Explaining the Mechanism of Wireless Harm, Part 1
Guest: Dr. Martin Pall

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Josh: With us today on the summit is Dr. Martin Pall. Martin, thank you so much for being with us.

Dr. Pall: My pleasure.

Josh: This is an interview that I've been looking forward to for a long time. I think I contacted you around a year ago, and we've been trying to set it up. And so now that we're doing the summit, I'm just very pleased to be able to talk with you and to be able to help your vast knowledge and information get compiled and released to the people, to the viewers. It's very important at this time. So I'd like to just read your bio, and then we'll dive right in.

Dr. Pall: Okay.

Josh: So, Martin Pall is a Professor Emeritus of biochemistry in basic medical sciences, at Washington State University. He earned his PhD in biochemical genetics from Caltech, and was on the faculty of WSU for many years before; "retiring" in 2008. But you haven't really retired, have you? You just continue to do a lot of work in this area. Since then, he has published numerous papers on wireless radiation effects. Dr. Pall's research has focused most on nine different categories of the effects of wireless radiation, including neurological and neuropsychiatric effects, cellular and DNA, cell death, endocrine effects, cancer, cardiac effects, very early onset Alzheimer's, and other dementias.

One of the most valuable contributions Dr. Pall has made, is describing in detail, the main mechanism by which these effects are produced. So, Dr. Pall,

let's dive right in. So talking about these so called government safety standards, governments and their agencies are telling us that 5G, just like other wireless sources, is going to be safe because it comes below the threshold; below their stated threshold of supposed safety. What can you tell us about these government standards and why we should or should not look to them as defining what is and isn't safe?

Dr. Pall: Well, with any theory, and basically, the safety guidelines are a theory that predicts what things are safe and what things are not safe, you need to test the theory to see whether it makes accurate predictions. And so what I've done recently is to go through each of eight different types of repeated studies, which tell us whether the safety guidelines in fact, predict biological effects and therefore are safe or not. In every single one of these, these safety guidelines fail and in most cases, fail massively, to make accurate predictions. And it's very interesting to see the way in which they fail because the way in which they fail tells you a lot about what the problems are with the safety guidelines.

So I guess what I'd like to do is to go through those eight with you. So we can we can discuss what's going on and why these safety guidelines really don't tell us anything about safety. Okay, so the first thing is that there are these different effects that you discussed in your introduction. There are large numbers of reviews on nine different effects that have been published, that clearly show that each of them occur at levels well below safety guidelines. And therefore the safety guidelines do not predict safety. And by the way, they range from nine to 38 different reviews on each of these things. So there's a lot of evidence on every single one of them.

So let's talk about them. First of all, you have reproductive effects. So, the reproductive effects... EMS, well below safety guidelines, have effects on the structure of the testes, and the structure of the ovaries. Both of those have been done in animals. They produce a lower sperm count, lowered sperm motility; other measures of lowered sperm quality. So all those things are very important for male fertility. They produce lower number of eggs in females and lowered fertility, in human studies. They produce increases in spontaneous abortion, and humans and in animals. They produce lower levels of each of the three kinds of sex hormones; estrogen, progesterone, and testosterone, and lower libido.

So everything that you can think of that might impact reproduction is being impacted here, and this is extraordinarily serious; at levels well below our safety guidelines. And in many cases, orders of magnitude below the safety guidelines, like 1,000 times lower or 100 times lower. So that's a big deal. Now, there are all these other things, there are widespread neurological,

neuropsychiatric effects. And we'll talk about those in some detail, I think, in the second interview. And they are already far along in our societies. And we'll talk about that also, in the second interview.

There are other effects. The mechanism of action goes through excessive intracellular calcium, which produces everything else, and so that's one of the things it's produced. These are intracellular calcium levels go up, following EMF exposures. Oxidative stress, and free radical damage goes up following EMF exposures. What's called apoptosis, sometimes pronounced apoptosis; programmed cell death, goes up, following EMF exposures. Again, all of these well within our safety guidelines.

Josh: Just to jump in, you're talking about peer reviewed published science that is vetted and within the scientific community, right?

Dr. Pall: Yes.

Josh: But which the safety standards and the governments are not taking into account?

Dr. Pall: That's correct. So the apoptosis is very important, both for the reproductive effects that we already talked about, and also neurodegenerative effects and so that's important. And you also have attacks on the cellular DNA, of three different types. You get single stranded breaks, you get double stranded breaks, and you get oxidized bases, they all produce important mutations that can be involved in both cancer causation and in reproductive... producing mutations in young babies that were just born. So that's a big issue.

And then cancer, which of course is caused to some extent by the DNA effects we just talked about. There are 38 different reviews arguing that EMFs, well below our safety guidelines, cause cancer. And I think it's absolutely stunning that we're still discussing this issue. The only reason we're discussing it is because the industry puts out so much propaganda, that it's getting covered all the time. But there is extraordinary evidence that cancer, in fact, is caused by EMF exposures. And that the DNA effects we talked about before are an important part of that, but not the only mechanism. There are other things that are going on as well.

