Dr. Jill

Your Functional Medicine Expert®
Jill Carnahan, MD ABIHM, ABoIM, IFMCP

#54: Dr. Jill Interviews Bob Miller on Dangers of EMFs

Dr. Jill 00:12
Well, hello everyone! For this Friday afternoon, I've got Bob Miller. And I know that if you've been around this page for a while, you've seen... I think we're number five. Does that sound right, Bob?

Bob Miller 00:22
Number five, yes.

Dr. Jill 00:23
Oh my gosh. And one of the reasons is because people love your information. It's a very high level for the average person. But a lot of our clients, patients, fans, and, of course, other doctors are really enjoying the information you bring. And today is so relevant. We had a lot of comments already, [such as] "I can't wait to see this." So I know we're going to have a lot of listeners and then even more on the recordings. And like I was telling you right before we got on, Bob, your YouTube videos and the ones that we do here have been consistently the top-performing viewers. So people love your content and I just love talking to you. I feel like I've got a friend in you. And just like we said, it's almost like we need to retitle it "Two nerds talking about EMF" or something like that, right?

Bob Miller 01:07
Geeking out, yes. I look forward to these as well. It's so much fun, it really is.

Dr. Jill 01:12
It is. It's just great, great information and I think we go back and forth well on the different points. Just a little background: If you haven't been here before, you can find my free blog, newsletter, and all kinds of free resources at my website, JillCarnahan.com. You can find products at DrJillHealth.com. And if you haven't subscribed to the YouTube channel, you definitely want to do that. That way, you won't miss any of these videos. They're live here and then they're reposted on YouTube just a couple of days after. They are there. There are over 50 videos now.

So if you like Bob Miller and want to see more, they are all living there on YouTube. And every single one of them is fantastic information and still very relevant. So be sure to go there and see the previous episodes that we've done.

Dr. Jill 01:58
Bob Miller, as you've heard me, needs no introduction. He's a leader of Tree of Life Health and NutriGenetic Research. He puts on conferences for practitioners. And just all around, what I love is that he's always looking for new things and new ideas, bringing us new information in this realm of epigenetics and genetics research. So without further ado, Bob, thanks for coming on again. And let's dive right into how cell phones, EMF, and Wi-Fi might be damaging your health.

Bob Miller 02:27
Absolutely. Well, thank you for this opportunity. It's always such fun to be with you. We geek out together, as we said. One of the things I find fascinating if someone wants to be entertained or somewhat surprised: Go on YouTube sometime and search for 1940s cigarette commercials. What you will find is that there are commercials with either doctors or someone acting as a doctor saying that doctors are busy, they're stressed, and they prefer Camel cigarettes. It shows a physician sitting there puffing on his Camel cigarettes. And you can find commercials that recommend that pregnant women smoke cigarettes to help deal with stress. So back in the 1940s, people just thought smoking cigarettes was pretty cool because it does relax you a little bit and makes you feel a little more calm. And it was a social thing at the time. If anyone had said that cigarette smoking is harmful, they would have said: "Well, I've smoked for five years, and I'm fine. There's no problem here." Twenty years later, [they'd have] emphysema and lung cancer.

Bob Miller 03:36
And I don't say we know this for sure, but I think there's a very high possibility that we're going to look back on cell phones, Wi-Fi, and the chronic EMF that we're exposed to, possibly in the same light. I know probably you and I sometimes talk to people about cell phones and Wi-Fi and they kind of scoff: "Oh, that can't do anything. I don't feel anything. I hold my cell phone and I'm okay." But what I'm afraid of, and as we looked at the literature that we're going to go through today, [is that] the long-term effects might be more serious than we ever realized. We might

be having our 1940s version of cigarettes today. So I encourage people to go look at them and they'll be somewhat shocked at what they see.

Dr. Jill 04:20
Bob, I want to just mention one thing. I've been at conferences on environmental health, your conferences, and EMF conferences [for] decades now. But one thing that really struck me probably four or five years ago was that one of the EMF experts presented a woman—and this is published in the literature; this is not just like a story from a doctor—who put her cell phone in her bra for many years and she developed a tumor. They didn't think a lot of it. But then, when they looked at the radiograph, it was the outline of her cell phone and the exact placement where she had placed it in her bra to carry it. They later wrote up the evidence and probably, as we'll learn today, she had some genetic polymorphisms that made her more susceptible because, obviously, that didn't happen to everyone. But it was a case study of a clinically relevant EMF long-term exposure and breast cancer.

Dr. Jill 05:11
There have been lots of brain tumors due to the changes in glucose metabolism with [phones] being right by your head because, as part of the EMF, the distance is very, very relevant. So that's why, if you are talking on your cell phone, [you should use the] speaker[phone]. Or the AirPods, where you don't have the radiation from the Wi-Fi and Bluetooth, are going to be more protective. So [that's] just a little backstory. I remember seeing that story of the breast and being so profoundly like, 'Wow!' The evidence was undeniable in that case study of the connection in that particular woman.

Bob Miller 05:43
Sure. And what are guys doing by putting [phones] in their pockets six inches from their prostate? And there are probably multiple factors involved with this, but sperm rates have dropped 53% since 1973. And we don't have to get down to zero until we're infertile. I think someday we're going to look back and say, "What were we thinking by putting radio transmitters in our heads?" I know it's convenient and all, but I think someday we're going to look back and say, 'Oops!' to that.

Bob Miller 06:14
All right, well, let's dig in here. Let's do a screen share. And as you know, for people who've seen this before, what we always do is just don't give opinions. We bring up

peer-reviewed studies. So our subject is how cell phones and Wi-Fi may be harming your health. And of course, all of this is educational, informational. We're not diagnosing or treating any disease. I call this the "Three-D Chess Game Played Underwater". It's complex. Sometimes people are looking for simple answers. You know: "What is the SNP? What is the thing?" But typically, multiple factors go together. So here we have our scuba divers totally perplexed over this three-D chess game. And I believe that's what we have going on: Multiple factors. Now, tonight, what we're going to talk about is EMF and the antioxidant defense system.

Bob Miller 07:04
Now let's talk a little bit about free radicals and antioxidants. Probably most of the people on here know what they are, but just a quick review: Everything is made out of atoms. You've got the neutron, the proton, and the electron. I mean, this goes back to fifth- or sixth-grade science. That needs to be balanced. A free radical is when one of those electrons gets ripped off, and it's called a free radical. Antioxidants have a spare electron and they neutralize that. That's called an antioxidant. The traditional naturopathic philosophy that went way back was that excess inflammation or excess free radicals were the primary consideration in many of the problems we're having. And when you look at most of the diseases we're seeing today, especially some of those that we haven't seen before, clearly free radical damage is a factor. So it really comes down to: Are you producing more free radicals than antioxidants?

Bob Miller 08:02
Now, there are three major antioxidants. One is called glutathione. And we'll dig into that a little bit more later. But it's the master antioxidant. Glutathione does a couple of things. It takes out toxins like mold and other things through glutathione conjugation. It is also involved with something called glutathione peroxidase. That clears hydrogen peroxide. And it goes through a process of being made, recycled, and used. If that gets disrupted, it's not going to work very well. So when we talk about mold, sometimes people live in a house and one person is terribly impacted by the mold and the other one says: "What mold? I don't think there's any mold in here. You must be imagining this." Well, the difference between them may be that the one person had other things that made them more toxic, or they may have a genetic predisposition that they don't clear that mold as well and are more impacted. I just spoke to a lady this week. If she walks down the sidewalk and

someone has their dryer running and the fumes from the dryer come out, it makes her sick. That's how difficult a time she has with detoxification.

