Introduction and Bob Dennis Background

Hi, this is Doctor Pollack. This, session of the Electromagnetic Field Healing Summit is with a dear friend of mine. Colleague? Somebody who I routinely, have great discussions with is Doctor Robert Dennis.

Now, I'm not going to try to introduce Doctor Robert Dennis because he's it possible to introduce. So I'm going to let him introduce himself. And if he misses something, I'll remind him.

Oh, okay. Well, I'm Bob Dennis. I, stumbled into PMF, I think. The great thing is that that, Doctor Pollack and I approached this totally differently, came from a clinical observations, and I came from a engineering and scientific where I was trying to disprove it.

So, so my background is mechanical electrical engineering. I'm a professor of biomedical engineering. Unk. And I've had a laboratory at MIT in Michigan.

And so I've been working on this for for a long time. But, you know, my entry into it was very different from almost everyone else in the field. As I was saying, my entry into it was as a skeptic.

I was asked by NASA in 1996 to build a system for them, for growing cells, to do gene expression experiments on the space shuttle in the mid deck lockers.

And the idea was, could I build a PMF system that would modulate gene expression? And my answer as a skeptical, practical mechanical engineer was, that's a stupid idea.

What is the science for that? And then they said, oh, it's, you know, you can read while I read it. And I thought the science was terrible. And I went back to and I said, this is really bad stuff.

You want to waste your time on this. And they said, yes, in fact we do. So so my background is in sort of medical device design and scientific instrument design.

So I try to design a really, really reliable system. But my intention was to disprove the effect of PMF. And I thought if you were careful enough you'd be able to disprove this effect so that you wouldn't get these spurious things happening.

And so I was very, very careful. And I forced the guys at NASA to do a completely double blind experiment, and we ran it, and we got very strong results for certain kinds of waveforms that I'm sure, you know, Bill want to talk about here soon.

And I was wrong. So I didn't believe it. So I said, let's replicate it. We I took all the equipment back, recalibrated it, and I was wrong again. So so I'm, I'm, you know, I it turns out that I had to change my opinion entirely.

There's definitely something to PMF. So for the last 25 years, my whole career has been focused on finding out what that is. Right. And, you know, I have to use PMF every day because I had a really bad back injury as a firefighter and going on a rescue and and nothing else was working.

I was one of those many people who got, you know, prescribed opioids and was not given anything else that was effective, that wasn't effective. But PMF was.

And so, you know, I completely changed my opinion on this. So I didn't enter into PMF as a clinician. I didn't enter into it as a person looking for a business opportunity.

I entered into it as a person who needs it and who came in as a skeptic and I think that's kind of the different angle that I bring to it. Well, of course you have that scientific background, the the query background and the rigor and the precision that engineering requires.

Right? So you brought the academic side of this engineering side of it, the personal side of it. So that's all very important. But why don't we talk about that.

And that's a study and tell us what you found. Because I think that study with stem cells, neuro stem cells was I think a very, very important study at it.

Right early on in the research that people have done with stem cells. And because it was with NASA, it's got a huge amount of credibility. All right. So let's let's talk about what you found.

And so they formed discussion okay. So I will share screen here okay. So this was the original device that I built for NASA. It occupied a whole, tissue culture bioreactor and, shelf full of equipment.

Right. And, what we were doing, I said that was published by NASA, and I subsequently published the, Oops. Pardon me. My mistake. Okay, sure. You can edit that out.

We subsequently published the waveforms, which I'm showing here ABCd in NF. And the real finding of the NASA study was that certain waveforms had no effects whatsoever.

And other waveforms had profound biological effects. And by profound biological effects, what I mean are a many fold increase or decrease in gene expression, not small amounts.

But this is early in the in the age of, you know, gene chips and being able to measure gene expression. And we used, these different waveforms, a sinusoid for A and then a B would be like a steady like a, like a solid magnet.

You could see. Yeah, yeah. It b is like a steady magnet. C and D are just sawtooth waveforms. And then E it's just square wave and then F which is just a very narrow duty cycle square wave sometimes called a delta pulse.

NASA Stem Cell Waveform Study

It's just goes, fairly quick. So F is all about looking at the effects of the edges of a square pulse. E, and it turns out that the really significant changes in gene expression in particular, and cell growth and colony formation happened with waveforms E and F consistently all the time.

Nothing else really happened with the other waveforms that C and C and D being, diamond shape or triangular waves. Right. There's a variation to these called the sawtooth.

That would be D. So I didn't draw it. Enough to make it to make it show, but I didn't want to have like the straight edge sawtooth in there, because actually, with those sawtooth generators, I wasn't I wasn't getting good controllable, edges.

And I didn't want to mix d I didn't want d to be a mixture between C and E, right. So I wasn't finding any sort of controlled slope. Sawtooth waveform.

All sawtooth is is a is a is a bias triangle right. One way or the other. And if you control the, slope up and down, you know, at a slower rate, you don't see anything.

The only time you start to see things is if you jump from one end of the sawtooth back down or from low back up, and it's because of the edge. And it was separating those two effects from the front edge.

Yeah. The whatever edge is steepest. If you have a really fast changing sawtooth, which whichever edge is steepest is the one that's going to have the biological effect.

And it was really quite significant in in some cases we would see, genes up and down regulated, you know, by 7 or 8 times what they normally would be.

And the interesting thing was this was families of genes. So it wasn't just like some random gene somewhere, but like all the genes related to extracellular matrix or growth or, you know, regenerative, regenerative, activity, growth, regeneration of the cells were all upregulated. And, and, you know, other things related to apoptosis and other things were downregulated.

So I raise that point about sawtooth, because there are many magnetic field devices where people are making claims that sawtooth is the only waveform that you should be using.

That's what they say, right? But I think that it's because it's not because of the part that makes it look like a sawtooth. It's because of the steep edge in.

If they if they just had that sawtooth part of that, that, you know, if they if they reflected that angle in both sides, they'd see no biological effect.

It's because of the edge. And so you don't need the ramp part of the sawtooth. If you just keep the edges, it will work just great. That's my that's my finding.

So what happens is you can design almost any waveform except for B, you can design almost any waveform to produce a really rapid rise right curve. You can, you can and and so that's why some of the sinusoidal based ones are really high intensity.

Because in order to to get the effect that they're looking for, it's really just the steepest crossover from negative to positive or negative that's having a biological effect and probably 99.8% of the sine.

So it doesn't really do anything in my technical opinion it doesn't. But if you turn it way, way up, then you get a very high, steep slope crossover and that's what's happening.

Biological fact. So that's, that's what you see with the rtms devices. They're basically it's, I think, a very rapid rise and then gradual fall off. Yeah, yeah.

And it's, it's the rapid changes that put them into the sort of the, the sweet spot for, you know, biological effects that tell us what the results of that you're a stem cell study were.

Well, the main results of this particular study, that were at NASA, it was published, was that the, there was a lot of gene, expression changes, and those genes were related to growth and production of ECM, things like that.

And those were upregulated quite a lot. Some other ones were downregulated, but it was not as systematic. And then when I further a now further published that data that hadn't been published, in the first NASA report, what we found was a lot of differences in colony formation, and there was a lot of pictures of that, but, we wasn't really included in the first paper.

So if you look here, where you have big biological effects, you know, we were you know, these are basically this is what the cells look like. If you if you just look at them, you know, and the thing is that you can see this with the naked eye.

You don't have to you don't have to, look at an under microscope. Here's a 100 millimeter cultured dishes sitting over an electrode. And in the NASA study, and you can see it looks like a fingerprint, almost.

What that is, is a colony of cells forming, right? Stem cells. Yeah, exactly. These are normal human neuronal progenitor cells. So they're actually a human cell line that was neuronal.

Right. And when when you take those, those images and you grade them like the image you just saw, that would

have been about a three. And that was as the colony was forming under, you know, a square wave.

Right? So after after, you know, a fairly short period of time, it doesn't take a lot of time, because we're not trying to grow a whole tissue, just a monolayer of cells.

You start to see pretty thick colony formation and it perfectly lined up like, you know, we would just we could just tape the electrode to the bottom and then you see these colonies forming.