There are also hormonal effects of various sorts. Almost every hormone system or perhaps every hormone system in the body is impacted. And then there are also the cardiac effects, which we haven't said anything about. So the EMFs cause immediate tachycardia, rapid heartbeat. They, over longer time periods, produce bradycardia, slow heartbeat, and they all produce arrhythmias. Arrhythmia is associated with bradycardia, and are highly associated with

sudden cardiac death. And we have a big epidemic of increases in sudden cardiac death, including among apparently healthy athletes, dying in the middle of an athletic competition.

Josh: Yeah, sorry to jump in there, Martin. We saw a Canadian longtime career journalist, exposing what was happening in, I believe the Simcoe County School District in Ontario, in a talk to, I think the board there, the school board. And he was telling how since the Wi-Fi was installed several years ago, in a short period of time, there was two sudden deaths from students and two others, cardiac arrest that were resuscitated. All around the time from the Wi-Fi being installed. And in many of these districts, and most regions aren't correlating that possible link between when Wi-Fi transmitters and all these Wi-Fi devices go live; and effects like that. I mean, so that one thing alone is potentially, like, huge, in terms of the risk of what we're talking about here with 5G and beyond.

Dr. Pall: Yah, it is. I mean, there are many, many risks, and we'll talk about five of them that are, I believe, clear, existential threats to our survival. And I won't even be talking about the cardiac effects at that point.

Josh: We'll dive into those in the second half, in part two. If you're watching this, we'll go into those five specific areas. What we're going to do now is just more of an overview to expand the science and the mechanism really. So yeah, please continue, Martin.

Dr. Pall: Okay. So we have all these things. By the way, there's a total of 197 bodies of evidence, each of which shows that one of these things is occurring at levels well below our safety guidelines. So there should be no question about any of them. And yet the reason, of course, we're still talking about it is because of all the industry propaganda, which has no connection with reality. And by the way, there are a whole series of types of radiation that we are exposed to all the time that have major effects on us.

So we're talking about cell phone radiation. We're talking about cordless phone radiation. We're talking about cell phone towers, you know, people who live near cell phone towers. We're talking about Wi-Fi. We're talking about smart meters. All of these have major effects on us, based on all the available evidence we have. So it's really outrageous that people don't have a feeling for what they're facing. And the main reason is because of all this industry propaganda, and the lack of coverage in the media, on all these things. And again, we're talking about peer reviewed studies, in the scientific literature, that show all these things. I mean, we're in a weird situation. Okay, so let's go on with regard to the eight. That's just one of the eight that we just talked

about. That 197 bodies of evidence. That's just one of the eight. Okay, let's go on to two.

Josh: One of the areas in which…?

Dr. Pall: Areas where you have extensive, repeated evidence that the safety guidelines do not predict biological effects and therefore do not predict safety.

Josh: Okay, thank you.

Dr. Pall: Second one, we have 13 different reviews that each show that pulsed EMFs, EMFs that pulse up and down rapidly, are in most cases much more biologically active. And therefore much more dangerous than our non-pulsed EMFs. And part of the reason this is important, is that every single wireless communication device communicates at least in part, via pulsations. So, these are things we are exposed to all the time. And even radar has as its own sort of pulsation because it uses something called phase arrays, which exposes us to pulsations.

So, almost everything we're exposed to is highly pulsed, and the smarter the device, the more the pulsations. And potentially, and I believe actually, the more dangerous it is. So we're going down this road towards smarter and smarter devices, with the whole issue of pulsations being key, and this is totally ignored. The whole role of pulsation, totally ignored in the safety guidelines and totally ignored by the regulatory agencies. Even though we've known about these things. I mean, the first review on pulsations was published back in 1965. Believe it or not, and so it's bizarre where we are. Okay, so that's the second area and it's very important, and especially important with regard to 5G, because 5G is terribly highly pulsed.

The third area has to do with what the main mechanism is, by which non-thermal effects are produced. And this is my own work, not based on my own experimental studies, but based on studies that were in the literature before I ever got involved in this. So what we know is that there are, I believe, 28 different published studies that have shown that EMF effects, these non-thermal effects, can be blocked or greatly lowered by using calcium channel blockers.

And there are five different classes of these that have been used for these studies. And they're all thought to be highly specific in what they do. So this argues that those calcium channels, and they're called voltage gated calcium channels, which are blocked by these drugs, these calcium channel blockers; that what the EMFs are doing is activating those voltage gated calcium channels. Therefore, you can block or greatly lower the effects by essentially blocking these channels.

Josh: Do you want to dive into that more now? And we will be able to show some visuals on the screen as you talk about this. But is what you're saying, EMFs disrupt the ability for calcium ions to go in and out of the cell through the membrane? Is that correct?

Dr. Pall: No. What the EMFs do is they actually greatly increase the influx of calcium ions through these voltage gated calcium channels. The voltage gated calcium channels, I abbreviate as VGCC, is just so you don't have to keep repeating all that stuff. So what happens is that the VGCCs get activated by the EMFs and we know now why they get activated. And this is very important. The VGCCs have a structure called a voltage sensor, in which the normal physiology, it detects the electrical charge across the plasma membrane.