Bob Miller 09:14
Superoxide dismutase is another antioxidant that neutralizes the superoxide-free radical. There's a third antioxidant called catalase. That has many functions in the body. But for our purposes today, we're going to be talking about how it clears something called hydrogen peroxide. One of the ways you can know if you're not clearing your hydrogen peroxide well is if you gray prematurely. There are other factors as well. But if we don't have enough antioxidants like catalase to clear our hydrogen peroxide, many times we'll gray prematurely. Right before this, I talked to a gentleman who's had lifelong health problems and I said, "When did you start to gray?" He said, "In my mid-20s." So that's a good indication that you don't have enough clearance of hydrogen peroxide.

Bob Miller 10:04
Now, EMF stands for electromagnetic fields. As you know, your electricity runs at 60 cycles per second. In other words, it goes one direction and the other direction 60 times per second. As you get into AM and FM radio, cell phones, Wi-Fi, and microwaves, [they] all [have] different frequencies. In other words, the frequency that they're going at. So that whole spectrum would be considered electromagnetic fields.

Bob Miller 10:04
Now, [there are] three things we're going to be looking at today. One is called the Fenton reaction, discovered in 1895 by Dr. Fenton. What he discovered was that hydrogen peroxide collides with iron to make something called hydroxyl radicals. We'll show that in the chart. Nitric oxide is very important. It won a Nobel Prize back in the late 1980s. It's related to circulation, calming down inflammation, and many other things. And something can happen called NOS uncoupling, where rather than creating nitric oxide, it creates peroxynitrite. Now, I can't remember if it was our first or second interview, Dr. Jill—I believe it was one of those that we talked about peroxynitrite. As you said, some of those interviews are still quite relevant. So if someone would like to learn more, go back to that original interview we did on peroxynitrite.

Bob Miller 11:28

And then the EMF also creates something called interleukin-6, or IL-6. That was the last interview we've done. I just noticed on YouTube that that's one of the most downloaded and viewed. [I'm] very honored by that. But I believe that multiple environmental factors are upregulating this cytokine. Again, we're not going to repeat all that data, just a little bit. But I'd really encourage people to go back and listen to that interview on IL-6. And then, finally, we're going to tie it all together [by explaining] how when people get genetic mutations, that amplifies the effect. So that's why one person can say they're sensitive to EMF and the other person says, "You must be a little crazy because that couldn't be a problem." So many times people have EMF sensitivity—not only that problem, but a stigma as though they're making it up or doing something like that. I'm sure you run into that in your practice as well. People are EMF sensitive and they're ashamed that there must be something that they're imagining. Do you ever run into that, Dr. Jill?

Dr. Jill 12:28
Yes. And I actually like that you mentioned that because even the topic and the title seem like a political thing. It's not, guys. This is real science. This is just legitimate stuff that is happening out there. The difference is that—which is why it seems like maybe pseudoscience, which is why we're going into this today—there is a difference in genetic variation susceptibility. So there are people who are probably minimally affected by EMF and there are others who are massively affected by EMF. And that's why we're talking about this today. Again, there's good science on this. This is clear and very measurable. This is not anything [related to] pseudoscience, but it's variable in its presentation.

Bob Miller 13:11
Absolutely. Back to smoking. Every once in a while, you'll see somebody who lives to 100 years old and they say, "What's your secret?" "Oh, I have a cigar every day." So there's a person who probably did not have a genetic predisposition to smoking. Somebody else could smoke for 15 years and have emphysema and lung cancer. So we're each impacted differently. That's why I think it's so important that we do personalized care because each person is unique. When we talked about histamine, we talked about how for some people, fermented foods are just the right thing for them to help their gut. For the next person, fermented foods make them ill. And we see that time and time again, that everyone is unique. So one of my favorite things is that we've got to get away from "the pill for the ill" and really start looking at the person individually.

Bob Miller 14:09
All right, let's dig in. Now, again, we go with peer-reviewed studies. We just don't make things up. We don't get things from blogs. So I think most people know that when you see this, all these came from PubMed, where somebody wrote them—there are a lot of scientists involved—and somebody reviews it before it gets published.

Bob Miller 14:27
So here's an article: "Effects of electromagnetic field exposure on the antioxidant defense system". So again, antioxidants are what neutralize those free radicals that hurt us. I summarize over here the points of this study. It's a long study, but it says "oxidative stress occurs if the antioxidant defense system," that's your antioxidants, "is unable to prevent the harmful effects of free radicals. Several studies have reported that exposure to EMF results in oxidative stress in many tissues of the body. Exposure to EMF is known to increase free radical concentrations." Now we're going to go a little bit farther here, and it says, "The cytotoxic effect from EMF derived from peroxidation of the membrane phospholipids. This creates a change in the conductivity of the membrane and loss of membrane integrity." The final comment in there [is], "Exposure to EMF has been observed to cause increased free radical production in the cellular environment."

Bob Miller 15:28
Now, one of the things we often hear is that people use the argument that we don't get any thermal heating. It's well known that if you get next to an FM radio station with 50,000 watts and you're 10 feet away from it, you're going to get a burn. So the thought has been that if you don't have thermal heating, you're not going to have any problems at all. But here it's saying that a significant part of many studies have investigated the non-thermal effects. So if someone tells you that if it doesn't heat the tissue, it can't be a problem, that theory may not be correct anymore.

Bob Miller 16:09
Going on further, it says living organisms have anti-oxidative mechanisms such as glutathione (GSH), glutathione peroxidase"—that is how it uses glutathione to clear hydrogen peroxide—"catalase and superoxide dismutase to alleviate the damage caused by that ROS", which is reactive oxygen species. Now what we're going to

show a little bit later is that you can have genetic mutations that you inherit from your parents where you may not make enough glutathione, you may not recycle it, you may not make enough catalase, and you may not make enough SOD. These are the people who don't have the antioxidant mechanisms. And it's that proverbial straw that breaks the camel's back: It doesn't take much oxidative stress to push them over the edge. So this defense mechanism acts by suppressing or impairing the chain reaction triggered by the reactive oxygen species.

Bob Miller 17:05
Now, this is interesting: "Antioxidant defense mechanisms are impaired by being subjected to an agent that causes overproduction of reactive oxygen species, including EMF." So the net result is oxidative stress. What we see here is that we are making too many free radicals and if we don't have enough antioxidants, we're going to have a problem. I think that holds true not only for EMF but for many of the things that we spoke about. In our last interview, we talked about IL-6. [There are] multiple things we spoke about that create reactive oxygen species.

Bob Miller 17:45
Now, here's a study that says, "Although non-thermal effects do not raise the body temperature sufficiently, their effects can still be seen as an increase in free radical production in tissues." I can't tell you how many times I've spoken to folks about: "Well, be careful with your cell phones. Don't charge it next to your bed." And what's really scary is that sometimes some teenagers decide they don't want to miss a text message so you put your cell phone under your pillow.

Dr. Jill 18:12
Right? The brain. And that's what I was saying earlier. One of the things we know is that this affects brain glucose metabolism, and this is also in the literature. Granted, we don't want it in the breast, we don't want it near the prostate, and we don't want any of those things but at least please don't put it right by your head, because that, I think, is the worst of all.

Dr. Jill 18:31
One thing, Bob, as I'm hearing you with the reactive oxygen species, we know these are a big deal, just a practical tip: I think that's why both you and I are huge fans of the hydrogen tabs, and both of us have the hydrogen inhaled [form] that we often

use. I use it almost every day. Would you say that a really good general way that we can combat reactive oxygen is either hydrogen tablets or inhaled hydrogen?