But you wouldn't it wasn't thermal because when we would just run current through, there had no effect. Right? Sinusoids would have no effect. The triangle waves would have no effect.

But the cells really responded well when you had a sharp edge, like a square wave or a or a vertical pulse. Right. You were stimulating these cultures called your plates.

Hours at a time. Right? Continuously, actually. So these culture plates had the cells seeded, and then we taped the electrodes to the bottom with, like, Scotch tape and then put them on the signal generator and put them in the incubator.

And they would just there they would sit for how many hours they would feed them for a few days. And, and it, it would take, it takes 3 or 4 days to get the cells to really start growing and another few days to really get the colonies to fill out.

But if you let them keep growing, it's interesting. And you can actually take off the electrode from the bottom. You just peel the tape off and you can see a perfect outline, solid square of cells that were growing right over where the electrode was on the outside of the plate, because the cells were growing right over where the fields were changing.

The most. Okay, the key there I was trying to imagine is that even for very sensitive structures like neural stem cells that are outside a, a biological system, they, they can handle days of 24 hour, 24/7 stimulation.

It was continuous. It was continuous from the from the moment they were they were they were plated onto the plate for it could go I think it went as long as two weeks.

Continuous. It was no let up. It was a continuous wave. All right. Because that's an important question, Bob, that I have for you, with all your experience, is that it depends on what you're studying the to categorically say you should only do eight minutes a day, or categorically say you should only do four hours a day or 20 minutes or an hour a day.

They shouldn't do any more than that. Is false. What you should do is what you should do for what the tissue or what the problem needs, right? You adjusted to the to the conditions that you're trying to, affect.

I, I agree with you. And I don't want to be too cynical, but I think that a lot of times when they say, oh, you should do this for exactly 20 minutes a day, two days a week or three days a week, that's a clinical expedient so that you can shuffle people into their treatment room like 15 or 20 minutes.

You know what I find and and the reason, you know, the reason that I have really gravitated toward personal PMF, something that's portable, something you can carry around is that it's, I find that I respond better.

And many thousands of people who who use the technology that I've developed to really respond better with a low amplitude, low dose, continuous use, they really do.

And it's it's like the reason for that is that PMF isn't forceful so much as it is permissive, in my opinion, to defy that. What do you mean? What I mean is that a lot of people want to take a drug or get shocked, you know, get some kind of aggressive therapy and box it into a short time and then they're done with it.

Right. And what I'm what I'm saying is that that's when you're trying to force a biological effect, right? You kind of you kind of really juice the system.

You you blast it and then you, then you get an effect. And sometimes that works with some things. But I think PMF is better utilized by gently suppressing pathologic inflammation.

And the longer in the day that you do that, the better it is, right? So if you can walk around with it, if you can sit down with it, maybe sleep with it on, then you're allowing tissues to heal at a natural rate, which, by the way, seems to be 2 or 3 times faster than what we think of as natural when we're 50, because we have the seen chronic underlying, you know, things that are slowing down our healing.

But, you know, you can but by maintaining the exposure to much lower level, you know, peak dosages, but extending the time, what you're really doing is extending the time over which your body has to, to to regenerate and heal.

Right. That's that brings us to a point that we and you and I discussed earlier. Having to do with fractures that don't heal. You know, again, we have this conception that you only need a short period of time.

And the reality is that you need whatever time you need for the problem that you're dealing with. So let me share my screen and show you this slide. This is from a study done on, people with about 370 people who had fractures of the tibia, tibia and fibula, or fractures of the skateboard.

So skateboards in the hand and the tibia fibula between our and our lower extremities. So this magnetic field system produced about 18 gauss peak. They did about 15 pulses per second.

And the recommended treatment time was ten hours a day. So a nonunion fracture is a disaster. It's a bone that hasn't been can't be used because it's got this fracture in it that won't heal.

So there are no good therapies for it. I tell PMF we're found. So right before that it was all kinds of invasive procedures that often failed even by themselves.

So this this research was done at NYU and they they did all kinds of modeling and animal studies and laboratory studies, etc.. And what they found is that as they assess the people over time, what they did with their machines and how how they use them, they were recommended to do at least ten hours a day.

And then what their research looked at this library of people went back and asked them how much they use on average per day and what they found. Then basically was that if you do close to what they recommended greater than nine hours a day, a nonunion fracture will heal in 112 days.

But it's 76 days earlier than if you do less than three hours a day. So the people who did just a little bit of treatment time took a lot longer to heal their fractures.

And there's a direct correlation with how much time you, spend doing your treatment. So 69 hours, 141 days earlier, 3 to 6 hours, 29 days earlier. And again, if you're if you're barely treating yourself less than three hours a day, it's going to take a lot longer to, to get a benefit.

So that's again, you got to design your testing. You got to know what you're treating, and you have to treat it for what it needs, not just because there's some theoretical, cost structure.

I get calls all the time, Bob. I'm sure you do as well. That, Well, I only want to do half an hour a day, right? Right. That's all I want to do. I don't want you any more.

I hear this all the time. Or somebody says, well, you know, your device doesn't work. And I'll ask him, well, you know, how are you using it now?

Continuous Dosing and Treatment Duration

Like, well, I use it for five minutes a couple of days ago, and I didn't feel anything, you know. But this really brings out a good point when you're talking about, dosage.

And as far as I can tell, any of the data that I have like it. Dosage, the way it's applied really, really matters. It's like you don't want to cram it all into like the shortest time period with a maximum dose.

You really want to spread it out with a lower dose over a longer period of time. And this study shows actually, I think pretty convincingly, although there's not like a, like a, like a people using the same total exposure, you know, more intensity over shorter time.

But that's what most people would want. They want to just blast themselves, you know, and then and then spend the rest of the day not thinking about it.

Right. But, that doesn't PMF doesn't seem to work that way. It's permissive. And that is that while you're using it for a period of time afterwards, it's actually putting the tissues into, condition where they're much more balanced.

Yeah, they're better balanced. And they, they're not inhibiting, you know, they're not inhibiting their own ability to regenerate. And that's that's what I mean by PMF being permissive and having a huge dose of it.

By the way, we find even with our systems, that many people respond better if they turn down the peak intensity, if that's all they do is just turn down the peak intensity, don't even extend their their exposure time.

They, they find that most people, actually the vast majority, find that they respond better just because too much can be too much. And it's there's not like a linear, you know, use twice as much power.

You get twice as much benefit. I don't I don't believe that that's really true. When you're when you have a good therapeutically valuable waveform. I don't I don't think more intensity helps you.

But longer exposure time definitely does. And our goal is the problem with, again, that short term thinking that all I want is the magic pill. I don't want to be involved in my own healing.

Right? To help me, heal me. I want one pill. That's it. I'm done. Our goal I think we agree on this. Our goal is not to just help you with your pain. Our goal is to heal the cause of the pain so the pain doesn't come back.

But to the extent you can, you're trying to initiate and recruit and and support and prolong healing processes. Add to that. To that end, you're going to do whatever treatment time you need, right.

That's that's exactly right. Part of my job then becomes educating people on the reality of biology and what Pmfs can and cannot do. I think you and I agree on this completely.

And this particular point and, and, you know, just for the listener, Bill and I talk about a lot of things we don't necessarily agree on everything. Right? So I'm not a yes man. He's not a that's science.

That's science isn't it. It's science. It's it's I mean, you know, we have Bill and I have lively discussions about things. There's lots that he knows that I don't know about.

And, you know, hopefully I can contribute to his his understanding of some of these things from an engineering standpoint. But on this point, we absolutely agree.

And that is that, you know, it does require more engagement from a person to get the most out of PMF. And you sort of you have to find the sweet spot where you're really responding well to it.

It's not that hard to do. You just mostly you just need to pay attention. Right. And, and and there you go. And it's

like, you know, I, I do a lot of work around my house and around my laboratory and stuff like that.

And if I twist my ankle or do something, it used to be before I had developed this, that I was looking, you know, in my 40s, I was looking at, oh, it's going to be a week or ten days for to recover.

And now, you know, almost 60 years old for me, you'd expect that to be longer. But I, I apply PMF, I keep it on and you know the first day maybe it doesn't seem like it's helping that much, but then all of a sudden by the second day, it's helping a lot, right?