So, these are channels in the plasma membrane, the membrane that surrounds all of our cells. And as far as I can tell, they occur in every single cell type, not necessarily at the same levels, not necessarily the same types; there are actually 10 different types of these things. But they occur in all of cells. And when the channels open up, they allow large amounts of calcium to flow into the cell. And most if not all, biological effects are produced by excessive intracellular calcium. And intracellular calcium is designated Ca2+i, which I think is on some of my figures that you may be showing.

Josh: So that's a huge point right there. In the fact that there was an existing body of science before, like, you've looked at these studies, you've expanded this awareness about the primacy of the role of VGCCs. And you've added to this body of knowledge, and you're bringing it forward; because for years, that's been kind of a distracted question by the industry, is, "What then is the mechanism?"

So now you've essentially answered that and there's others who have different parts of the puzzle, such as Paul Héroux, who is part of the summit, and other researchers. But this, I just want to focus in on that, for people to realize this mechanism, this aspect of the mechanism and the science of how these molecules work together, and these VGCCs. That's absolute prime knowledge and information that everyone needs to be aware of. Would you agree?

Dr. Pall: Yeah, well obviously I will agree. Of course, I have a little bias in this but let me just say; the first paper that I published on this that I published in 2013, has now been cited 219 times in the scientific literature, according to the Google Scholar database. So that's very important because what it means is, is that this has been widely recognized. And this is unusual, usually in science, when you come up with a new paradigm of what's going on, it takes quite a while before people accept it. But this is already widely accepted. That

doesn't mean everybody accepts it. But it means that there has been a stunning amount of acceptance of this view, in a short time period. So that's important.

Now, there are a couple of other very important things here that I want to mention. And one is that, all the EMFs, all the way down from millimeter waves, through microwaves, through radio frequency, through intermediate frequency, through extremely low frequency from our power wiring, 50 or 60 hertz, depending on what part of the world you happen to be in; all the way down to static electrical fields, and amazingly, static magnetic fields, they all can work via VGCC activation. And this is absolutely stunning because it's a big surprise.

So then the question is, why is it that the VGCCs are so sensitive to low intensity EMFs? And I think the reason basically comes out of the structure of the voltage sensor, the thing that actually regulates the opening of the channel. So the structure has been known for a while, from a number of important scientists who've worked on this thing. And what's true is that the voltage sensor occurs on four different alpha helices that are within the structure of the VGCCs, and that occur within the lipid part of the lipid bilayer. So they're in the fatty part of the lipid bilayer of the plasma membrane.

That turns out to be very, very important for two distinct reasons. And one is that there's something called Coulomb's Law, it's the law of physics; it was first enunciated back in 1784 by August Coulomb, a French physicist. And Coulomb's Law says that the forces on electrically charged groups are inversely proportional to the dielectric constant of the medium in which they occur.

Josh: Translation?

Dr. Pall: Well, so the dielectric constant of the fatty part of the membrane is about 120th of the dielectric constant of the aqueous parts of our cells and bodies.

Josh: What is dielectric?

Dr. Pall: Well, it's a measure of the electrical properties, basically, of that part on a charger. The point is that the forces on those charges are about 120 times stronger, because of the dielectric constant. Okay, so that's important. The other thing that's even more important is that the plasma membrane has a very high electrical resistance. And for that reason, things are highly amplified. The electrical gradient, highly amplified across the plasma membrane, and that's about a 3,000 fold.

Now, when you put all this together, it turns out there are 20 charges in the voltage sensor and so you've got 20 times 120, which is the dielectric constant, times 3,000. So if you're comparing the forces on the voltage sensor, with the forces on singly electrically charged groups, and the aqueous parts of our cells and bodies, the force is about 7.2 million times stronger. That's absolutely stunning. And the safety guidelines are based on heating, on the thermal effects.

Josh: Yeah. The safety guidelines throw out all of that science and all of the science period, and just look at how much something heats up over a period of time.

Dr. Pall: Right. So the thermal effects are produced mainly by the forces of these electric charges on singly electrically charged groups and the aqueous parts of our cells and bodies. That's how it gets produced. So that argues alone that our... and we'll talk about other things that come into this... but it argues alone that the safety guidelines are allowing us to be exposed to levels that are something like 7.2 million times too strong.

Now, one of the things that we'll say later is that those response curves on this are nonlinear. So that doesn't mean the effects are 7.2 million times higher than they would be at the safety guidelines, as opposed to at the very low levels the safety guidelines should be. But still in all, this is a huge, huge thing, and it's really gigantic.

Josh: Can I just ask about the plasma membrane? I want to understand and kind of visualize this mechanism, and hopefully some of the slides we can add in, will help. So you mentioned the plasma membrane of the cell. Does that have anything to do with what I think Gerald Pollack and Paul Lemay, science and tech writers, journalists, were talking about like this fourth phase of water? Do you want to say anything about that or is that going into left field?

Dr. Pall: I mean, it doesn't have a direct relationship to it. That's all I can say.