Bob Miller 18:54
Oh, absolutely. And we're going to be talking about the Fenton reaction very soon. And the Fenton reaction, of course, is where we make those hydroxyl radicals. 2 OH^- + H_2 = H_2O (water). So we can take those free radicals and turn them into water. And I know a lot of people find that hard to believe. It's like, "You mean I drop this pill in the water and all of a sudden it becomes helpful?" But it does because water, of course, is H2O. Drop a pill in, a capsule, or a tablet; it knocks the hydrogen loose as it fizzes. And if you drink it quickly, you get the hydrogen. So here it says EMFs, no matter where they occur, are reported to cause a rise in the level of oxygen-free radicals in an experimental environment—hold on to your hat—in plants and humans. So scary stuff—we have no idea what we've done—when you think about how quickly we've acclimated ourselves to cell phones and Wi-Fi.

Bob Miller 19:58
In our schools, we're putting Wi-Fi up in the ceilings and we're putting cell towers on the schools and in churches. Many times, when you look at a hotel, the cell towers are at the top of the hotel. So if you're sitting in that room, you're being bombarded with EMF.

Bob Miller 20:20
Now, we're going to talk about the Fenton reaction in 1895 by Dr. Fenton. And when you think about it, Dr. Jill, isn't it amazing that back in 1895, before we knew these things, someone was figuring out the Fenton reaction? It's quite astonishing.

Dr. Jill 20:34
Amazing, yes.

Bob Miller 20:37
So this is where we take hydrogen peroxide, a product of mitochondrial oxidative respiration—yes and that's the same thing that you put on cuts—into highly toxic hydroxyl free radicals. "Studies have suggested that EMF is yet another mechanism through the Fenton reaction creating free radical activity in the cells." And when I do health consults, or in the software that I developed that the doctors use, one of the first things we look at [is]: Is there a potential for Fenton reaction? And there

are a couple of patterns that make people more susceptible then. We'll talk about that.

Bob Miller 21:18
But before we get to the Fenton reaction, here are the PubMed articles: EMFs have been shown to have the potential to stimulate reactive oxygen species, including superoxide, via the activation of an enzyme called NADPH oxidase. Now, I would encourage people to go back and listen to the video we did. We spent an hour or an hour and a half talking about NADPH oxidase. This is an interesting enzyme. The short version is that when we're faced with a pathogen or something coming into the body that shouldn't be there—what a miracle we really are!—it says: Hey, you don't belong here. The NOX enzyme says: Hey, Mr. Iron, give me some oxygen, something called NADPH, give me an electron. I'm going to start shooting some bullets. It starts shooting superoxide and hydrogen peroxide. It stimulates cytokines, mast cells, and histamine. It's going for the kill.

Bob Miller 22:18
If we didn't have that, we'd die of infection. However, it's kind of like a military that protects us from the enemy. But we have a real problem if the military starts shooting the citizens; it's called autoimmune disease. And I'm sure, Dr. Jill, you are seeing many more children now with autoimmune diseases like ulcerative colitis and inflammatory bowel disease than you did when you started practicing. I mean, this is just skyrocketing.

Dr. Jill 22:43
Epidemic. And one of the things with statistics is that each of these autoimmune diseases is in silos. So, we have the rheumatologist see the arthritis, the neurologist see the MS, the gastroenterologist see the Crohn's and colitis, etc. So each of these silos feels like a separate entity. It's all the same mechanism. So if we put it all together, it's the fourth leading cause of mortality among men and women in the US.

Bob Miller 23:10
Absolutely. Autoimmune disease is skyrocketing. It also activates nitric oxide synthase, which combines with superoxide to make peroxynitrite, and it decreases

the antioxidant activity of superoxide dismutase. This sounds like a rather perilous thing to me—what do you think, Dr. Jill?—if it does all of those things.

Dr. Jill 23:32
It sounds incredibly dangerous.

Bob Miller 23:36
Absolutely. [This is] one of my favorite drawings. I probably refer to this every day. I'll see if I can draw on here. Let me get my drawing tool here. Okay, so inside the cell, sometimes an electron flies off and combines with oxygen to make superoxide. Then, superoxide dismutase comes along and makes hydrogen peroxide. Then, if we have adequate catalase, glutathione peroxidase, and glutathione that feeds that, and we have enough peroxidase and thioredoxin, we turn this guy into plain ordinary water. But there's a lot that can go wrong here. Your glutathione can be used up elsewhere. You can have genetic mutations that [mean] you don't make enough. And then—you and I did another whole webinar on NADPH, one of my favorite molecules—if we don't make enough of this or we have the NADPH steal that we explain in those videos, we don't recycle these guys, and the hydrogen peroxide stays high. Here comes iron, and we have hydroxyl radicals.

Dr. Jill 24:52
A quick question for you, Bob, as you're talking about this. You talked about this in the beginning and we had some questions about this. Everybody's like, "Oh, gray hair—how do we fix that?" We're saying we know the cause partially; we don't necessarily have the cure. But if we could reverse this, [the answer is] yes. But what I'm wondering there is you're talking about that hydrogen peroxide and iron—do you think that there's an increased risk of early premature graying in those with hemochromatosis genetics? Could that be inferred? Or is that going too far from where you mentioned that?

Bob Miller 25:20
Well, tough to say because I've seen people who have the overabsorption of iron; they're making hydroxyl radicals. I'm totally speculating here, but I think if this reaction is going on en masse, they don't get the gray. What I've observed is that if you don't have excess iron and you don't clear the hydrogen peroxide, these are the people who gray prematurely.

Dr. Jill 25:39
Got it. So maybe it's the opposite. Actually, iron is instigating that reaction to OH.

Bob Miller 25:47
Yes. Then that will go on to combine with iNOS, the nitric oxide version that's more reactive, and ONOO—peroxynitrite—which, of course, we know is very oxidizing. Interestingly, in one of the first research projects we did, we researched people with chronic Lyme [disease]. As you know, some people have Lyme disease that they didn't even know they had. For others, one dose of antibiotics takes care of them. While others are sick for years and can't seem to get over it, even after a dose of antibiotics. We studied those people, and interestingly, they had a five-time higher probability of having the gene that would cause them to absorb more iron. We presented that in Helsinki, Finland, in 2016, and were very honored to receive the research award from ILADS at the international conference.

Bob Miller 26:40
Now, what are some of the things that can cause this to happen? There is a gene mutation called HFE, and when this is mutated—in other words, when you get a genetic polymorphism from your parent—your potential for increased iron absorption [increases]. [It's] very, very common among the English, the Irish, some Germans, and particularly the Ashkenazi Jews. Now, what's interesting is that, during times of famine, this mutation was actually to your benefit. Particularly in Ireland during the times of the potato famine, the women who had this genetic mutation were the ones who were healthy enough to have babies. So, it was an adaptive mutation back then.

Dr. Jill 27:25
Very interesting, Bob, because I have one copy of that one.

Bob Miller 27:30
So, maybe you have some English-Irish roots there, my friend. All right, SLC4A1—I am really intrigued by this one. This is the only iron exporter. When I see a lot of mutations in here, these people many times have massive inflammation. And then interesting things happen. We say to them, "Well, you've got the gene that can cause the extra absorption of the iron." And they'll tell me: "Well, that can't be right. I've been told I'm anemic my whole life." So, when the iron gets stuck in the cell, it makes inflammation, and blood levels can be normal to low. And these are the

people who, if they take iron, feel horrible. So some well-meaning health professional says: "Your iron is low. Take iron." It's like, "Wow, that just threw me for a loop."

Bob Miller 27:30
Ceruloplasmin, of course, is needed for the proper use of iron. If we don't have enough of that, the iron can become a free radical. Transferrin factor and transferrin factor 2 [cause the potential] over-absorption of iron. And then, as we said, if you have genetic mutations in catalase, superoxide dismutase... Keep in mind that superoxide is the free radical; superoxide dismutase is the antioxidant. Glutathione peroxidase clears hydrogen peroxide. TXN and PRDX clear hydrogen peroxide and peroxynitrite. We also need vitamin A for the proper use of iron. There's an enzyme called BCMO1 that converts beta-carotene to vitamin A. Mutations here will not allow that to work as well. I don't know if you've ever seen someone who wanted to become a health nut; they drank lots of carrot juice and turned orange because they didn't convert their beta-carotene to vitamin A. G6PD and ME1: They create that NADPH, which recycles the antioxidants.