And it's like I just more or less keep it on continuously. And so now I'm regularly know this is no exaggeration. I regularly recover from the same kinds of minor, you know, orthopedic type injuries, you know, about a third of the time or less just by very quickly going right to PMF, which means I think you need to have one and not say, okay, I've got an opening in my clinic three and a half weeks from now.

You know, you need to have it right now, and then you need to use it during the day and at night. And if you do that, it it really makes a big difference.

Like I, I've had some fairly serious injuries and some, you know, that I was considering seeking more medical attention with. But you know, with the application of PMF, a lot of things can heal a lot more quickly.

But you got to use it right. It's not like 15 minutes and you're done. I tell people that aging is death by a thousand cuts, and those cuts are deep. And some of those cuts are scratches.

They're barely, barely discernible. But all all of what you're talking about, all that sort of lifetime stuff that you accumulate, you can dispense with a lot of it just by with the PMF therapy.

Well, I think you can. I think you can. And what I've taken to in the last year or so is actually I have built myself some pads and some stuff that work really well when I'm sleeping, and I more or less sleep with it.

Now, if I have any kind of a pain, like if I was using a hammer a lot during the day, and that, you know, that repetitive impact is really quite damaging to me now as I'm older and it would last for weeks.

Sometimes the discomfort, the tightness, I, you know, more or less sleep with my arm on a PMF pad the next morning, I'm like, ready to get up and and do stuff.

And I know this sounds like some kind of infomercial, right? But I developed the thing. Well, you've been working with Magnetic Fields for 25 years. I've been working with magnetic fields for over 30 years.

Yeah, yeah. Yeah, exactly. So, so. And the thing is, I keep doing it for the same reason I do a lot of other things because it really works and it works. Right.

You have to use it properly. It's just like a hammer. It's great for pounding nails is terrible for fixing watches. Right. And you know, it can give the watch a permanent fix.

You can give a watch a permanent fix. Right. Exactly. So it's like any other tool. And I think, you know, the other thing that's awesome about PMF that does not get talked enough about there's two things.

One is everybody seems to use it as the modality. They call it a VA. You know, it's of last resort. And I and I donors this I gave a, I gave a, online survey at one of the meetings at dawn I attended.

And I was asking people, you know, what had you tried before you got to PMF? And there were people who are listing 20, 25, 30 different things they had tried and failed.

Oh, I did this and I did that and this other thing. And, you know, they climbed a mountain in Tibet and all kinds of stuff. And then the terminal treatment was, oh yeah, and then PMF worked.

So I don't, I don't think PMF should be a treatment of last resort because it's so non harmful. You know, I don't maybe Bill knows or what. I haven't been able to find a case where somebody hurt themselves with properly applied PMF.

I don't know the case. I can't find one anywhere. I routinely tell people as well PMF therapy does not cause problems. It reveals problems. It reveals them.

That's exactly right. And, you know, it's it's like so I would say first, you know, before you go under the knife or anything like that, I'm. I'd love to tell you about my sister.

Diabetic, type one diabetic. If we have time. But I would say, I would say, first of all, PMF first resort, not a tool of last resort. And and the second thing is, I think it's the greatest adjunctive therapy that I know of.

It just makes everything else, everything work, work better. Yeah. Especially like dietitians that I know, like 4 or 5 of them are totally, you know, you know, I, you know, I was doing this for my dad or for my, you know, my best patient, my, my friend or somebody close that really matters to me.

And, you know, I know that this nutritional adjustment should have helped them, but it wasn't, and it wasn't and it wasn't. And then they applied PMF, and they found all of a sudden that everything else was working better.

And this seems to work with chiropractic. And, you know, it works with chiropractic, practic and acupuncture, every, you know, stem cell therapy, you know, mainstream surgery.

There's a whole surgical group out in, Utah, just over 100 of them that use it regularly for like, tendon repair. And they say it makes the tendency 2 to 3 times faster post surgically.

Right. So there's no doubt about it. So let's let's switch topics since you're the, the engineer, the guru, you've done quite a bit of research. Let's go back to some of the studies.

So you told us that you had like a 400, about a 400% increase in stem cell growth and about 160 growth factors significantly increased as a result of that stem cell study.

But you also did a study on rabbits and rabbit. Rabbit, fabulous. But surgical wounds. Did you tell us about that, please. Did you want me to pull up that slide?

Yes, please. Okay, so the idea here is let me find the correct one. That's the right one. And, there it is. So the idea here was that the veterinary school at Texas A&M, was, very interested in this to see if there would be, you know, the effect of PMF what would have any effect on what's called a nonunion, fracture?

And that means, of course, a bone, you know, would never heal. And the way that this is studied is, by making critical defects. And so they make a critical defect in the bone.

In this case, they cut, you know, a centimeter out of the ulna of a of a rabbit, which is that left picture there, that 0206 all along the bottom, you can see there's the defect.

And after four weeks, that defect is just there, and it never closes. Right now, Bob, it's important to say that that particular defect, that particular critical defect removed the part of the bone that causes bone cells to grow.

The stem cells come from, which is the periosteum, right. And in fact, when they first did this experiment, they didn't do that. And they found that it, that it wasn't this didn't results weren't as clean.

But when they removed the periosteum, actually they were at first they were like, well, we're not really getting very clear results here. And then we talked about it. They said, oh yeah, it's new technician.

And they didn't, you know, surgeon wasn't doing exactly that.

Bone Healing and Rabbit Study

But yeah, to to do a critical bone defect, you have to remove the bone and the things that bridge the gap, the lining of the bone, a lining of the bone, right.

So above what you see is when you, you know, is, is a bit more representative of what you see, we did a whole bunch of them, but I just have all of these on one screen.

When the gap starts to close at four weeks, you can see it. Sometimes it doesn't close very much like on the left. Sometimes it seems to be partially filling in, and sometimes it seems to be really reaching across.

Right. So these are Cat scans after four weeks of the bone. So in these cases up here, we're starting to see the gap definitely closing. And it's not just growing up from the periosteum.

It's like it's really sort of like this you know bridging across. Whereas where the periosteum has been removed and there's no PMF, you don't really see any indication of any kind of bone regrowth.

Right. So and these rabbits were getting treatment for how many hours or these were continuous. I would I can show you. So oops. For a second after you, do this in a way, there's a life form.

So what they were wearing were these cuffs. And so it's just like, this is a little battery with a pulse generator and a cuff, and then that plugged into the EMF pulse generator here.

And the cuff was just placed around them. Post surgically. It was placed around their, you know, forearm post surgically or their four leg. And it just ran continuously on this battery.

And so they went. They did they studied in two weeks, three weeks, four weeks and six weeks and eight weeks. And I was just showing I was just showing me, like, intermediate.

So you could see the difference in the regrowth process. Right. But we we got, really astonishing results, essentially no bone regrowth, which is what you expect in a critical defect model because critical defect model is design to not, you know, surgically designed for research to not ever be able to heal.

Right. So, so anything that you do that causes it to heal is a real improvement over the baseline, right? Baseline biology which should not heal. And so we found in our study that none of, you know, the 18 or so animals that had the critical defect ever heal showed any signs of healing.

But most of the animals were they with a the properly applied calf that was working throughout the study. We're we're showing very significant healing, which is like a really big difference.

So that's critical. That critical wound was that your control group that was our control group. Right. And then we had a we had a group where, this is this is one of these interesting scientific findings, right.

Started off with a small calf so that, you know, I had calculated it so that it would be right in the sweet spot that I could tell from the NASA data, we want to have this much magnetic change.

We want the waveform to be a certain amplitude, certain slope. And so, you know, you can't just make a calf the size of a room. You know, you've got to get a magnetic field properly.

You got to have the right size. And so I, designed them all the right size. And they should have fit just fine over the rabbit leg. But then about halfway through the study, the surgeon said, well, it's a little tough to pull it over the ulna.

Doesn't quite fit, you know, can you make it larger? And I said, well, not really, we shouldn't change that halfway through the study because that will vary a parameter dramatically.