Josh: So plasma membrane is essentially just the cellular membrane that regulates the influx of calcium ions and other ions.

Dr. Pall: Yes, it regulates the influx and efflux of all kinds of things into the cells. Yeah, that's right. So, the plasma membrane is very, very important. One thing about this is that normally, under normal conditions, where you're not trying to regulate anything, the calcium levels inside cells are about one 10 000th to the calcium levels outside the cell. And so there's a big concentration gradient driving calcium into the cell.

There are also electrical forces driving calcium into the cell. So all of this means there's powerful forces driving calcium in. And obviously, the fact that the cells keep the calcium levels very low, means that that's a very important thing to do. And so what happens when you activate these VGCCs when they shouldn't be activated, and you keep activating them, you get all kinds of really stunning effects that occur.

Now, there's one other thing I want to mention here, and that is that you can see the physics here tells us why these VGCCs are so sensitive. And let me just say, there are also other voltage gated ion channels that are activated, but the calcium channels seem to be the really important ones, probably because calcium itself is so important in the cell. So basically, the biology is telling us that the VGCCs are the main mechanism of action of the EMFs, and the physics is telling us why. So here, the biology and physics are clearly telling us that the same thing is going on here. So this is a very, very important finding here.

Josh: You mentioned earlier that there are specific medications for reducing the influx of calcium ions. Can you say a little bit more about them? And are you talking like, are they pharmaceuticals, or are they natural? What effects have been observed so far?

Dr. Pall: A lot of these studies have been done in cell cultures. So, people have been looking at the kinds of things you can look at in cell culture. Which include calcium influx, which include the hormone release, for instance, which include apoptosis, and which include oxidative stress. So a lot of this stuff has been looked at, at the cellular level, which is, of course is what... in general, in biology, if you've got something occurring at the cellular level, it's best studied at the cellular level. So this is the best way to study it. So, those things are all terribly important here.

Josh: I just want to dive into that a little bit more. Are there specific medications or remedies available for reducing the influx of calcium ions?

Dr. Pall: I think there are some things that help and in fact, for a long time, people have been saying, "Well, these calcium channel blockers don't really help clinically." Now there are starting to be reports where apparently they do. At low concentrations, you can actually get something. I don't know that it's that clear. The problem, of course, is that these VGCCs are important. I mean, they're there for important reasons. So you can't completely block them. If you do, you're just blocking not only the whole nervous system, but all kinds of other things like your heart, and so forth.

So, there are limitations to what you can do. I think there are a number of things that could be useful, including magnesium, which is probably useful as

well. But let me just say, I'm a PhD, not an MD. Nothing I say should be viewed as medical advice. So, should we go on to some of these others? We've gone through three of these things and each of them shows that the safety guidelines don't predict biological effects and therefore don't predict safety. There are several others and I want to talk now about a couple of other types of studies, which involve this whole area of pulsation. The reason why I want to talk about it, you know, pulsation is terribly important with regard to understanding 5G. So it's very important to understand these things, to understand 5G.

Okay, so there have been at least 100 different studies on what are called nanosecond pulse studies. So nanosecond pulse is defined as a pulse that's between one nanosecond and one microsecond. So there's a big range here, but they're all very short. And what's true, is we have a lot of studies that show the nanosecond pulses, and some of these occur in cell culture and some of these occur in whole organism studies; produce effects, very similar to the effects that are seen from other kinds of EMFs. And that it's been shown that these effects also go through VGCC activation.

So, the next two actually are very important, with regard to the pulsation issues, and which are very relevant to 5G. So those are things we need to focus on, to understand 5G. Okay, so the first of them has to do with single nanosecond pulses. So these are pulses that last somewhere between one nanosecond and one microseconds. They go up and down quickly, and they produce effects. But the safety guidelines... which we really haven't talked about their structure, the safety guidelines use average intensities, over a period of six minutes or 30 minutes, to predict whether there will be biological effects or not. Okay, so six minutes, think about that.

So if you take, let's say, a typical nanosecond pulse, let's say one that's 40 nanoseconds long. And you average that intensity over a period of six minutes, you're averaging the intensity over a period that's 10 to the 10th times longer; 10 billion times longer. Now, obviously, what that does is it lowers the average intensity by a factor of 10 billion. So what the safety guidelines do is they predict, "Oh, there shouldn't be any effects," but there are. There are effects over and over, and over again, and safety guidelines say, "No, there can't be any effects."

Josh: It's almost insane, when you break it down. The fact that this has been allowed to occur, to define our standards of safety for the general entire population for so long. I mean, it's insane. But please continue.

Dr. Pall: Yeah, I mean, it really is insane. So, what is the rationale for taking something that will work in, let's say, 40 nanoseconds to produce an effect, and averaging it over 10 billion times longer? It makes absolutely no sense to

do this. I discussed something, which would be a sort of a parallel failure in logic, in the document that I wrote up on this. Let's say you're concerned about being shot by a high powered rifle bullet that goes over 2,000 feet per second. And that rifle bullet then takes about 50 microseconds to destroy your body. And you go to a regulatory agency, and you say, "Well, I'm concerned about this," and they say, "Oh, don't worry about it. If you average the intensity over 10 billion times longer," which turns out to be about 75 days, "the average intensity is so low. You don't have to worry about it."