Bob Miller 29:27
So you can see here when people are saying, "Well, what's the gene involved?" it's like: "Well, we don't have one of those. It can be any one of these or any combination." Just Bob Miller observing: HFE and SLC40A1 together are a problem. G6PD and glutathione together are a problem. And the more you have, the more it piles up on you.

Bob Miller 29:54
Now, let's look at this. That was the Fenton reaction. Let me go back to this chart. My whole point here is that if the EMF makes more superoxide, then you're going to have more hydrogen peroxide, and the more trouble you have over here combined with iron, the more likely you are to have the Fenton reaction.

Bob Miller 30:18
Now, let's move on to another method by which we can make all these free radicals. It says, "The initial stage of the reactive oxygen species production in the presence of radio frequencies is controlled by the NADPH oxidase enzyme." Again, we've done a whole video on this, and we call it the "Holme cycle," where the NOX enzyme—and

remember, we just talked about this briefly; it's a fascinating enzyme—without this, we die. We wouldn't be protected. So, it is our protection.

Bob Miller 30:53
When we're invaded by a foreign invader, the NOX enzyme says: We've got a problem. Iron, give me some oxygen. NADPH, give me an electron. Let's kick up some mast cells, some superoxide, some histamine, and kill this. Without it, we die of infection. If you knock out this enzyme, the animal dies of infection. However, I'm firmly convinced there are so many environmental factors. And if somebody's interested in this, go back and watch that video. I'm not going to repeat them all now. Watch that video where we talk about all the environmental factors that overstimulate this [and] make the mast cells, make the superoxide, and then make the histamine.

Bob Miller 31:33
So, what happens then is that there's something called the RAAS system, the renin-angiotensin system, that will crank up and make aldosterone and stimulate our nemesis, IL-6. Interestingly, IL-6 stimulates NOX, NOX stimulates IL-6, and we just get this positive feedback loop where this thing just feeds upon itself. So the more EMF creates the superoxide, the more that just makes more peroxynitrite, and in multiple ways, this feeds upon itself. So, again, I would encourage everyone to watch that video. And again, I don't have time to get into it here today, but again, a three-D chess game.

Bob Miller 32:20
All these little yellow boxes over here are our genes or enzymes. Mutations in any of these could make this whole process spin more quickly. So if someone says, "Well, what's the genetic predisposition to the Holme cycle?", it's like: "We don't have one of those. It's a combination of multiple environmental factors combined with perhaps multiple genetic factors." And that's what makes it so complex. So if somebody says, "Well, what's the supplement or medication to take?" Like, "I don't know if we have one of those," because it's going to be unique for each person. And just in Bob Miller's opinion: I believe that upregulation of this is why we're seeing so much autism, ADD, and autoimmune disease. I believe that many of the people who are struggling today, had they been born 75 years earlier, may not be the healthiest persons but wouldn't be as sick as they are today.

Dr. Jill 33:20
Bob, I couldn't agree more because it's really this environmental toxic load. And part of it's the EMFs, part of it's the chemicals, and part of it's the mold. There are so many viral loads, infectious [diseases], and tick-borne infections. All of these are on the rise. So even for me, 20 or 15 years ago, when treating patients, there was less complexity and people got better quicker. And I've seen that even in that short decade, there's been a massive difference in, first of all, how quickly people get better and how complex the illness is now. And I think it is directly related because toxic environmental insults, as you can clearly see in your diagram, will all stimulate NOX.

Bob Miller 34:00
Absolutely. And when I talk to elementary school teachers who've just taught for five years, I'll say, "How are the kids different today than five years ago?" Every one of them says [they have] more difficulty concentrating, [are] more angry, [and are] more frustrated. When I talk to college professors, [I say], "Tell me about the boys." "They're fragile." That's the word they keep using, fragile. They get upset quickly. I spoke to a gentleman who is a Texas Ranger, and he said he's still in contact with the organization. They constantly have to lower the standards of physical fitness because they wouldn't have anybody that could apply anymore. The boys are not as strong as they were 20–30 years ago. And if you'd listen to Dr. Theoharides, he believes that [as far as] autism, mast cells are playing a significant role as they create neuroinflammation.

Bob Miller 34:58
One of the things that concerns me—turn on the news for 10 minutes—is the amount of anger that people have, even on political views. I mean, families break apart and friends stop talking to each other because they have differing political views. In the past, we could have different views on politics but not hate each other. Now we're seeing such a rise in anger. The only thing I put on Facebook is, "Here's my recent interview with Dr. Jill." I'm not getting involved in conversations because everybody will lash out at you.

Bob Miller 35:37
So one of my researchers just found this, and I just about fell off my chair. As we know, some people get COVID; they don't even know they had it. Others are like:

"Eh, I had a cough and a sore throat. It wasn't all that bad." Others are gasping for breath on ventilators and dying. This was recently published, just on December 15th. I'm just going to read the bottom line here: "Taking into account all these evidences, we propose that pre-existing NOX pathway dysregulation could be a determining factor in the development of the severe form of COVID-19 infection." So this isn't saying it determines whether you'll get it or not or whether you fight it off or not, but whether you have a severe infection and the onset of the complications, worsening the clinical outcomes of the disease.

Bob Miller 36:28
I think this is incredibly significant. And I think that one of the concerns a lot of people have is: If COVID had hit 50 years ago, would it be as serious as it is today? Then it goes on to say, "The data discussed in this present opinion paper suggests that reducing oxidative stress could improve the poor outcomes that characterizes severe COVID-19 due to the central role exerted by NOX's pathway dysregulation and related oxidative stress in the main comorbidity associated to severe COVID-19. And considering its involvement in the SAR's CoV viral infection mechanism, targeting NOX enzyme seems a promising strategy to treat COVID-19 to prevent severe complications."

Bob Miller 37:18
I suspect what they're talking about here is medications that may inhibit NOX, and that's fine. But another way to go about this is: Find out what environmental factors are stimulating my NOX. Might I have a genetic predisposition that they harm me more than others? And then take some active steps. Now, I don't want anybody to say that cell phones are causing the problem with COVID, because I think it's much more complex than that. But I think what we can see from this is that it's got to be a contributing factor for some individuals.

Bob Miller 37:58
I was really intrigued by this drawing that was part of that study. And this was new to me. The virus comes in—of course, we all know it comes in using ACE2—stimulates NOX. And this was new to me. It inhibits the Nrf2 antioxidant response. I want to have my research team get on this. [I have] no idea how it does it. But for those who don't know, when we're faced with inflammation, Nrf2 signals the production, usage, and recycling of our glutathione and other antioxidants. So,

if we crank up the NOX enzymes to make more inflammation and we tamp down our antioxidant response, what are we going to have? A lot of reactive oxygen species going on. And potentially, this is a factor that's involved in why some people breeze through and other people are on ventilators and pass away. I mean, I'm sure there are other factors as well, but I think this has to go into the mix. I was a little stunned by this study because, as you know, Dr. Jill, we've been talking about the NOX enzyme for a long time.

Dr. Jill 39:11
Yes, it pulls it all together. I keep finding these things, too. I'm like, "Oh, LPS endotoxemia and the same cytokines like IL-6 are upregulated." So no wonder that diabetics, cardiovascular disease and some of the other predisposing factors that are related to LPS often have worse outcomes in COVID. It just makes sense.