And, the, The problem was that this was a, commercially funded study in the CEO of the company said, change it. And I said, well, I don't want to. And he said, I don't care.

Change it anyway. So I said, okay, well, I'll just I'll just keep track of, of what happens. And so we doubled the size of the calf in terms of area wasn't double the diameter.

It was like 1.4 times the diameter. But it fit nice and easy on the on the rabbit of any size. And we continued the study and we found that the effect dropped off because it was below the therapeutic threshold.

Right. So that gave me this information where it really needs to be above 80 or 90, you know, kilojoules per second, you know, steepness of the, of the pulse on the edges in order for it to have the desired biological effect.

And then, you know, when we use the smaller cuffs and we were getting the the steeper edges worked just great work, much better. But that was. Yeah. So that's an in vivo study.

That means it's done in a live, creature, a live animal, as opposed to the petri dish, which is a test tube about a petri dish. Studies at the lab in vitro and in vitro in glass.

Right? Right. Early reference, as you know. So, yeah. Now you did you did some beyond that, you did another study with mice. I believe it was. And the healing of, inflammation, artificially induced inflammation in a mouse.

That was rats. That was the rats. Okay. Yeah. That was. Yeah. Yeah. That's the. And I actually didn't control that animal. That was a separately carried out, third party neutral done by Charles River labs, which they're a contract research company, and they do all the contract research for drug discovery. Right.

And there's a standard test that you can you can pay them for, and they will actually take whatever substance you have. And they can test to see whether or not it's got an anti-inflammatory effect.

And this was I think this is probably our strongest data because I talked to the the division head for inflammation studies at CRL. He was in Finland at the time.

It's a big it's a big international drug discovery company. Right. It's not some mom and pop organization. And this is what they do. And he told me that this data would be the FDA or any other agency would be legally compelled to accept this data because it's, done to all the standards, good laboratory practice and everything, all certifications, to make it, you know, I mean, I had no, I, no hands on it at all.

And it was all analyzed separately by statisticians and everything, the data that you can see here. And I said there's a there's a mistake, there obviously is not a mouse rat part.

It's a rat part inflammation study. So what they do is that's okay. The standard here is they inject carrageenan, right? Which is an extract, as you know, it's from, like, I think it's a, like a seaweed firm.

Right. And it's very standard. And they use and you inject it and it causes a great deal of inflammation. And then that inflammation slowly, over a course of 8 or 10 hours, will just start to go away. Right.

And it's very it's very standard and repeatable. So all you have to do is measure the volume of the part of the, of the rat. And they have a standard way of doing that in dunking in water.

Right. And measure displacement. And so they get very, very repeatable, reliable data. And what this data shows is that, black line. Okay. So let's look at the graph here, the footpad volume.

So how swelled up does it get. That's a vertical line right. And then the that's your vertical lines like how swell and time how many hours into the study.

That's the horizontal line. Right. So you're doing something. What are you doing. It's the black red green blue. You

know purple or light blue is telling you what you're doing.

And, you know, so, so the standards that they use for these, this testing is the black line is they just inject as a test. They just inject saline. So it's nothing. It's supposed to have no effect.

So if you do absolutely nothing it should follow the black line. Then they give it a very large dose of dexamethasone which is the red line. Right. So if you do the best thing we can do for suppressing acute inflammation, it'll be the red line.

And so all your data for all your testing should fall between the red line and the black line. It's like there's a negative control that's black and a positive control that's red right.

So so the closer you get to the red line, the more effective your treatment. And the closer you get to the black line, the less effective your treatment.

Right. So what we have in the colors here green, blue violet and sky blue, that's different doses. And the dose in this case is measured by the steepness of the the steepness of the, of the edges.

And for light green, for example, it's 400 kilojoules per second. For dark blue it's 800, and for violet it's 1200. And then for light blue it's, 1600 kilojoules per second.

So how steeply is the is the magnetic field turned on or off. And the take home message from this is that you can almost completely eliminate the, the inflammation, the acute inflammation from carrageenan with the right higher dosage of, PMF.

And this, by the way, is the same dosage that we deliver with our small, you know, portable units. So it's not like a big wallop or anything like that.

So we were testing like really low dosages or my, you know, my earlier study at Texas A&M, we thought that when you get much below 200 or 100, you don't really see much of an effect.

And then you get up over that range 200 and above. You start to see an effect. And that's what we see here. So this is actually the second in a series of studies that was done by Charles River lab.

For us this was our dose response study. And you can see that the light blue and the magenta yeah are relatively equivalent. So there seems to be a threshold at around 1200 kilojoules.

Yeah. That's right. So what you see is if you did a if you did a standard tox, a logical dose response study, what you, and, you know, you would see, it would be a sigmoidal response right below threshold, which would be in the 1 or 200 kilojoules range.

You wouldn't see anything. And then it would start to increase and go up like a sigmoid S-shaped 200, you know, 300 or 400 all the way up through about, you know, a thousand.

Then it starts to roll off to about 1200 and then you don't see much more anymore. Right? So, so what's really cool about this is it shows you that there's a, there's a range of dosages that's optimal and you don't really benefit from more than that in terms of amplitude.

So the black curve in this diagram shows you what happens naturally, essentially with just nothing. Yeah. So you start at zero with no inflammation. Then you do the injection and then you see what happens over the next eight hours.

So the maximum, swelling happens at around four hours. Right. And then it tails off. But it doesn't go away at eight hours. Nope. Right. It doesn't go away even at eight hours, but it gets closer, they tell me.

And but they don't didn't show me data, but they tell me that within a day or so it's completely gone. But the real differences show up at about four hours.

And what they're looking for, like fast acting, you know, anti-inflammatories is can you do something in two hours and, you know, does the effect persist for at least eight hours?

You know, so they've had different drugs that they've tried that seemed really promising for an hour or two. And then they just didn't do anything after four, 6 or 8 hours.

Right. So this is this was I didn't have them very their experiments at all.

Rat Inflammation Dose-Response Study

This is what every every anti-inflammatory that you can buy or be prescribed has been subjected to this exact protocol. Yeah. Now I would like to tell you what the what the, director of inflammation study said to me.

If you don't mind, he called me the next morning, the day after the test was done, and he said, well, can I talk to you off the record? And I said, sure.

And he said, I'm not supposed to call you. But he said, the whole lab is abuzz because we've never seen an effect like this. We've seen it with some pretty potent drugs, but we've never seen it with anything electromagnetic.

And I said, oh, really? I said, like what? For example, he said, well, I can't tell you because we do all these on contract. He said, but pretty much any one that you could find, we've studied it here.

They've asked for this kind of study. They said we never seen in effect. And in fact, he said, this is this is like the most effective that they'd ever seen of anything electromagnetic.

And it's about the same as pretty high doses of some of the most powerful anti-inflammatory, you know, drugs that they can give. But he, he thought it was amazing because it was completely, in fact, the PMF coils were outside the rat cage, so they weren't even inside.

The rat cage was about as noninvasive as you could get. And he said that? Yeah. He said it was in his 32 or 36 years as as an inflammation researcher.

He said it was actually, in his opinion, the most exciting data he had ever seen. And he actually asked me, he said, could, you know, could we do a follow on experiments?

Sure we did. And we kept getting the same results. Basically, I have a personal experience with the Ices device, the A9. My wife, broke a toe, and it was black and blue right away.

You could see that probably it was broken. So she started she put on her a IX, the A9, put her on her toe. Right. And we put her in a an A flat shoe, which is what you're supposed to do to prevent the toe from moving right.

She treated at 24 seven. So this is like midday the next morning. She woke up. Bruising is gone, swelling is gone. Pain is gone. So then we. You're not supposed to walk.

So basically, she treated for another 24 hours continuously. And again pain's gone. Then she walked 24 hours later. Basically, she's walking more than 24 hour.

But, 12 hours, 36 hours later, she's walking in tennis shoes. She walk a mile in tennis shoes. Awesome. And another 24 hours later, she continued to improve.

She felt great this whole time. So another 24 hours later, she's now walking three miles in tennis shoes. And that was it. Wow. That's fantastic. That's continuous use. That's that's great.