Josh: Right.

Dr. Pall: I mean, that's exactly the kind of logic that's being used here, by the safety guidelines in the regulatory agencies, with regard to EMFs. So it is, as you said before, totally insane; and yet, that's what we're doing. So those nanosecond pulses are very important because 5G is going to have huge numbers of nanosecond pulses. It's also true that there are also studies on pairs of nanosecond pulses; and those are also important, and they're also highly relevant to 5G.

So there are studies that have been done where you have pairs of nanosecond pulses that are within a few microseconds of each other. And what you find is, if they have the same polarity, and we'll tell you why the polarity is important a little bit, they produce super additive effects. So, the safety guidelines are based on only having additive effects on anything. So here you have super additive effects of two nanosecond pulses within a few microseconds of each other.

You're going to have billions and billions of these pairs of nanosecond pulses in any kind of full-fledged 5G system. So these are highly relevant to the kinds of exposures that we'll have, whenever 5G, if it ever happens, that we get something like the final system that they want us to get, which I certainly hope we never will, it's going to be absolutely stunning what the biological effects are going to be.

Josh: So, by super additive, you mean, kind of synergistic on the negative side. Where more than one adds up to be greater than the sum of its parts.

Dr. Pall: Much bigger effects than the two summed together, yeah.

Josh: Okay. And then I also just wanted to say, for our viewing audience, that as part of this summit going to make that standards document that you wrote, we're going to make that available as part of this summit. So look for that, if you're watching this, either on this page or look for it in your email, but that's an important document, Martin, and we want to help to get it out.

Dr. Pall: Great, thank you. So there are also studies that have been done where the second pulse has the opposite polarity of the first pulse; and when that happens, it actually lowers the effect of the first pulse. So you get much less effect than you get with the first pulse alone. So this has been called cancellation or partial cancellation. So the second one, if it has opposite polarity, you get a major lowering in the effect. Now, that's not predicted by the safety guidelines either, because the safety guidelines assume that everything's additive.

Now, this actually tells you several very important things about the EMFs and the safety guidelines. First of all, the safety guidelines are based on the assumption that EMFs have scalar properties; that is they have intensity, but they don't have any directionality. And that's what allows the safety guidelines to just average these things. They just look at average intensities; that's all they look at. But what this clearly shows is that's not true, and in fact, it's been known for about 200 years that EMFs are vectors, not scalars. They have a directionality, and that the angle at which the magnetic and electrical fields kind of stick out from the direction of the vector, can vary.

So you can get different angles, and that's where the polarity comes in. So the polarity is very, very important here, as you can see, because you have one polarity and a relative polarity. And you get super additive effects, you get the opposite one; and the second one greatly lowers the effect of the first one. So there are major issues and all of that shows that the basic structure of the safety guidelines is completely bogus. They're assuming that EMFs are scalars, not vectors, and not vectors with polarity; and we know that assumption is false.

So the physics is false here, again. Okay, we talked about the physics of the VGCCs as being very important and being a very important example where the physics is false, with regard to the safety guidelines. Here's the second one. So the people who taught the safety guidelines say, “Oh, the physics is wonderful." Well, the physics in fact, is not wonderful, and it doesn't work. The physics they've got in the safety guidelines is deeply, deeply flawed. So that's important.

Okay, now let's talk about two other things that are important here and that is that there are a whole series, I think there are nine different reviews that have been published. Where you have what are called intensity windows. Where the intensity of a particular kind of EMF, within a certain range of intensities, not a very tight range, but a fairly tight range of intensities, give you maximum effects within that intensity. But when you go lower or higher, they drop way down.

Josh: Interesting. So it's not always a higher intensity equals a higher effect and a lower intensity equals a lower effect. There's something else happening here.

Dr. Pall: That's right. That's right. So what that tells you; that tells you something else that's very important about the safety guidelines. So the safety guidelines, as I said before, are based on everything being additive. You can only have additive effects if you have linear dose response curves.

Josh: What is a linear dose response curve?

Dr. Pall: It means if you double the intensity, you're going to double the effect. If you go up the intensity tenfold, you're going to get tenfold the effect, and so forth. So it's directly proportional, the effects are directly proportional to the intensity. So it makes no sense whatsoever to simply add these things, and we already said they didn't add them right anyway. But it makes no sense to add these things if you have nonlinear dose response curves, and these dose response curves are not only nonlinear, they're what's called non monotone. That is, they don't always go up with increasing exposure, and they don't always go down with decreasing exposure.

So again, the whole structure of the safety guidelines is bogus. It's not just that it doesn't make good predictions, the whole structure of it is just ridiculous. Okay, so that's another thing that's very, very important. So, the other one is that there have been a whole series of studies where specific research groups, using the same methodologies, have studied different cell types in culture. So you look at different cell types. And what they find is that the effects produced are highly dependent on what kind of cell you're looking at.