Bob Miller 39:30
Mm-hmm. Yes, the more inflamed you are going into it, the more potential there is. All right, back to EMF. We spoke about superoxide dismutase. Now we're going to talk about glutathione. It's an antioxidant and an important cellular defense agent against oxidative damage. It reacts with the free radicals in the cell and reduces the entry of hydrogen peroxides. It also prevents the oxidation of sulfur groups in the protein structure. There's plenty of information out there [that says] that the lower your glutathione goes, the sooner you die from all causes. So we have to have glutathione to do this reduction of all of these free radicals.

Bob Miller 40:17
Now, interestingly, we were just talking about this before the show started. We were talking about [how] glutathione is especially important for the activity of glutathione peroxidase and glutathione reductase. This is what takes the oxidized back to the reduced. And I am absolutely convinced that mutations in this are more significant than we've ever realized. And we can talk about that at the end if we have a little bit of time.

Bob Miller 40:44
Here, they studied the effects of a 900 megahertz EMF for two hours a day for 45 days in rats. They reported that catalase and glutathione peroxidase activities decreased significantly compared to a control group. And, as you said earlier, this is now science. This isn't just a tin hat: "I think cell phones are hurting us." Similarly,

an increase in lipid peroxidation and—in studies, I never heard demolition, but that's an interesting word—[demolition] in glutathione levels were seen in all lymphoid organs after EMF exposure, suggesting that increased levels of lipid peroxidation may have been a consequence of depleted glutathione stores. So there it is, peer-reviewed literature—that it's decreasing our catalase and glutathione peroxidase activities.

Bob Miller 41:32
Going back to what you said about hydrogen water, hydrogen water supports the production of glutathione. That's why that can be so vitally important because, clearly, we're not going to get rid of our cell phones and our Wi-Fi. But we have to do things that may lessen the potential that harms us.

Bob Miller 41:53
So here's catalase. It's a common enzyme present in organisms exposed to oxygen. It's in fruits, vegetables, and animals. It catalyzes the reaction that degrades hydrogen peroxide into water and oxygen. And remember, we said that hydrogen peroxide combines with iron to make hydroxyl radicals. It's a crucial enzyme in the protection of the cell against oxidative damage caused by free radicals. And what does the EMF do? It reduces it.

Bob Miller 42:26
Now, here's another study. These researchers observed a decrease in catalase levels in an EMF-exposed group. They reported that EMF exposure led to the depression of anoxidant systems because of raised lipid peroxidation and the generation of free radicals. Mobile phones triggered oxidative damage in the living cell by increasing the levels of xanthine oxidase and carbonyl group activity and reducing catalase activity. It sounds like a train wreck to me, Dr. Jill.

Dr. Jill 42:58
Oh, absolutely. It's unbelievable how this all pulls together.

Bob Miller 43:03
Then back to SOD. SOD is an enzyme that catalyzes the reaction in which toxic superoxide is taken to molecular oxygen or hydrogen peroxide. Superoxide is generated as a byproduct of the result of the oxygen metabolism, as we talked about, leading to several types of damage to cells. And this study reported that

50-day exposure to EMF causes oxidative stress levels by increasing MDA levels and consequently reducing your superoxide dismutase activity. Now, interestingly, for both catalase and superoxide dismutase—those are your enzymes that are made from your DNA—mutations in those mean you're at more risk. In other words, the more it gets lowered by just the way you were born, then there's more of an effect on these outside exposures. So what are some of the genetic mutations that decrease catalase, SOD, and glutathione? GCLM and GCLS.

Bob Miller 44:05
It might be a good idea to pull a map over here. And to talk about glutathione a little bit, glutathione is made from cysteine. That's why sometimes people take NAC, or N-acetylcysteine, glycine, and glutamate. GCLM and GCLC are what make this occur. You can have mutations in here. But hold on to your hat. Mold will inhibit this. So what do a lot of people do? They're inflamed and they think, "Well, I need more glutathione. I'm going to take some NAC, or N-acetylcysteine. NAC, as it's called, if all goes well, will come down in here and make glutathione. However, if you've got mutations or mold, that doesn't happen.

Bob Miller 44:57
And many people know that cysteine can come down to what's called the transulfuration pathway. And if we have any difficulty—here's cysteine over here—so if it's in excess, sulfites are very inflammatory. If we've got problems with SUOX—not enough molybdenum or not enough heme—that sulfite doesn't turn into sulfate. And guess what sulfite does? It stimulates the NOX enzyme. Oops. And cysteine will also combine with iron to make hydroxyl radicals. So under the wrong conditions, we can think we're doing something good for ourselves by taking NAC to make glutathione. And lo and behold, we're making ourselves worse.

Dr. Jill 45:48
Bob, I agree. I think I've probably said this before—of course, I have all these personal experiences—but years ago, I could not take NAC, and it was exactly this. One way that patients might be able to tell is if their doctor checks organic acids and there's a high [level of] cysteine and taurine in the urine. That's often that CBS upregulation and the metabolism of the NAC or any of those precursors in the pathways you were describing. For me, it presented as pain, like shoulder and neck stiffness and pain.

Dr. Jill 46:13
And I remember the day I took my first one milligram of molybdenum, and it was like, "Oh, I feel really good." You and I are like, "Oh, of course!" right? At the time, I didn't understand the pathway, but it was magical how for me, molybdenum was like an anti-inflammatory or a pain pill because it took care of that excess sulfite issue before I knew what was going on. Now that I've detoxed from mold, I can take a lot of NAC without any issues. So part of this is, like we talked about, the personalization of medicine. The order of operations and the doctor working with you are so crucial because if you give some of these beautiful nutrients at the wrong time, you can actually make the patient worse.

Bob Miller 46:49
Absolutely. And just a quick note: Nrf2, the nuclear transcription factor, is what controls this. Keap1 holds on to Nrf2. So I often give the analogy: Think of Nrf2 as somewhat of a sprinkler system that turns on water when there's a fire. Keap1 is kind of like the valve that holds the water back and the heat sensor. So Keap, as the name implies, holds on to Nrf2. And when fire comes along, meaning inflammation, Keap1 releases Nrf2 and it says: Okay, guys, let's make some glutathione, let's assemble it, let's use it to take things out, and let's recycle it. However, we've just found one Keap1 that's very pathological and that actually—hang on to your hat, this sounds backward—makes Keap1 stronger. Keep in mind that Keap1 holds back Nrf2, so if Keap1 is too strong, Nrf2 doesn't get released.

Bob Miller 47:56
But interestingly, there are other variants that make Keap1 more active. And to really make it complicated, if you get a cancer cell, you want your body to make oxidative stress to kill the cancer cell. So if Nrf2 is too active, it can protect the cancer cell. So back to the Three-D Chess Game Played Underwater. But the one that I see most often, and possibly because of my demographics, the Keap1 is holding on to Nrf2 too strongly. Combine a Nrf2 mutation that makes Nrf2 weaker, and then mutations in any of these—it's a real train wreck.

Bob Miller 48:34
Now, for the doctors who are listening to this and might be doing genomics, I'd like to pass on what I believe might be one of our most important discoveries. Genetic

mutation and Keap1 hold this stronger. Genetic mutations in Nrf2 make it weaker. And genetic mutations in GSR, or glutathione S reductase, take your oxidized glutathione back to the reduced. We're observing that in the sickest of the sick—those who just cannot get on top of their inflammation.

Dr. Jill 49:03
Bob, I think that's important enough. I want you to repeat that just for people listening because they'll be like, "What did you say?" And they can rewind, but go ahead and say that one more time because that was a really important point.

Bob Miller 49:11
Yes, I believe this is one of our most important research findings. So, glutathione is what neutralizes your toxins and your hydrogen peroxide. It starts out in reduced, and after it does its job, it goes to oxidized. We need NADPH and GSR to take it back from oxidized to reduced. Nrf2 controls GSR and all of them. Nrf2 is released to do its job by Keap1. There's this one RS number that makes Keap1 stronger, meaning it holds on. So when the fire starts, it kind of says: Fire—what fire? I don't see a fire. Do you see a fire? So then it doesn't respond. But more importantly, if GSR is not doing its job, oxidized glutathione doesn't come back to reduced.

