant women in their second trimester, I believe. And I kept going in and saying, cool, I'll consider it, let me see the research. And they wouldn't give me the research and so finally I looked it up and I believe it was like a 30 or 40-person study that they had done like two years before that showed that the babies had slightly elevated titers towards whooping cough once they were born, and then they claimed that everybody was all

clear. But I don't know that there are any long-term research studies on vaccination during pregnancy. I know this is treading in sort of interesting water, but I can't help myself but ask.

0:45:51 - Stephanie

Well, I definitely think the vaccines are a factor, a significant factor, in autism. In fact, I don't know whether they're more collectively, more than glyphosate, or whether glyphosate is a primary and then they're secondary. I can't say in my opinion, but I think those two, the vaccines and the glyphosate, are by far the biggest contributors to autism and I really do believe that if we were to cut out the vaccination program altogether, we would see the autism rates drop. But I don't know how much glyphosate. If we could cut out both, if we could go to organic food and get rid of the vaccines, I think autism would almost disappear. That's what I would predict in time, and it'll take time because everything has to sort of work its way out. But I do believe the vaccines. I think I don't understand how I personally don't understand how anybody can think it's a good idea to give a pregnant woman any vaccine at any time. I just don't understand that, because you know the vaccines are going to cause inflammation and they're going to cause inflammation in the placenta and probably reach the fetus. Dtap contains aluminum, which is an extremely toxic metal. There's no, absolutely no reason, I think, why anyone should want to inject a pregnant woman with aluminum. I don't understand that at all. So, personally speaking, I'm baffled as to why the government thinks it's such a good idea to do all these vaccines. We've got way too many and of course we have way more now than we did.

When I was a child I only got smallpox and polio. Those are the only two vaccines I got as a child, and even my kids. My kids pretty much grew up by the time by the 1986 ruling when they said the vaccine industry is excused from any consequences. You know this was a critical law that was passed and it needs to be retracted this law that Reagan signed into law in 1986. That said that the industry was no longer liable for any injuries that a child might have. They set up this vaccine court government run. If you think your child got an injury from a vaccine, you have to go through this special vaccine court and if you think your child got autism from the vaccine, that court is going to make sure that you're denied any kind of compensation. They absolutely refuse to admit that the vaccines could be causing autism, which is very, very frustrating to me.

0:48:19 - Chloe

Well, I think it's honestly. Since I live in the world of paediatric disability, I know many families who have children with vaccine injured, who have been vaccine injured, and to me the gaslighting and the silencing of these parents is going to cause an untold amount of harm to future generations. And I think that, as a practitioner and as a mom, I understand that there's a tremendous amount of cognitive dissonance that goes around with this, because nobody's trying to hurt these children, especially parents, especially doctors. Everybody's doing what they think is best. But until we actually start listening to moms and start looking at the research and start being able to have open conversations about the research, about the pros and cons of every single medical intervention for every person, we're going to continue down this disastrous path that we're on. So before we nerd out a little bit more on vaccines, I just wanted to touch base on what are some of the ways I mean. Again, I highly recommend anybody listening to this.

Get the book Toxic Legacy. It's unbelievable. I have 15 pages of notes, literally 15 pages. I also have it on audible. I needed the hard copy for my notes, but there is just so much information on there in terms of liver disease, neurological disorders, heart disease, autoimmune disorders, and I believe you mentioned in the beginning that there's obviously a tremendous connection to glyphosate and cancers. But you wanted to show how this is all happening, since it really is such a slow burn and there are so many different pathways and mechanisms that are affected by glyphosate. So I really do encourage everybody to read this. It should be essential in

reading for every human as far as I'm concerned. But so since we've probably properly terrified a few people, let's talk about some of the ways that we might be able to mitigate our exposure to glyphosate and maybe help sort of detoxify some of the glyphosate from our bodies, if that's even possible at all.

0:50:35 - Stephanie

Right, and we certainly. I think that it's really important to spend more money on food. I think people have to get used to the idea they need to spend more money on food because, unfortunately, our certified organic is more expensive and, of course, farmers need to figure out how to grow organic food. We have a major and more and more people are asking for certified organic. It's kind of flying off the shelves, which I find interesting, and we're also seeing more and more supply at even regular grocery stores. I've watched over time that it's becoming much more accessible than it used to be. I think more and more people are becoming aware and more and more people are demanding it, and we need to grow that group. I think we can solve this problem bottom up, grassroots, by getting individual moms aware of the need to feed their family healthy food. So I think number one really is to switch to certified organic food when you shop at the grocery store.

That's the most important thing you can do for your children's health and for your own health. And then, beyond that, is eating only whole foods, so whole-stom, whole foods, as opposed to, say, soy, protein bars and candies. So you want to eat foods that you can recognize what it is. You see broccoli, you know what that is, you cook the broccoli and also, of course, a lot of home cooking as well. Because I think the processed foods definitely by themselves are nutritionally deficient. That's another issue because basically when they you know the industry, the processed food industry is based on basically corn and soy and canola oil and soybean oil and soy protein and you know flour coming from wheat and then you've got sugar beads to give you the sugar, so you just mix together the sugar and the flour and you put in some flavoring, some artificial flavors. You know that is an extremely deficient food. When you make a fruit out of those products that are heavily processed into this individual, very nutrient deficient things like flour and sugar and oil and vegetable oil, you know there's just not enough nutrition in that and I think we have a absolute epidemic in B vitamin deficiency and probably vitamin C deficiency, vitamin D I mean all of the vitamins are deficient in our food and and the and the minerals as well, because glyphosate is disrupting the uptake of the minerals. We didn't get into that, but glyphosate is a very big mineral chelator and it grabs onto the minerals and prevents them from going up into the plants.