That's not surprising at all, when you've got a biological target. But that's not what you expect if all you're looking at is heating, you know, the thermal effects, and a biological target, which differs from one cell type to another. At least in terms of how much is there and what kind of susceptibility they have. So, what that tells you, in fact, is you cannot ignore the biology. That's clear. And in fact, every other example that we talked about also says you cannot ignore the biology; because all of these things, where you look at the biology, you find the safety guidelines don't work.

So, the fact that the industry and the regulatory agencies have been ignoring the biology throughout this whole thing is just another outrage in this whole process. So what we have here is a multi-trillion dollar set of industries, all of whose claims of safety are based on fraud, really. Because the safety guidelines are fraudulent, and therefore anything based on those are fraudulent.

The last thing of these eight is that there are also, what are called frequency windows, and these are very specific frequency ranges. So you're talking about a very, very tight range, where specific frequencies give extraordinarily strong effects, even in extremely low intensities. So, intensities many orders of magnitude below what some nearby frequency would require to see an effect; you can see extremely large effects.

And these are thought to be due to resonance with a target, and I think that's right. I would predict the targets are the voltage sensors of these VGCCs, but we don't know that; we have no evidence on that. The interesting thing is, the only place where we do have evidence on what the target is from these resonance things, are some studies that were published by Igor Belyaev, on Escherichia coli bacteria. And in that case, the direct target is actually the DNA.

Josh: Can you define the direct target? Are you talking about the specific target mechanism?

Dr. Pall: Well, I mean, so we talked about the fact that the voltage sensor is the direct target, but there could be other direct targets. And in this case, from Belyaev's study in E-coli, the bacterium, E-coli, the target of these frequency windows is the DNA of the cell. And I won't try to tell you what the evidence for that is, but I think it's very compelling evidence. So that's interesting and that's surprising. So it raises another question about, is the DNA also a target in the animal and plants? And I think there are effects on the DNA in animals and plants, but so far, we don't have any evidence that they're important for anything. So I don't know. I don't know the answer to that. But we shouldn't be too dogmatic about things. That's a possibility that may still be out there.

Josh: It seems like the insurance companies know about this, at least to some extent, right? Like Lloyds of London doesn't ensure wireless products. And I mentioned in a couple of the other talks, like Swiss Re and some other major insurance companies are identifying the high level of risk of the wireless industry. It seems like there's some level of awareness of this behind the scenes and probably throughout a considerable amount of industry. But they're just looking at the short term and making as much money as they can, and getting as much control as they can, I would argue.

Dr. Pall: Interestingly, the Swiss Re insurance company put out a press release, expressing a great concern about 5G; specifically about 5G. And that's, I think, very important. It was in German, and I actually translated it into English and put an English version up.

Josh: So, we know of the bio initiative report on bioinitiative.org, there's roughly 1,800 studies, I believe. As early as 1972, Zora Glaser and the US

Naval Medical Department, compiled something like 2,300 studies, all showing a biological effect. And all these studies are just not taken into account, as we've discussed, by regulatory agencies. How many studies would you estimate, Martin, are there that show a biological effect from EMF?

Dr. Pall: At levels well below safety guidelines?

Josh: Yeah.

Dr. Pall: I think there are probably at least 14,000.

Josh: Wow.

Dr. Pall: And I can sort of give you a rough idea. Let me just say, there are also therapeutic effects of EMFs, and that's something I recognized from the very first paper that I wrote on it. Which, interestingly, are not recognized by the industry. They're more concerned about maintaining their propaganda claim that nothing's going on, than they are in trying to take credit where they might actually have a little bit of credit. In that there are actually therapeutic effects of these EMFs.

Josh: Interesting.

Dr. Pall: Yeah. So there's something like 4,000 papers on the therapeutic effects and there are at least 10,000 on the pathophysiological effects. And then of course, it's the pathophysiological effects that we're concerned about.

Josh: So, diving into 5G, what is it specifically about 5G, from your perspective, that makes it potentially more harmful than 4G and other technologies? We know that 5G is a higher frequency band, or it includes a higher frequency band, and it actually includes low and mid-range as well. And you mentioned the nanopulses. So maybe talk a little bit about, how is 5G different, with regards to your concerns?

Dr. Pall: Well, let me just say, I'm also very concerned about 4G. That's not a trivial point; but I think that the thing about 5G is the extraordinary level of pulsations. So the whole idea behind 5G is to use high frequencies, which allow you then to have extraordinarily high levels of pulsation, in order to carry extremely large amounts of information per second, or whatever time period you're interested in. So this, again, emphasizes the importance of pulsation in this whole story. And so you're having extraordinary amounts of pulsation in a 5G system.

And if we ever get to the point where 5G antennae are interacting with what they call the Internet of Things, with thousands and thousands of devices, the

amount of pulsation undoubtedly is going to be absolutely extraordinary. So, this is an absolutely gigantic issue, the pulsation issue. And let me just say, some industry sources now are saying, "Well, we're really not going to use millimeter waves," so I can't say about that. They may have found out that millimeter waves are way too dangerous, and they've decided maybe they're not going to use them.