I you know, it's sort of reminds me of the story, you know. Hey, doc, you know, when the close up will I be able to play the piano? And the doctor says, yeah, sure. He goes, oh, great.

Because I couldn't before, you know, I was like, I thought you were going to tell me. She's going to say, can I dance? Sorry about that. Couldn't be more right, but that's wonderful.

I just stories like that just make me light up. So one of the things that keeps me really doing this, honestly, and it must keep you engaged to this, to you.

And I've never talked about this, but I get a call or an email about once or twice a week from somebody who says, this is really changed my life. This is really kind of sound like an infomercial.

This is really helped me. Right. So and they'll tell me their personal story, you know, and you'll notice I don't put any testimonials up. And I just don't do that.

I don't I don't I don't do that because this is like a personal thing between me and that person. And and man, I've, I've heard some unbelieve stories of people I would actually like to tell you about my sister, what happened to her.

So, if I may, my sister is an eighth grade science teacher. Smart girl. She's about five years younger than I am, but she's not always smart. Great. So in November, technically smart.

Yeah, sometimes. Yeah. She's, you know, like. Yeah, you know, a little bit, like, not thinking. Right. So she's a 52 year old woman getting up on a chair trying to put up decorations in her eighth grade science class.

Falls off the chair. Really serious injury, right? She is type one diabetic, so she doesn't heal as well as a person her age could or should normally heal.

So they go in there right now. Sorry, we got to put in a titanium rod and or in her tibia. So they did a big, big, complicated surgery didn't go well.

She's had to go back for a couple of surgery since November. They had her in these really aggressive casts. And so she's getting these diabetic ulcers right.

Oh boy. Yeah. And so about about three weeks ago, the doctor said, you know, I might have to take your leg. It's not going well. We need to see some forward progress on this leg was all swollen.

They had to keep replacing cast because her leg, it ended up being about twice the size of her other leg. Right. And just really bad rashes everywhere.

Diabetic ulcers and, and and the imaging was showing that the bone in, you know, growth in growth was not the way it was supposed to be in the textured surface of that titanium implant.

She had zero load allowed on it. They're like, don't you ever get up on this leg? Right. And so anyway, her doctor was telling her, they're going to probably have to take her leg.

And she was like pretty upset about it. Talk to me about it. You know, like about three weeks ago. And she's never really believed in PMS, you know, because a few times I've tried to help her and she's like, yeah, well, it's inconvenient and I'm, I'm a restless sleeper.

And, you know, I knock it off. I really can't use too to inconvenient for me. So I'm I'm going to be pretty brutal here, Bill. Maybe your desperation.

She's coming to a point of desperation. So she says to me, you know, well, well, will it help me? I said, well, if you do what I tell you to do, there is a a 90, roughly 94% chance it's going to really help you.

Some people don't respond, but most people do. And the type of injury you have is the type of thing that people tell me when they use it. You know, I'm not a clinician, so I'm not testing them.

But when they tell me this is one of those things where it responds really well and she's like, well, you know, I'm not so sure I can use it. I said, you know, I'm a really restless sleeper and have restless leg syndrome.

And I said, well, restless leg syndrome is not going to be one of your problems in a couple of weeks because you're going to be missing that leg. And that's like, let's like, let's keep going.

Like, oh gosh, I was so brutal with her because she just was not listening. I said, so let's keep restless leg syndrome is a problem you have in that leg for the rest of your life.

Okay, let's do that. Maybe we'll deal with that separately. Right. Well, magnesium or something, but she. So she finally listened to me and I said, okay, you're in a wheelchair, so you're seated.

So you're not walking around, you know, so put it on and wear it all day and then wear it all night and just do this right. The next morning she calls me, it's not really work.

And I knocked it off. I unplugged it, everything. I said, stop fidgeting around, get serious. Are you going to lose your leg? Right? She says, like, okay.

The next morning and she lives in Colorado at like 8:00 am, which is 6:00 Am. Her time. I get this text, oh my God, it's really working. And then she start taking pictures of her legs.

You know, before she had taken some pictures before and after and her swelling was like gone. And she said she had to wake up because her cast fell off.

Right. Because her leg swelling went down. Yeah. So. So anyway, it looked so bad I could hardly look at the pictures like before. And then after. Now, a couple of weeks of this, it's just down to you can see the suture line.

But she said her diabetic ulcers were you know, they were instead of getting worse, they're getting much better and starting to go away and the swelling is down.

And she said it feels a lot better and the pain is down to almost nothing. And so in a week or so, she's going to go in and get it reevaluated and, you know, hopefully she sticks with it.

I, I've had similar experiences as well. I had a brother in law who is also type type while he's type two diabetic. And he had, something called Charcot foot with an ulcer.

Boy was draining, continuously draining, and he'd been in wound care for two years. They didn't handle it and they didn't deal with it. We got him on on A9, which was where he 24 over seven again.

And you can see the pictures as you said the pictures like complete shrinking basically like a flat foot compared to I think he showed me I think he showed me the pictures of this.

It looked like a little like volcano shape. Yes. Exactly. Because where they put the pressure on it, the skin was going through where the pressure was and it just, it just it just went away.

And that's what's amazing to me. And so like, you know, this is one of those things where you just can't seem to get the signal through because there's so many charlatans and snake oil salesmen out there telling you, you know, they're going to sell you, you know, monkey pick organic broccoli, and it's going to cure all your ills and stuff.

That's fine and everything, but it's really hard to get this signal out there. But I have I have never had anybody tell me that didn't work at all. About 6% of people let in this is that placebo.

Let's, let's let's talk about your cat study. Oh, yeah. Yeah. You know, let me, let me pull that one up because that's one of my favorites. And I know, I know you like this one too, you know?

So, like, with humans, you can you can have a placebo effect, right? But not so much with the animals. Right. And so here's another thing to bring the screen up to the bottom of it, please.

Yeah. There's, there's, I'll tell you. See the other colors underneath. Oh. Can you, can you see it yet? Okay. Let me, let me pull it up. There you go.

There we go. Okay, so the thing is that the, the, one of those diseases of animals, that is. And humans, but especially in particular cats, that's lethal.

It's like half of all cats get this, you know, chronic kidney disease, right? And, and it creeps up on them and, and owners don't know what's happening.

And, it's a big business, I think, with a lot of veterinarians giving treatments for, for cats that have this. My brother went to one of those veterinarians for like a year.

And they gave it all kinds of, you know, was homeopathic, naturopathic treatments. And none of them really helped their cat. And so a lot of people agree that pretty much all you can do is palliative care, right?

So here on the vertical axis of this is, the creating, level, which is, you know, measuring, kidney function. And then on the horizontal axis is time.

And it's about from September of 2014 till almost August of 2019. Right. And the blue line with black dots shows you the time course of my brother's cats.

This is my brother who did this. He's like, what can I do to help, you know, help my cat? I said, well, my brother went ahead and he kept he's another engineer, so he kept meticulous records.

And, you know, every black dot was a laboratory tests done by his veterinarian. Bob, hold on a second. Let's go back up to the near the top of your article.

You give the ranges of creating A levels by the severity of the, disease. Yeah, I do up here. And it's, Let me see if I can find it. Yeah. Here we go.

There you are. Right there on stage one is. Yeah, there's an accepted disease state above 1.5. And above. Stage four is, like, lethal. So it would be above five.

So stage one is 1.5.

Cat Kidney Disease Case Study

Stage two is 2.2. And here we, so his, his cat was, you know, 1.5 is just off the bottom line here. Can you see the colors on the bottom? Yes. Perfect.

So so his cat was way into like, stage three right when we started, on off. So we don't know before that first vertical. Well. And that 2.8 the life expectancy of a cat continuing at that level, it's normally going to be progressive.

And then it moves very rapidly to rapidly. So we're talking about like 6 or 8 months I think at that point. And my brother was fairly desperate. So we started him on.

So if you look across in the horizontal direction, which is time, there's sort of a red green and yellow orange bar there. And wherever you see red, that means there was no PMF being used.

Whenever you see green, that's where the PMF that I developed, which is I, CSP. That's what I started developing at NASA. And Bob, that when the treatments were being done, they were being done 2 to 3 times a week, right?