Bob Miller 50:08
Now, also, NADPH is a cofactor. We won't go into a lot of detail here, but if you watch our video on the NADPH steal... NADPH is a fascinating molecule. It's used to take oxidized back to reduced, but it's also used by the NOX enzyme to make inflammation. So this same electron can be used to make inflammation or reduce inflammation. So I call it the NADPH steal. But the bottom line is, if this oxidized doesn't get back to the reduced, this oxidized combines with oxygen to make superoxide and nitric oxide to make peroxynitrite, depleting our glutathione, oxidizing and damaging our DNA. So how ironic is it that, under the wrong conditions, cysteine or glutathione can make you inflamed and reduce your glutathione?

Bob Miller 51:07
Again, for the doctors who do this work, I just point out—this is our latest discovery—that Keap1 is upregulation and Nrf2 downregulation. And particularly when people have homozygous on GSR, these are the people that are barely functioning. And I've seen it in some of the most severe cases of autism, where the

children don't speak. They are violent. They cannot function. So it's too early to tell if we'll be able to help with that. But again, this is a dynamic—Keap1, Nrf2, and GSR—that we're observing. And we'll keep you apprised on that. All right, that's why I believe GSR is very important.

Bob Miller 51:51
GST is your glutathione conjugation and how it takes out toxins. We talked about mutations in GPX, mutations in Nrf2, any mutations in SOD1, 2, or 3, or catalase. And again, for the doctors who are on here or the health professionals, we've just upgraded our software. The National Institute of Health has determined which of the SNPs are really most significant and could be evidence-based or pathological. And we've now isolated those to show which ones might have more impact, giving us more ability to determine what's going on. That's how we discovered the GSR. There's one GSR that's considered pathological, and when that's mutated, that's when they really have a hard time taking their oxidized back to reduced.

Bob Miller 52:38
All right, so here's a study that shows "hundreds of studies showing microwave changes in calcium fluxes and intracellular calcium signaling." Now, of course, we all know that calcium is needed to build bone, but [when] used improperly, calcium can be very inflammatory. Now, there's something called the voltage-gated calcium channel. It sits on the outside of the cell and a slight voltage sends calcium in. You can have genetic mutations in these genes, and that means that voltage will send more calcium in. So, what is EMF? It's a voltage. So, downstream effects: Nitric oxide signaling, peroxynitrite, free radical formation, and oxidative stress. And in this study, this is put out by Martin Paul—of course, he's very well known—said, "It's time for a paradigm shift away from only thermal effects towards voltage-gated calcium channel activation and the consequent downstream effects."

Bob Miller 53:45
This is a SNP from my software, where we actually look at the calcium voltage channels. It seems as though these two in the middle are quite common to be heterozygous and don't seem to be a problem. Heterozygous means one parent. Homozygous means both parents. These two seem to be more severe. Even among sick people, this only shows up 3% and 2.7% of the time. Invariably, these people are very sensitive to EMF. And then here's another pattern where there are three. So,

by looking at these calcium voltage channels, you can get a clue if that voltage channel… And I'm not quite sure how this works. Martin Paul knows more than I do, but I make the simple analogy that the gate is a little floppy, and voltage pushes calcium in a little bit more robustly. I've never seen genetic mutations that are that accurate, because many times mutations are a predisposition. [They] could be effective or maybe not. We found these to be very effective.

Bob Miller 54:50
Now, here's what happens. Here is the calcium voltage channel, CACNA1C. This is the cell membrane. Here's calcium. When you've got this mutated—in other words, it's weak—EMF comes along and pushes more of the calcium in. As we said, that stimulates the nitric oxide. Then EMF, as we already showed you, stimulates superoxide. Superoxide and nitric oxide [react to form] ONOO, (peroxynitrite). So, if you've got weakness in glutathione peroxidase, or glutathione in general, or you don't have enough SOD, we're going to make more peroxynitrite, [which] damages your DNA.

Bob Miller 55:35
Now, a couple of nutrients are fascinating. Cat's claw is a natural calcium channel blocker. Of course, magnesium balances calcium, and vitamin K2 is needed for the proper delivery and use of calcium. SOD, catalase, resveratrol and rosemary help SOD. Witch hazel, rosemary, grape seed extract, and selenium sop up some of your peroxynitrite. So, those are nutrients that you can use to actually slow down this, in addition to staying away from your EMF.

Bob Miller 56:16
Now, we want to talk a little bit about peroxynitrite. I think we spoke about this in our very first [interview]. I think it was our first interview that we spoke about peroxynitrite. So, if someone wants to learn more, go back and watch that one. But the cliff notes: Peroxynitrite, produced from nitric oxide and superoxide, has been proposed to cause neuronal dysfunction and cell death in aging and age-related degenerative diseases. 3-nitrotyrosine, an oxidation product of tyrosine by peroxynitrite, was reported to increase in degenerating brains. That's a scary thought. Now, interesting: Calcium channel blockers block EMF effects and several types of additional evidence confirm this mechanism. So calcium channel blockers could actually be supportive of that.

Bob Miller 57:04
Now, this is interesting. There's a molecule called hirsutine. I'm probably not saying that right. But it actually comes from cat's claw. It is concluded that this, from cat's claw—this is the botanical name, common name—inhibits that calcium-voltage channel blocking activity, mainly through inhibition of the voltage-dependent calcium influx. Cat's claw, which has been around for a long time, comes from a tree that grows in South America. It's been used historically for the immune system and other things. And here it is. It's a calcium channel blocker.

Dr. Jill 57:39
Wow. I love that, Bob, because practically speaking, I use it all the time to treat Borrelia and also Epstein-Barr. And I'm sure [inaudible] bacteria and a virus, but it's very powerful in conjunction with other herbs for each of those things. And for Borrelia, I use it with other herbs. And then for Epstein-Barr, I combine it with something like monolaurin or lysine. But it's very, very effective for both of those infections, probably for immune support and stimulation. But who knows if there's this effect on calcium channel blocking that also promotes the immune system?

Bob Miller 58:11
Well, it may be multifactorial, and that's the beauty of the things that God put on the earth for us. They're very complex. I'm totally speculating here, but clearly, peroxynitrite suppresses the immune system. So if, by having calcium channel blocking, that reduces the peroxynitrite, [there's the] potential that that could be another factor as to why it's helpful. So here it says: "The major active component showed rosemary acid to have strong ability to scavenge peroxynitrite." So here they're saying in this article that these scavengers might be developed as therapeutic drugs for preventing peroxynitrite-involved diseases. So I guess what they're suggesting is: Can the pharmaceuticals somehow synthesize the active ingredient? But it's already there in rosemary acid.

Bob Miller 59:03
Then here there's an article that says: "The radioprotective effect of rosemarinic acid against mobile phone and Wi-Fi radiation induced oxidative stress in the brains of rats". So here they're saying there's a significant elevation of nitric oxide and a significant reduction in glutathione, glutathione peroxidase, total antioxidant capacity, SOD and catalase in the RF radiation-exposed rat's brain compared to the

control group." Hang on to your hat: "Rosemaric acid reduced the levels of nitric oxide, elevated glutathione peroxidase, superoxide dismutase, catalase and glutathione levels in the rat brains in the radio and Wi-Fi groups compared to" the other group. So the bottom line of this study is that rosemaric acid can be considered a useful candidate for protecting brain tissues against RF radiation-induced oxidative stress. So who'd a thunk this simple thing that has been on the earth could have that kind of an impact? I mean, when you think about it, it elevates all of these things; that's astonishing when you really think of it. And what a miracle it is that something that God put on earth for us can be that helpful.