That's one of the first things I've learned about glyphosate. When I first heard about it from Professor Don Huber, um 2012, I happened to be at a at a conference where he gave a two hour presentation. That's when I first heard about glyphosate and I walked away from that presentation convinced that I had found my answer to the autism epidemic. Was very good time, because I was struggling and looking and I couldn't figure out, and he gave me the answer and I never looked back after that. I just kept on studying glyphosate from then on and um, he showed that. He showed experimentally that when you expose the plant to glyphosate when it's growing in the soil, it ends up with tremendous deficiencies.

And sulphur sulphur's one of the things that becomes deficient but also things like manganese and magnesium and copper and zinc all these critical minerals that you only need in tiny amounts. But if you don't have them, then certain enzymes don't work at all. They critically get, critically catalyzed several different enzymes that are crucial for for metabolism. So, uh, we have an epidemic in mineral deficiency and vitamin deficiency, and also an epidemic in the deficiency and all these different phytonutrients that come out of plants. So, eating a lot of fresh green vegetables and especially a lot of herbs and spices I really want to emphasize herbs and spices and, of course, sulphur containing foods, and so I love the cruciferous vegetables, that's like broccoli and cauliflower, and brussel sprouts and cabbage.

They're all very, very nutritious, so they have a really good choice of sulphur, uh, to help with that sulphur supply, because we have a sulphur deficiency as well as having an impaired ability to add sulphate to various molecules.

So, yeah, so a high sulphur diet, a diet that's rich in and foods that have a lot of micronutrients and, of course, organic eggs, is a fantastic food.

So that's both organic and rich in micronutrients both both vitamins and minerals. So you want to look for foods that are like that and fish, fish and seafood. Or another example, very nutritious uh with lots of micronutrients, and then all these different fresh vegetables and fruits that have all these interesting polyphenols and flavonoids. These are really special molecules that are present in plants that get completely destroyed when you make, when you make the process for which they're gone, and so it's very important to eat whole foods and I think it's important to devote time in the kitchen. To go back to the idea that you should spend time cooking for your family. You shouldn't just buy everything already pre-made. It's going to be healthier if you do that and maybe try to make that a more a valid activity, because we've been trained to think that we shouldn't waste time in the kitchen. We should. We have better things to do, and I think we need to reverse that message.

0:55:45 - Chloe

I agree completely. Um, I can tell anybody who's listening. I know that it can get tricky, but I am a solo mom of a child with multiple disabilities. I've gotten my doctorate in the past couple years and run three businesses, and every single thing that Remi eats is homemade. It's totally, really super. I'm not a superhuman, I just I love my food and um, and I think that it's the most important thing that I can and do do for him is to to make sure that he's fed whole foods and good quality foods, because he already has enough challenges that we're facing. So, and then I know that you often recommend apple cider vinegar.

0:56:26 - Stephanie

Uh, yes, and fermented foods in general, that I'm hoping that it's true that apple cider vinegar contains microbes that can metabolize glyphosate, can actually fully metabolize it to make it be a source of nutrition, which would be really cool. If it's true and I only say that it turns out glyphosate has a what's called a cp bond carbon phosphorus bond which is an unusual bond in biology and most of the microbes, and certainly our own cells, don't know what to do with that. They can't break it apart, so that's why glyphosate ends up sticking around and doesn't get metabolized. But there are a few microbes that can break it down and one of them is is acetylacter. Some strains of acetylacter in a paper that I found can break down glyphosate. So it makes me hope that the acetylacter that are present in the fermented foods can also break, break it down, which would be great, and that would be a good reason to have apple cider vinegar, but of course it's also just fermented foods are good for you in general absolutely.

I always say that, uh, pretty much every traditional culture had a bone broth and a fermented food so bone broth is another one that you're definitely glad you mentioned that, because that's also important and again, start with organic sources of the of the bones and then just cook them slowly in the water, showing some all kinds of herbs and spices and vegetables, and you can make a delicious soup actually. Uh, that the bone broth is important because it pulls all these minerals out of the bone and becomes very, very healthy with a nice balance of different minerals yeah, I love bone broth, um, wonderful.

0:57:55 - Chloe

Well, I'm glad that we have some tangible steps for everybody to start taking. And, you know, I think that it's also important for people to remember that you don't have to change everything

at once, but it's like start making those changes. It's important, it's worth the effort, it's worth the money. You know, there are ton of ways that you can figure out how to to eat more affordably, even if it's organic. If you're cooking the food yourself. You know, if you roast a chicken that's organic, then you make the bone broth from the bones. You know, you just sort of learn how to mix and match and um, it's definitely definitely doable um, and it becomes kind of an artistic experience, right?

0:58:36 - Stephanie

I mean, if we take food seriously, it becomes fun. Actually, it's much more than just the drudgery of cooking oh, absolutely I love it.

0:58:43 - Chloe

I, um, I've been cooking like crazy all week. I got this new Mexican cookbook and it's it's trouble for me. I know it's kept you longer than I should, but I just want to say my most heartfelt thank. Thank you to you. Your, your work has been so inspirational and, truly, I probably would not be here trying to advocate for children's health and family's health, um, if it wasn't for a lot of the work that you've done and for the spirit that you've tirelessly fought forward.

It's like really challenging times, and it really is certainly keeps me busy oh, I have to tell um, but I'm I'm super grateful for your time and your wisdom. So thank you so so much, and I look forward to learning more from you over the years and hopefully, maybe you can come back and we can nerd out some more that would be great.

0:59:33 - Stephanie

I enjoyed talking to you and thank you for the work you're doing as well. Very, very important thank you.