For about 30 minutes. The 60 minute was only as he would have his cat sit in his lap and he would hold it on its kidneys in the right anatomical location, 2 or 3 times a week for about 20 or 30 minutes.

Yeah, it's about right. So that's a relatively low dose. It's a very low dose. And I told him I didn't think it was long enough to really do anything.

And yet over the course of months, what you saw was the most remarkable thing was it got better, it didn't get worse. It wasn't progressive. So, you know, the thing was that it even that very low dosage halted the progression of the disease.

And so he used it pretty, pretty consistently, brought it back way back down to where he was at the, you know, below the stage two threshold, you know, kept it on for, you know, until the end of April of 2015.

And then he didn't use it again. He just discontinued use. And then the, the creatine level started creeping back up. And then in late October of 2015, he started he resumed use and kept that going on for, you know, almost a year.

And you can see it dropped back down to almost normal levels. And then he told me starting there, he got root around, September of 2016, he started getting lazy and using it less and less frequently until he pretty much stopped altogether.

And then even with these really low doses, it stopped the progression of the disease until mid December of 2017, where he really discontinued the use and it started to shoot up again.

And then he thought to himself, you know, okay, he's got to get serious. He's going to sit down with this cat, use it all the time. And he did. And it was just going down and down.

And it just brought his cat back into at or below the normal level. 1.5. And it held it there for the rest of the cast life. And the cat ended up dying of old age, you know, last year and not have kidney disease.

Not have kidney disease. So the cat was about eight years old, maybe around eight years old when you started the treatment. And then the cat died. He was.

Yeah. It was a, it was a, it was a rescue. So I think he started when it was about eight, I think. And then it was, you know, it just went through the normal course of its life without the burden of, of this disease being severe enough, right, that it was life threatening.

So I believe, Bill, this is the only data ever showing that happening with cat kidney disease for any treatment. Well, I've seen it. I've seen it in patients.

I've seen it. People who purchased systems from us. Right. They've had significant benefits. But this study though, what you're showing here is really very important.

It's a very important principle. With PMA therapy they're what you call crossovers right. So you treat you stop, you treat again. You stop the treat again.

And so you see this pattern of worsening and better worsening and better with stopping and starting. Right. So the patient is its own control. Right. So you have treatment.

Negative. No. Then you have treatment positive improvement. Right. No treatment gets worse. Positive treatment gets better. Progressive disuse of the treatment gets progressively worse.

And then consistent use of the treatment gets better. So that is like you know you're taking out the biological

variation there. You're not talking about comparing different individuals.

Now you're comparing the same disease state in the same individual with the same diet. You know they are getting older, but that's as close as you can get.

And this crossover just showed time and again that even small doses of PMF were better. And I'm of the opinion, if I had been able to talk my brother into doing this daily for a couple of hours, who knows who that was exactly.

And so I've actually tried to formalize this study. So I've approached numerous veterinarians and, numerous people, my research colleagues here at UNC and NC state, and, they have no interest in it.

And I say to them, you know, look, you have no other treatments, so we have plenty of other treatments. I said, okay, allow me to correct myself. You have no other effective treatments.

And so, you know, I can't help but be cynical. Bill, this is, when I showed this to this graph, to some business partners of ours, actually, some business friends related to a different business were doing, the with a woman, the cat owner.

They had just buried their cat. Right. She said I paid more for two clinic visits, and we made dozens of visits to the clinic for this cat. She paid more for just two clinical visits than she would have paid for a PMF system.

So yeah, we we absolutely hear this all the time. This also tells me there's something that I experienced as well. I'm sorry. We're getting a similar, experience as well.

So for patients, for people who are actually using these therapies, what are the most instructive things that they can do to stop their treatment? Especially for a chronic problem, if they stop their treatment, then they begin to discover what it was doing because they take it for granted.

After a while, they take the benefits of the PMF for granted. Because they're not jumping over tall buildings, so I'm not sure that it's still working.

So if you stop it and the problem comes back, that's meaningful because especially when you go back on it, you say wow, it really was working. So this yeah, this off is actually an important a personal experience.

Right. That people can really is really is. And you and I've discussed this before but for everyone else's benefit. Right. What what we started doing when we were started selling PMF systems, we had a few people say, well, I'm not so sure that it's helping.

And so I'd like to send it back and get a refund or partial refund or whatever. And at first we would say, okay, send it back right away. We'll see if we, you know, and not.

And almost every time before it even reached us in the mail, the person would say, actually, I want it back. Right. And so we actually got this policy now, which we've had for years, which is okay.

You don't think it's working? Here's what we need to do. Stop using the system, set aside for a few days and don't use it for a week. And then if you still want to return it, then we'll take it right?

And we've never had a return since then. Not a not for that reason. Yeah. Because people don't. You know, the effects of PMF are quite subtle as they come on.

But when you stop using it, they can persist for a day or two and then abruptly you go right back. And that was my personal experience the very first time I, I guess I didn't go through my story of how I discovered my way into this, but I took the NASA systems and I was building them commercially for doing, controlling gene expression.

And so for, you know, for industrial purposes. And I had this terrible back injury and I used one of these big,

expensive devices on my back, and it worked beautifully.

And I was like, wow, okay, I'm cured. But then like two and a half, three days later, all sudden the pain really came back with a vengeance. I was like, no, I better, you know, go back to it.

So yeah, it's it. PMF is persistent in a way that like, tends is not right. Well, it doesn't tense doesn't do healing. And most other other technologies like infrared and laser and so on here they don't penetrate the body deeply enough.

They just don't. They just don't. Yeah. That's we're not going to get the deeper healing benefits from it. Right. But they're they're more subtle. Right.

And and and you're absolutely right. People who use PMF and especially like these gentle forms that we sell, you can't even feel it. But it's doing something.

People really start to wonder. Yeah. Is it really helping me, man? Maybe not that much until they stop using it. Then all of a sudden the pain comes back and then I'm like, oh yeah.

So a lot of people need to go through that one crossover before they can fully appreciate what they've got right now. What are the things I want to talk about is, and you and I have discussed this many times, is the loss of the magnetic field over distance.

And it's hard to calculate that. So it's hard to actually simulate what the magnetic field is in a volume of tissue. So if you start off at say 200 gauss what is the magnetic field at say three inches.

Because we're trying to treat a back, you know, from the skin all the way to the spine itself. Then what what how do you calculate that dose distance?

It's like it's like, like light. You know, how bright is a light? Well, how far away are you from the source? Right. It drops off one over the square of the distance.

Same thing with sound, right? You go feet cold. Right. These these radiant energy energy that's radiant linearly tends to drop off with an inverse square, you know, as you go further away.

But magnetism doesn't work that way. It's not radiant in the same way. It's actually very difficult to calculate. Magnets don't radiate rays of magnetism out to the edge of the universe.

These, these the magnetic flux lines curve around right? And they go like this. So they form closed loops. Right? They close left field is a closed loop.

If you had a flashlight that sucked light back in on the other end, it would work very differently. You'd be able to see things about a half a foot away, and then you go about two feet and be totally dark, because it would have sucked all that light back.

And that's not how light works. But if you could see magnetism, that's what you would see. Okay. And so magnetism is a lot more complicated than light.

So when people ask me, well, how many Gauss is it? I'm like, well, you know how good your math. You know, it's really complicated. And that's that's for the simplest possible, like solenoid, some single, you know, configuration is very hard to calculate when you start adding in multiple coils and different orientations and stuff.

It's virtually impossible. So, you know, my I guess my short answer to you is that. Yeah. The nice thing, though, about magnetism, unlike light, is that it penetrates very, very deeply through tissues, you know, especially dry tissues like skin and everything.

It gets very quickly and very easily deep, you know, into your tissues. So whereas heat and other radiant forms of

energy they can penetrate but they get absorbed by tissues, magnetism does not.

And I've started doing some experiments to show that. And this I've never actually talked to anybody about this. So you'll be the first to hear what I think I'm seeing is that if you disrupt cell walls, that is equivalent of causing a lesion that has a larger volume of conductive fluid because you've disrupted the cell walls, right?