But the millimeter waves are absorbed by materials, building materials, materials of our bodies; the electrical parts of the millimeter waves are absorbed. Now, what that tells you basically, is that the electrical parts of the millimeter waves are going to interact with electrically charged groups, including the electrically charged groups in the voltage sensor. So I think what that tells you is that their ability to activate this target is going to be extraordinary, because of this absorption.

Now, one of the things that the industry claims is, "Well, it's absorbed so much in our body and therefore can't penetrate, except maybe about a millimeter or so into the body, and therefore you don't need to worry about effects deeper in the body." And they've made that argument. I've made a counter argument, and I can tell you what it is, but what's also true is now we have evidence from published studies on millimeter waves that in fact, millimeter wave effects go at least 20 times deeper than what the industry claims. And I suspect it goes much deeper than that.

So how then do you get deep effects? And this is relevant both for microwaves and for millimeter waves. I think the way you get deep effects is that while the electrical parts of the EMFs are absorbed at some level, but the magnetic parts are extremely highly penetrated. That's the first thing. But now you say, “Well, okay, but it's the electrical parts that interacts with the voltage sensor. So why should you even think about the magnetic parts?" It turns out, and I mentioned this before, the magnetic fields can activate the VGCCs as well.

And I think the way they work is that, for instance, when you have a magnetic part of 5G radiation, it goes very deeply in the body, when it interacts with electrically charged groups, this is your dissolved ions in the aqueous parts of our bodies, what does it do? It puts forces on them, and when you put forces on those, you're going to regenerate the electrical parts deep within our bodies. The same frequency, same kind of pulsation, just much lower intensity.

But when you have the voltage sensor so exquisitely sensitive to these EMFs, you can get effects very deep in the body. And this is based on millimeter waves that are not pulsed, so they don't have all the problems with pulsation that 5G does. They can produce effects on the heart, they can produce effects on other internal organs in the body, many internal organs in rodents. They

can in humans, produce EEG effects, produce changes in the electrical activity of the brain, in humans. And so in order to do that, what do they have to do?

They have to penetrate through the hair, through the skin, through the skull, and through the meninges that surround all the neural tissue in the brain. And so what that means is, they have to go at least 20 times deeper than the industry claims as possible, in order to do this. And if they can go that deep, they go any kind of deep, because basically, the magnetic parts could go right through your body. So I think this is another situation where the industry makes all kinds of claims. But if you look at the data, it's just wrong.

Josh: So, Deborah Davis, who is the President and leader of the Environmental Health Trust, in this summit, is going to talk about the effects of millimeter wave radiation, according to the independent science. We know that the industry is not doing any science on 5G. They don't want to find out what they probably know that they will, if they were to actually do some studies, that's been admitted, as we talked about before. But one of those studies, I think it's an Israeli study that looks at sweat ducts. Have you heard about this one, Martin? I think it was a study from last year, the sweat ducts, how they act as Helios antennas of some type, to transmit the energy from the millimeter wave pulsations, more deeply into the body.

Dr. Pall: No, I haven't heard of it. Let me just say, in science, you always have to distinguish between the results and the interpretation. So the fact that you're seeing these effects, doesn't necessarily tell you that the interpretation that's been proposed is the correct interpretation.

Josh: Well, the bottom line, we know that the effects happen more deeply into the body, with millimeter waves, especially with pulsed millimeter wave radiation, and the science is very clear on that. Alright, so just wrapping up this first part, Martin, of this interview, what are your predictions in terms of what 5G, the implications of 5G, would have on humans and the environment?

Dr. Pall: My prediction is that everything that we know that microwaves do, 5G will do vastly stronger, because of the incredible pulsation. And again, we know that the individual nanosecond pulses work by VGCC activation; same mechanism. And, I think there will be absolutely extraordinary effects, because of the pulsation, and also because of the frequency that's being used. And I think there may be specific effects that may be particularly severe, where you have large aqueous regions in the body. Where basically, this

conversion from the magnetic to the electrical part may be very highly efficient.

So, there are a lot of those, where there are major concerns. For instance, the cardiac effects we talked about before. You've got a lot of water in the blood and the heart. So there could be very high effects there, and the cardiac effects. There are effects on the whole vascular system, and there are impacts of microwaves, for instance, on the vascular system. So, that's an issue. Kidneys have a lot of water. We may have huge epidemics of kidney failure. The eyes have the aqueous and vitreous humors; we may have gigantic epidemics of blindness, because of the impact on the eyes. I mean, so there are a lot of different things are extraordinarily concerning.

Let me just say that, I expect that obviously, you're going to have a lot of effects on the skin, because there are surface effects, and those surface effects are much, much higher. And among those things that I think will be occurring as a surface effect, we'll probably have giant... and I hate to use that term all the time, but I believe it's true, giant epidemics of melanomas, because of cancer. And there is evidence, in fact that melanomas can be produced by EMFs. And if you have these huge, huge exposures, I think we're going to have huge, huge epidemics of melanomas.