Bob Miller 1:00:22
Now, we also show that witch hazel has shown the strongest effect for scavenging peroxynitrite. I'm not even going to try to say that. The major active component of witch hazel bark was shown to have a strong ability to scavenge the peroxynitrite. It is suggested that this might be developed as an effective peroxynitrite scavenger for the prevention of peroxynitrite-involved diseases. So that's why in some of the formulas that I put together for EMF, [I've said], "Let's put those in there. Let's put some cat's claw, some SOD, some witch hazel, and some rosemary." Put them all together.

Bob Miller 1:01:02
Now, selenium—this one is almost a no-brainer—we know that selenium is needed to recycle your glutathione. And here they're saying that nano-selenium could improve the cognitive impairments of mice exposed to RF by increasing antioxidants, decreasing free radicals and the changes they make to the cerebra neurotransmitters. And we don't get as much selenium as we should either. Now, this is interesting. And again, I would encourage people to watch our interview on IL-6. I can't tell you how many of my own clients and others have just loved that interview that we did. That's going to be a tough act to follow.

Dr. Jill 1:01:40
I know. We outdid ourselves totally. I'll be sure to put a link for all of you listening on YouTube, on Facebook, and everywhere this is posted, because that was really worth your time to watch the IL-6 one. I'm going to be sure to link that up, Bob.

Bob Miller 1:01:55
Okay, sounds good. So here, they did a study: 112 employees of a power plant were

the exposed group and 138 unexposed [participants] were enrolled in a study. Pro-inflammatory cytokines, including IL-6 and tumor necrosis factor, were measured. Conclusion: Long-term exposure to these EMFs affects the immune responses by stimulating the production of these pro-inflammatory cytokines. So I'm just going to very briefly, extremely briefly talk about them. But, again, watch that link. In case anybody says, "What's a cytokine?", here are the cliffnotes. They're a class of chemical mediators involved in signaling between cells. 'Inter' meaning between 'leuk' [is a] reference to the leukocytes. They are a cytokine and they're signaling molecules that aid cell-to-cell communication. And again, needed, but in excess, a problem. Some are involved not only in the initiation but [also in] the persistence of pathologic pain by directly activating sensory neurons. And some are involved in nerve-injury/inflammation-induced central sensitization and peripheral inflammatory responses.

Bob Miller 1:03:08
Now, this is an interesting study. And we talked about this in the other interview we did. I'm showing just this slide. When comparing successfully aging individuals to those with aging-related diseases/disability, there were lower IL-6 levels in the successfully aging group. Longer survival was associated with lower concentrations. Conclusion of the study: IL-6 and CRP levels were good predictors of physical and cognitive performance and the risk of mortality in both the entire elderly population and successfully aging individuals. And this was a huge study of thousands of people, not just a quick [one]. And then IL-6 was consistently related to all-cause mortality, independent of the levels of adjustment, showing a dose-response relationship between IL-6 and the risk of death. IL-6 is a powerful predictor of all-cause mortality in male elderly community dwellings.

Bob Miller 1:04:14
Now, again, back to COVID. During a meta-analysis and systematic review, elevated IL-6 levels were found to be significantly associated with adverse clinical outcomes. Now, let's look at what we just said before. There's a NOX relationship. Well, NOX stimulates IL-6. IL-6 stimulates NOX. There was a reported 2.9-fold increase in mean IL-6 concentrations in complicated COVID-19 cases. One other study: "Interleukin-6 is one of the main mediators of inflammatory and immune response initiated by infection or injury and increased levels of IR-6 are found in more than one-half of patients with COVID-19. ... IL-6 is associated with inflammatory

response, respiratory failure, needing for mechanical ventilation and/or intubation and mortality in COVID-19 patients."

Bob Miller 1:05:08
Now, guess what IL-6 mutations are? Gain of function. So, when you've got homozygous mutations in IL-6, they may lead to gain of function. Now, what gain of function means is the IL-6 is quicker to be made. These 2s on here mean that these individuals got a mutation from both [their] mother and father. Just observing: As we see people who have a lot of mutations, they have a lot of inflammation, jumping from one doctor to another, desperately trying to find a result, and not having much success until we start addressing this overactive interleukin-6.

Bob Miller 1:05:56
Now, we showed this the last time, so I'm not going to go into a lot of detail. But again, watch that video. We showed all the environmental factors that will stimulate interleukin-6 and all the internal things that will do it. And some of the things that will inhibit it: Hydrogen water, [which is at the] top of the list here, thiamine, riboflavine, black cumin seed oil, apigenin from parsley and chamomile, pine bark, oxytocin—hug a family member or your dog—PEMF, Vitamin D, and the good fats. And again, we go through all that in that 1 hour and 50 minute interview.

Bob Miller 1:06:35
But just briefly here, you can see that IL-6 stimulates NOX. NOX stimulates mast cells. Mast [cells] stimulate histamine. KIT genes—if you've got mutations here, they're going to be trigger-happy and make more. One of the things I'm astonished at is how many people have mutations in their ABP1. They don't make enough DAO to degrade histamine. Their MAO degrades histamine. Histamine and methyl transferase degrade histamine. And I don't know if we had an opportunity to talk about this, but we are very intrigued. Histidine decarboxylase takes histidine, an amino acid from things like pork and beef, and turns it into histamine. We're finding that when people have a mutation in these significantly evidence-based HDCs and they have mutations where they don't degrade their B6, these people often overproduce histamine. So how often do you see elevated B6, Dr. Jill?

Dr. Jill 1:07:39
I would say quite frequently, actually. So yes, this is a big deal. And I haven't always

had the answers to exactly why that is. Even for some people who are not taking B6, which is even more puzzling. But that makes sense here.

Bob Miller 1:07:53
Yes, well, if we get a chance, I'll show you. There are two genes that I'm very intrigued by, and they are related to the degradation of B6. And well, why don't we do that?

Dr. Jill 1:08:06
Yes, let's do it.

Bob Miller 1:08:07
Let's do it. Let's pull in the pyramid. This is the pyramid that we use, and there's a section called nutrient metabolism. And I don't know what we'll find in this person but in the software, these are all the genes that are related to nutrient metabolism. I'm just going to zip right on down here to B6. Here's molybdenum. So when you've got mutations here, you might need molybdenum to support the sulfite-to-sulfate conversion. If you have mutations in thiamine, it is very important to supplement with thiamine.

Bob Miller 1:08:42
Riboflavin—the same thing. I think we spoke about that last time. So here's your pantothenic acid. And B6 is coming right up here. So for doctors who are doing any of this work, keep an eye on these two right here. PDXP [has an important role in the] degradation of vitamin B6. And I have my researchers on this: NBPF3. I am very intrigued by this. This is part of clearing vitamin B6. We're very early on, but we are noticing that when people have mutations in this B6 clearance, they oftentimes have high levels of B6. And unfortunately, sometimes people take multiple nutrients. They don't pay attention. A lot of people say: "You don't have to worry about the B vitamins because they're water-soluble. They'll be excreted." But what we're finding is that when people have mutations here, along with mutations in histidine decarboxylase, their histamine is through the roof. And many times, they don't recognize it. So for the doctors who are watching this, keep an eye on NBPF3 and PDXP.

Bob Miller 1:09:59

We're still researching this so I don't want to say it's definitive. Maybe someday we can talk about this in more detail. But I have a sneaking suspicion that mutations here, along with other things that don't allow you to clear your histamine... So for example, if you've got a lot of histamine being produced and you don't have enough DAO—maybe your HNMT is mutated or you don't have SAMe or you've got mutations in glucuronidation—and then on top of that, your HDC enzyme is cranking, turning histidine into histamine, [it's the] perfect storm. And I believe this might be happening.