There seems to be a focusing effect with PMF when you do that, because it can actually cause eddy currents, the resulting sort of inductively coupled currents there.

So where you have intact tissue, it's less absorptive of magnetic fields and where so so it's the equivalent, if you look at it from an energy conservation energy standpoint, your magnetic fields will tend to collapse into where they can have this eddy field effect.

And that happens to be at lesions. So the really cool thing about magnetism is that it is a what do they call it. There's a clinical it's pathologically activated.

Right. Like they're talking about certain substances. It's activated at the point where the pathology is right. More than, tissue away from it. That's right.

It's basically for fully intact tissue. It seems to be more or less, you know, dry like skin, pretty much inert, right? If it's wet and disrupted. Inflamed because inflammation itself doesn't, you know, is is tissue disruption, right.

The ECM and everything get much more continuous volume of a conductor. Right. You're going to get much more of an induced field. Whereas if you have intact cells and intact memories and intact junctions between cells, right, you don't get these continuous conductive paths around cells.

So much, you're going to get much less energy dissipated there, which means it's going to propagate further. So this is a fiendishly complicated discussion, but it's cool that way.

Can you describe an eddy current okay. Yeah, sure. So it's if like, if you have a magnetic field, use a screwdriver here. You have a magnetic field line going like this.

The anything that's conductive in its way, anything that can conduct anything which includes fluids like body fluids that have ions in them, like, sorry, in your cells as fluids between your cells.

Physically, the physical world tries to stop magnetic fields from flowing. So as a magnetic field changes as it goes up or down. That's why the edge is so important right in the waveform.

As a magnetic field changes, that's directly proportional to this eddy field, which is a current electric current.

Mechanisms, Research Challenges, and Future of PMF

Communion, right. Doesn't have to be electrons that spins around like this to make an opposing magnetic field. So as you try to change a magnet magnetic field, the the world around it will generate these eddy currents, which are currents of anything with a charge on them to generate an opposing magnetic field.

Well, the magnetic field is actually generating those eddy currents. It is the magnetic fields generating the eddy currents, which in turn are attempting to inhibit the magnetic. Yes.

Okay. Yeah. And so that works really poorly in like, dry air, you know, dry skin, anything dry like that, anything that's really conductive metals, salt water or whatever.

There's plenty of opportunity for the generation of these eddy currents. And those will oppose the magnetic field. And so like what's happening there is an energy transfer.

It's called induction. It's a process of creating those eddy currents from magnet. Changing magnetic fields is called induction. And that's what I personally, well, professionally believe.

Scientifically believe is what's going on. And that's the part of PMF that we do understand is the electronics of magnets is right up to that point of induction.

And beyond that point, the the biology becomes kind of murky. We're not 100% sure what it is in the cell that's picking that signal up, but it's certainly being picked up.

Right. And there's certainly a biological effect. If you have the right shape of waveform, then you get the right rate of change of the magnetic field.

And that induces a range, the right range of eddy currents, that seems to have a biological effect. So you can imagine if my face was a cell and I shoot a magnetic field line through that cell, that's going to cause an electric current around the cell, and also around every one of the components of the cell.

So when you apply a magnetic field, what you're really doing, if you change the field rapidly enough is you're applying a, a, an electric field around the item that you're shooting the magnetic field line through.

And that I think that is well, first of all, I know for a fact that's happening, you can calculate it. There's no real discussion about it. The question is, why does it have a biological effect.

And we don't know that. Yeah, I don't know that anybody knows that. But I think in the future somebody is going to get a Nobel Prize for figuring that out because the effect is very real.

And if if you control the right parameter, which is the rate of change of the magnetic field and how long that rate of change persists, you can get extremely reliable biological effects all the time.

Every time. Yep. Doesn't matter whether it's a cell in a petri dish or whether it's a frog or a rabbit or a seed. It turns out this is this really crosses, you know, my recent experiments, as you know, because we talked about how it crosses all kingdoms of life and and the thing that's interesting about PMF, it's not just that it has an effect on humans or has some kind of specific resonance with the specific kind of cell.

It seems to affect all forms of life systems. It does, you know, it affects plants differently than it would affect, you know, humans. But affects, plankton and amoeba.

I think I think anything living, basically anything living seems to be influenced by these, you know, properly applied PMF and very, very often it's a beneficial effect.

Yeah. Let's change the topic a bit and become a bit more theoretical. Sure. So give us your thoughts on the challenges of doing magnetic field therapy research.

I would say the first challenge is intelligently applying PMF in a way where you're controlling the parameters. The electromagnetism itself, correctly and consistently, where you're seeing an effect.

And the thing that I think has been the bugbear of electromagnetic biological effects, you know, the research up of them has been that people will say, oh, I apply a ten hertz square wave, you know, and and they're not giving you any really important information.

Exactly how steep are the edges of the square wave? That's what you need to know. And that's the most important thing for you to know. And how long you know, what's the duration of that slope and what's the steepness of it.

And, and, and and actually the duration of the slope and the steepness of it. It's like those two things, if you multiply them together, give you the peak magnetism.

But many people just report only the peak, right. It's like saying, well, how fast are you going? You say an hour. What do you mean an hour or what distance are you going in an hour?

Right. If if it's, you know, if you're going fast, you go twice the distance in an hour, right? How long does it take you to get somewhere? Half as long if you go twice as fast.

So you need to kind of know the two main parameters, which is how fast are you going and how long are you traveling. And that multiplied together gives you the distance.

Right. And what a lot of people think is they can just say, oh, this mini gauss. But it doesn't tell you the two parts of how you get the gauss level, the peak that you need.

Right. So this is why people say, well, you know, they'll argue with me. They'll say, well, if I turn up the Gauss, you know, it's more effective. Yeah, it's more effective.

Not because of there's more Gauss. It's more effective because in order to get more Gauss, what you're doing is you're increasing the duration and or slope of the line to get there.

Right. And that's what makes a difference. And that's what's called the Faraday's law. Right? It's Faraday's law. This is this has been well researched and studied.

If it didn't work, this phone call would not be happening. It's not the Faraday. This is the basic law that makes everything electrical or electromagnetic work from your cell phone to satellites.

So you know your car entirely. If it's an electric car, everything about your car works because of Faraday's law. So this is something we really understand.

Well, but we just don't understand how it interacts with biology. That's the that's the thing that's missing still. But science will eventually catch up with that.

And then eventually it'll be very passé. They'll say, well, of course a pulsed field of these parameters has biological effect. What, are you crazy? Every child knows that.

Oh, we are trying to move people along who get more and more people understanding this. What do you think the future is of EMF therapy? What do I think the future is?

I think it's, The more that you and I and the few of us, I think we would all fit into a car. But we need to be careful not to get on the same car or airplane because we could get wiped out.

Let's not go for a long distance. Yeah, exactly. I hope that, there's no dark period. My goal is to make this something that anybody can buy off a hook in a neighborhood pharmacy, because this is something that needs to be available to everybody.

I really think that portable PMF is something that everybody, you know, reliable, safe, portable PMF, everybody should have in their in their medical care, in their, you know, their first aid cabinet.

They should just have it. Because if you use it right away when you get, you know, you start to see something terrible happening, like a diabetic ulcer all the way down, down to, you know, bumps and bruises.

It can really dramatically reduce the amount of unnecessary pain and suffering you go through and really dramatically improve the healing rate. There's so much that could be improved by this.

Like I think that, abdominal fistula, for example, what, 11% of all abdominal surgeries in the United States result in fistula. And I'm confident from the data that I've seen, although I haven't studied it, you know, systematically, that could be something that is essentially eliminated with just one of these portable pmfs in the same way you could

eliminate, as you know, from personal experiences, I now know from personal experience you eliminate diabetic ulcers.

So I think this is one of those things that that, it's just too good and too important to be completely snuffed out. So I think it's it's a matter of time before, before people really embrace it.

But it's like so many things in life and in history and in medicine that, you know, like Gandhi says, you know, first they resist you, you know, then they beat you.

Then eventually, you know, they they, they embrace you and they agree with you. Right? So it's a question of, you know, I think it's, you know, my approach has been to just just tell the truth over and over and over again.