The other thing is that the blood circulates towards the surface, so anything that's in the blood can be heavily impacted. And so what kind of things are we going to see? Well, the erythrocytes, it turns out, are highly sensitive to the EMFs, surprisingly sensitive to microwave frequency EMFs. And you get things like what are called Rouleaux figures where the erythrocytes sort of stick together into long chains; that kind of clogs up the circulation of the blood.

You also get changes in the structure, you know, erythrocytes kind of look like a nice smooth, more or less donut shape. And those are really good for the erythrocytes to go through, in blood circulation. But when you have EMFs, you get little spiky things coming off of there, which kind of gum things up. You also get a lot of hemolysis, you've got a lot of cells that just lyse and release a lot of hemoglobin into the blood. You can get anemia from that. So I think there are going to be massive effects, from that standpoint.

I think that there will also be effects on the cells of the immune system, including high levels of allergy, because of the impact on mast cells; and also high levels of autoimmune diseases. And by the way, there is a report now on autoimmune diseases being elevated from millimeter wave exposures; and there's a whole series of reports that microwaves elevate autoimmune diseases. The way these elevations work, at least from the microwave studies, is that you get changes in the T cell signaling that controls the autoimmune

response. And these are our calcium signaling changes in the T cells that control it. So I think we're going to have huge epidemics of autoimmune diseases, as a consequence of 5G.

Josh: And we already are, right? I mean, there's 1 in 6 people apparently, in the United States that has an autoimmune condition and it's all been increasing exponentially, in just this generation, since the proliferation of wireless.

Dr. Pall: Right. So it's amazing that we've got all these things going on, and we

at least we have substantial literature, which says EMFs cause autoimmune diseases, and nobody's paying any attention to it.

Josh: Yeah. We know the chemicals, I mean, the various industries that produce chemicals. Dr. Tom O'Brien talks about this in the summit, how that contributes, and wireless exposures contribute to an overall toxic load in the body that once it's reached, is when people start exhibiting symptoms. And everyone has a different level of threshold. Would you agree with that, just that overall toxic load perspective on it, at what point people exhibit health problems?

Dr. Pall: I'm skeptical about that. I mean, the reason I'm skeptical about it is from some other work that I've done in the past, and that has to do with the fact that chemicals, and I believe EMFs and other stressors, such as physical trauma, such as infections, etc., etc., can initiate a vicious cycle mechanism. And once the cycle mechanism gets going, it can propagate itself over time. And then it doesn't make any difference what the initial causation was; this thing will go on regardless.

So I think that in fact, in things like multiple chemical sensitivity, when people are studying what kind of chemicals they have in their bodies, often they're not high. That's in part, of course that people avoid chemical exposures. But it doesn't help them get rid of the disease, it helps prevent it from getting worse, which is useful.

So I think that... let me just say, there are chemicals.... and this is another thing that I've worked on in the past... that act through increases in the NMDA receptor activities, those also produce increases in intracellular calcium. So the effects of the chemicals, and the effects of the EMFs can be very similar, because they can both work often via increases in intracellular calcium. So I think, to my mind, that's a better perspective to use, to understand the connections between the chemicals and the EMFs.

Josh: Is peroxy nitrate part of the overall mechanism that involves VGCCs?

Dr. Pall: Yes. There are two main pathways of action by which the EMFs produce pathophysiological effects. One is through excessive calcium signaling, and we already talked about that. The other one is that from the increases in intracellular calcium, you get increases in both nitric oxide and superoxide. Those are two free radicals actually that are relatively non-reactive. But when they react with each other, which they do very readily, they form peroxy nitrate, which is a potent antioxidant.

Peroxy nitrate is not a free radical, but it breaks down to form highly reactive free radicals, including hydroxyl radical, which is probably the most reactive of all of them. So, you then get free radical effects and in fact, that's how the DNA effects are produced. The DNA effects that you get are produced through the free radical attacks on the DNA. And those then can produce single strand and double strand breaks in the cellular DNA, and they also produce oxidized bases. And those are the three types of things that we see in the DNA effects, they can all be produced in that way.

So, the free radicals and oxidative stress are very important parts of this whole story. You also get increased inflammation as a consequence to them. And that goes through increases in a transcription factor known as NF Kappa b. So we know a lot about how these things occur. And that's, I think, very important. I mean, the industry tries to claim, "We don't know anything," and it's just complete crap.

Josh: Well, Dr. Martin Pall, thank you so much. This has been a blockbuster talk here, this part one of two. And just such valuable information that lay people, parents, the industry, and our elected officials need to know; this is the root fundamental science, showing causation, showing how all this is working at the cellular level. I really appreciate your time.

In part two, we're going to go into the big picture, Dr. Pall's big picture perspective. We're going to go into five main areas. We're going to dive deeper into the science of those five main areas of symptomatology. We're going to talk about how we solve this problem and get Dr. Pall's thoughts on that. So, Dr. Pall, thank you so much for your time today. And we'll look forward to talking with you again in part two.

Dr. Pall: Great. Thank you.