Bob Miller 1:10:46
Interestingly, iodine, testosterone, and ECGC from green tea temper this down. So what's happening to our testosterone levels—particularly in the men—dropping, particularly in the younger boys? And then COMT, or catechol-O-methyltransferase—testosterone. strengthens it, which clears dopamine and other nasty things. So for boys, particularly, dropping testosterone can have a profound, profound impact. And I'm sure you're probably noticing that testosterone is dropping in boys dramatically.

Bob Miller 1:11:35
Now, what are some ways that we can reduce that IL-6? During a meta-analysis, curcumin was found to reduce circulating IL-6 concentrations. The lowering capacity was not even dependent upon the dose or duration of the supplementation. Here is another analysis. Pycnogenol was found to decrease CRP and have an anti-inflammatory action. Here are thiamine and riboflavin. They will actually help the anti-inflammatory activity of dexamethasone and reduce the production of tumor necrosis factor-alpha and IL-6. And then good old black cumin seed oil. The bottom line of this study was that it significantly reduces interleukin-6. So those are all things that people can take that will reduce the interleukin-6. But on the other hand, you have to do things that also reduce the overproduction of it.

Dr. Jill 1:12:36
And Bob, I know you mentioned this last time, but black cumin seed is a favorite for clostridia. So that's another treatment option that we use. Again, you need to consult with your doctor. We're not giving medical advice, but there are other

benefits. I've had really good luck with the gut and excess clostridia with black cumin seed.

Bob Miller 1:12:54
And I think that's why some people think that they're allergic to it or can't handle it because it's doing the die-off. Now, this one blows me away. Apigenin found in parsley and chamomile has been shown to enhance the expression of glutathione synthase, catalase, and SOD, inhibit NADPH oxidase, increase Nrf2, and strongly decrease IL-6. Parsley. Seriously? But who would have thought? This is the ingredient that's in the parsley, but also in chamomile. I mean, when you think about how such a simple food has such an impact on us... So sprinkle that parsley on your food. But I'm a big fan of supplementing with parsley.

Bob Miller 1:13:52
And selenium—we spoke about that. Multiple linear regression analysis shows that serum selenium was significantly inversely associated with interleukin-6 after adjusting for potential confounding factors. Of course, it would make sense because if it helps your glutathione recycle, you're going to have more glutathione available and reduce the inflammatory cascade.

Bob Miller 1:14:16
Now, I'd like to mention that we're having another conference in 2021. And, Dr. Jill, you and I have to talk about if maybe we can have you participate in that again. Our subject is going to be cytokines, heavy metals, plastics and oxalates. The schedule and everything are still in progress, but if you're a health professional or just somebody who wants to lurk and listen, [visit] NutriGeneticResearch.org. And for health professionals, we do have software called Your Genomic Resource, the genetic test. We have our Functional Genomic line, software that interprets it, and we have education. So if you're a health professional and think that adding this to what you're doing is helpful, check it out. If you're not a health professional, we only work with licensed doctors, naturopaths, or other certified people on this. So this is not for the general public.

Bob Miller 1:15:14
[For the] online certification course: NutriGeneticResearch.talentlms.com. Anybody can take this. Obviously, you can't use the information if you're not qualified to do

so. But a lot of people just think this is interesting. They can take the course. And a lot of people want to know how to get ahold of us. We do health coaching at our office. There's our phone number and our website. For the doctors who are on here who want to learn Functional Genomic Analysis, [visit] FunctionalGenomicAnalysis.com. Yvonne Lucchese is the executive director and she or some of the sales staff can help you out.

Bob Miller 1:15:57
Let me stop this screen share here. Stop the share. There we go. So the bottom line: EMF is hurting us in many, many ways. As we talked about, it initiates the Fenton reaction. It does the NOS uncoupling by creating more peroxynitrite and stimulates IL-6. So, as you said, some common things to do: Keep that cell phone away from you. Don't charge it next to your bed. I personally got a little Faraday cage for my Wi-Fi so that it reduces the amount of EMF. Use those [wired] earbuds rather than the Bluetooth [ones]. Try not to spend a lot of time next to your Wi-Fi machine. Some people are concerned about the meter on the outside of their house. Some people can get the electric company to go back to traditional reading or you can get cages to put over them. And just use some common sense.

Bob Miller 1:17:01
One of the things that concerns me the most is when people stream to their television sets. When you get a text message or an email, blip, not much. But when you're streaming to your TV, that's a lot of EMF. And one of my concerns is that, particularly if the router is between you and the television set, all that's passing through you. So I think we're going to find over time that EMF is not this benign little thing that brings us the world. But I have a sneaking suspicion we're going to have a big 'Oops!' to all of this someday. So the best we can do is avoid [it]. Personally, I sleep in a 5G block bag every night. There's a sleeping bag that you can get that is made out of silver threads and protects you. And just some common sense things to try to stay away a little bit. Make sure your antioxidants are working well. And try to do the best you can in what may be a relatively tough situation.

Dr. Jill 1:18:03
Bob, this is such great information. Thank you so much for all the hard work you and your team have done to share it. Again, I couldn't be more excited as we partner together to support your educational platforms and all that. And I would

just add the same thing: Don't keep your phone next to your body. Do not keep it on or charging at night. I always recommend airplane mode, and if possible, charge it in another room at night.

Dr. Jill 1:18:27
And then there are some devices that I found useful. There are so many out there. These are just the ones I use. On my phone here, this little guy is called an Aires Tech. I'll put a link to where you can get that. And then the brand new one that the Aires Tech company has is called a LifeShield. And that's this little guy right here. This company has over 200 IBM patents, as far as the background, in EMF protectiveness. This thing can be stuck in this little pocket and worn around your neck. And again, I wasn't actually planning on showing these; that's why you saw me lean down. I was like, "I'm going to show this stuff," because this is what I use.

Dr. Jill 1:19:00
Nothing is as good as keeping the cell phone away from your body and working with your practitioner to have nutrients that protect you. But all these things can be super helpful. And I don't have it with me but my dogs actually have dog EMF protectors. So you can actually get these for your dogs. This Lifetune is a brand new one. It's like 30 times more powerful for 5g, especially. So the Lifetune series with Aires Tech has been geared towards 5G protection. And that's the line that has the dog tags and has these guys here. This is 50 square feet. The dog tags are 12 square feet around your pet. And then there are the phone ones. They have lots of devices. I also often wear a BioShield. It looks like a necklace or a medallion.

Dr. Jill 1:19:47
I personally have actually felt better. I'm not an electrical engineer, I know the bioscience of the human body, so I am not your expert on EMF devices. But I'm just telling you stuff that I use personally and have found to be helpful for my physical well-being. Also, you've heard me talk about PEMF mats and people are like, "Oh, isn't that worse?" [For] patients with severe EMF sensitivity—that mimics the earth's surface, so [it helps with] earthing and grounding—PEMF, or pulsed electromagnetic frequency, I have found to be incredibly helpful.

Dr. Jill 1:20:20

And it's funny, my little story. You probably heard me talk about this before but my friend, a naturopath, has a $20,000 PEMF mat. So I was like, "Oh, that's out of the range for myself and most people that I know." That's a really, really expensive investment. But HigherDOSE recently made one that was very simple under $1,000. That's the one I use. It's quite affordable in the relativeness of PEMF mats. So I really have the HigherDOSE PEMF mat. Again, I'll link to the "Products We Love" page so you guys can see and check this out yourself. I feel like it's an affordable option. In fact, I like it so much, I bought them for my staff for Christmas and my family. So I've purchased a lot of these because I actually believe in them and they work. So check those things out. See what works for you.

Dr. Jill 1:21:06
And again, the other stuff: Just keep them away from your body. Take in the nutrients. [There are] so many things out there to do. And Bob, thank you so much for your time and your expertise today. As always, it's been a joy. It's been a full ride of great information. We'll be sure to share this. So thank you all for joining us today.

Bob Miller 1:21:25
My pleasure to be here.