And there are, you know, there are thousands of people who listen to me. My wife is not one of them here. Right. But there are thousands of people who listen to me on this.

And they, they, they by and large, they get the vast majority of them get excellent results. And I think that, you know, I think that I think there will soon enough, there will be just too many people who know this, who know about it.

But, I think what harms the future of PMF to, to get to, to to see if the future could be bright and will be bright. The thing that harms it is up until, you know, a decade or two ago where everybody selling PMF was selling some kind of secret frequency, like they had some kind of secret they would reveal, and they were, you know, charging vast amounts of money for these really primitive machines or pretty much 100 year old technology.

So they, you know, I think the thing that hurts it more than anything is this turning it into, like, some kind of mystical, you know, thing. It's not this is science.

But we're slowly figuring it out and eventually, you know, the right person, unfortunately, is going to get the right kind of injury, is going to have somebody recommend this to them, you know, and, you know, like like I like I often say when, when, when, when the pretty blond, blue eyed daughter of a senator gets hurt by something, then laws change, right?

When like when they're that's when it happens all of a sudden, hey, you can't drive drunk anymore. You know, we're going to name it after the daughter of a senator, right?

Because, gee, she was the first person to ever get hurt by a drunk driver. Well, you know, when the right person gets a miraculous recovery and then just becomes a a tireless advocate of this, this, that's that's what it's going to take is, is because that's what people listen to as celebrities.

And, you know, I mean, that's the that's the way the world is. Right? But you find that a lot of, a lot of like athletic, you know, celebrities wouldn't want to talk about it because there's a stigma associated with it.

So it's going to take the right combination of people and, and and takes people like you and me to just keep telling people the simple truth. You don't have to lie about, and you don't have to exaggerate the effects of PMS because they're so astonishingly good.

You know, you don't need bobbies, like you said, like people like us. You need to be if you're going to get PMF equipment, you need to be talking to people who are knowledgeable about the science.

You can't just talk to a salesperson because they're not going to necessarily get you into the right machine, right for the right amount of time using it properly.

So I'm going to teach you proper use, because if you don't, if you don't use it properly, doesn't matter what you what you it's like anything else if you don't use it right, you can't expect the right outcome. Right now.

I'm actually not the best person to talk to either, because I'm a I'm a technical person but not a clinical person. Right? So I have talked to literally I've talked to many hundreds of clinicians yourself, of course, primarily, but many others and thousands maybe, you know, coming up on 10,000 people about, about their experience with this.

That's what I use to tweak my designs, get everything just right. I it's a combination of science but also clinical outcomes. Right. And I'm a real believer that the science of PMF is less important at this point.

Now that we know things, certain things are effective than actually dialing it in for a clinical benefit. Like for example, we don't we don't have to have hard study data to show that you should use it, you know, 24 over seven.

But we know from clinical experience and, you know, from clinical experience that that's the right way to use things is like, you know, is using them properly.

It doesn't have to be 24 over seven, but enough time during the day or night or both. I've not had enough time understanding physiology. The body right and simply making the clinical observation that by far that you get the best outcomes when you do that.

And you know, there's always going to be people who say, well, you know, I like my sister was, yeah, you know, I don't have time to mess with it for that much time.

Well, I, you, saved her leg, I think so, I think so I just checked with her last night, and she said things are looking really good, so I'm looking forward to that text from her saying.

Yeah, her doctor said everything's cool. They're going to be able to take the cast off everything. I hope she sticks with it long enough, you know, to to do that.

But I mean, you know, you and I both know of cases where people use it, they get a benefit and then they, they decide against it. It's just in to inconvenient for them or something, you know, like, you know, you can lead a horse to water, right?

Okay. And that was the end of that expression. Well, the way I, the way I say it is kind of crude or not like the way I say it, Bob, is that you can lead a horse to water, then you start an IV, you can lead a horse to water, you can put its muzzle in the water.

You can pull its tongue out and connect it to the bottom of the trough. And you could put a suction tube on the other end of it, but you still can't make it drain.

All right. When they get bad enough, you have to start an IV. Yeah. There you go. That's that. Yours is less crude than mine. But what I'm trying to say is there are some people that does does not matter what information or data you show them or how much it's it helps them or even how much they've experienced it themselves.

They just will simply not, change. There's a there's an actual term for this in psychology. It's called mind freeze. And you just once a once certain people once.

It's a pretty big percentage of the population. Once they have formulated an opinion on something, they matter. What is. Yeah. No amount of of anything will change their mind.

Another expression that I've learned from a colleague, pharmacy pharmacist friend of mine is a mind forced to change its will is of the same opinion. Still.

There you go. That's exactly right. So, you know my my, my strategy is, is different from a lot of scientists who are, who do this kind of thing that's on the on the fringe or on the edge.

They're like, I just need to I need to convince the scientific community. Right. But there was this beautiful paper in the Atlantic last year, and, and the title was Prof.

No one reads your stuff. And it was like, sort of an open letter from students to their professor. And apparently there was a study where, like the average scientific paper gets read 11 times 1111 readers of the typical scientific paper in medical stuff, it's a little bit more in, but in some fields it's as low as average of 1 or 2.

The readership is as low as 1 or 2, and very often people will download papers without reading them. They'll even cite them in their own papers, you know, as citations.

They don't read them. Right. And, the funny thing was, you know, it's like professors or, you know, you know, thinking they're having this big impact.

But the vast majority of them are writing to this extremely narrow, tiny little audience. Right. And I pointed this out to, to my colleagues, you know, talking to them about it at the university, they're like, oh, you know, you need to publish this more and you need to publish that more.

And I was like, you know, no, my son, my 13 year old son has a minecraft channel where he talks about him. So, you know, one of those things where he play the game Minecraft, he has much more impact than, you know, most of my colleagues do publishing papers.

He's got, you know, dozens of followers, you know, like like these are people who are listening to him about playing Minecraft. A typical professor has got less than a dozen people paying attention to them.

So, you know, I don't I don't think the answer is more smart said. More science. So what your experience with your sister, our clinical experience, our real life people experience is what's going to drive the change because people who have success talk to other people.

Right. I think that's what it is. I think that we hope that's exactly what it is. I think, you know, you know, you know us, right? Because because, you know, full disclosure, obviously, I saw these devices, but I build them by hand.

So it's not like we, you know, some junky, mass produced thing that we make hundreds of thousands of. We make every one of them. We test every one of them.

We make sure it's right. We support it and give people, you know, technical advice after we sell it. And and it's like, you know, every one of these people becomes our our best sales representative.

We don't spend we never have, you know, we don't spend money on on marketing, on, you know, my company, we do everything by word of mouth. Every single person that comes to us, you know, that's that.

I wouldn't say that, actually. Now, many of them are starting to see my videos on on YouTube and everything, but still, we don't invest any money in that.

Right? It's more or less trying to get the message out. And I make a message that I think is very clear, which is I think PMF works and it's not something magical to my products or anything.

I try to optimize mine to make them really small and efficient. But that's not the only kind of PMF that works. Is tons of good ones out there. You know? You just have to use it properly.

Well, then that part of it in my book, Supercharge Your Health with PMF therapy, we give people multiple options of different devices for different problems.

But, Bob, I want to thank you for coming on with us and spending all this time. It's a it was a great pleasure to reconnect and re discuss many things.

Oh, absolutely. Happy to talk to you about this. Any time. I appreciate the opportunity to be on your summit. Thank you very much. My pleasure. What's your what's your website? Please go to micro-pulse.com.

Micro-pulse.com. That's us. And and there you know we give links to to papers and we have our user forum. And you know we respond to emails. Anybody sends us an email will respond to them.

And you know it's it's one of these things we don't really we don't really advertise it, but we got a lot of traffic and a lot of people coming to our website because, you know, very typically people will say, you know, I heard about this from so-and-so, their doctor, much more often.

It's from a family member or friend. Yeah, yeah. And we, we sell, your A9 especially, and have tremendous value from it too. Bob, again, thank you. One of the most intelligent people about therapy that you're ever going to hear it talk to.

So thanks, Bill, and the rest of your day. Yep. We'll talk again. Talk to you later. Bye bye. Bye.