How Your Nutrition Impacts Your Immune Function And MS Transcript

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Introduction and career background

Welcome, Jeff. I am so, so glad that you agreed to be interviewed for the Messenger Immune Summit. Now, what I'd like to have you do is very briefly introduce yourself and then we'll launch into what I think will be a really interesting conversation.

Well, thank you. First of all, it would be remiss if I didn't say how fortunate I feel to have you as a colleague and friend and to be part of this monumental summit, which I think is of its time and so, so important.

My background is a little over 40 years in this field. I'm a nutritional biochemist by training, and I went through medical school training at the Oregon Health Sciences University back in the sixties, late sixties.

Hard to believe that I then became an academic, only to then have the opportunity on a sabbatical year to actually two years to work with Dr. Linus Pauling, three time Nobel Prize winner, and his institute in Palo Alto, California, which was a life changing event for me.

I came back, gave up my tenured faculty position at the university and made a decision. The rest of my life was going to stand in trying to help physicians how to apply nutritional medicine in their practice.

And that ultimately led me and my wife actually in 1990 to found the Institute for Functional Medicine. That kind of developed the concept of functional medicine as a system biology approach to chronic illness.

And the rest is all in history of the last 33 years and watching it grow up. Jeff. And I am so grateful that you did, because in my journey I had pieced together a lot reading the basic science myself.

But when I discovered the Institute for Functional Medicine took that course on neuroprotection, you know, I had a longer list of supplements and I loved learning and reinforcing all that mitochondria, biochemistry.

And then I had this, you know, really big. Aha. And I'm very embarrassed about how long it took. Like what if I redesigned my paleo diet and incorporated all these things I was taking in supplement form what would happen.

And you know, that's when the magic began. So we were talking that you had had some exposure to Roy Swank, who was the first guy who had this radical idea that food mattered.

Could you tell us a little bit about that? Yes, I think this was a really interesting part of my journey. I came from California. I did my undergraduate work to Oregon to medical school, all the way to Portland in in 1967.

And I happened to run into Dr. Swain, who was actually born in 1909. So he was kind of in his memoir. What would you say in 1967? He was in his senior year as a faculty member at that point, and he had quite a body of literature, but he had started publishing back in the 1950s, I think 1955 actually was publication on a low fat diet and multiple sclerosis.

And it was as he was actually the first, the head of neurology at the Oregon Health Sciences University. And in his field as the academic and clinical neurologist, I think he was thought to be a little bit strange that he would be studying something about diet that was not in the mainstream of what neurologists did or thought about.

It probably wasn't and maybe isn't. Even today, but quite honestly. But he was quite a heretic.

Roy Swank and the early diet-MS connection

But he published over 177 peer reviewed articles over the course of his years, not all of them in the diet

relationship and a variety of other things he looked at in terms of myelin and synthesis and integrity.

But he was quite a force of nature and he did a variety of different clinical trials early on to look at this low fat diet connection to an and showed reasonably good statistical increase in improvement in outcome using various metrics in the body politic of the condition and he was he was a very, very staunch believer that if you could take saturated fats out of the diet and and pretty much eliminate them, you would get significant improvement in patients with remitting or symptoms of.

Now, I think there's an interesting feature of that work for me in which your work actually over the decades now has really exemplified. And that is when you take something out, you have to add something back in.

By definition, unless you just remove eating, you're going to feel those calories that you take an hour saturated fat calories in you. And there are going to be other calories that will will fill the gap.

So the question is to me often, do we make an assumption that when we take something out and we see a positive effect, that's because we took something out.

Or maybe it was because what we took out was replaced by something that we put in that was better. And so we have to turn the converts around and look at the null hypothesis and say, what happens if we replace, not just remove?

And I think your particular approach, which has been so brilliant, is an exemplar of what happens when you replace and you start asking about Whole Foods, you ask about your brain, about all the things that you advocate, and then so beautifully, which is not just taking stuff out, it's adding a bunch of things back in.

So that led me then in 1997, by this time, we started the Institute for Functional Medicine in 1990 and we were into our annual meeting. So this would have been our sixth or seventh annual meeting, and I decided that I wanted to do a little mini focus of that meeting.

I recall it was in we had in Palm Springs and I invited the three ages, particularly Beanie Horlick and Hayes. So these were three named people that in the early nineties were doing quite a bit of work on neuromuscular disorders related to one specific thing you put back in with this vitamin D, so oh yeah. Dr.

Heaney, of course, was the head of the American Endocrinology Society and probably hundreds of papers in osteoporosis and vitamin D and calcium was considered kind of was in the Food Nutrition Board.

It set the R or the iceberg for vitamin D and was quite a broad thinker. And he had come up with the concept of saying, Why do we focus so much on deficiency when we should be maybe thinking about insufficiency?

Because maybe under intake of specific things in this case, specifically vitamin D doesn't believe the rickets, which is the vitamin D deficiency disease.

But maybe it leads to other things that precede records that have immunological sequelae like neuromuscular disorders. So he started talking a little bit about, well, let's not just assume that you have to wait to get rickets before you don't have enough vitamin D.

Maybe we want to measure blood, vitamin D levels and see what status that person is in. So he was very early on in that concept. And then, of course, Michael Haller, renowned, you know, as the actual person when he was doing his work in Wisconsin, discovered the 25 hydroxy vitamin D and C metabolite of vitamin D and actually developed a blood test for assessing vitamin D status.

Because you measure the 25 hydroxy derivative, it's rather than vitamin B itself. And then he went on, obviously, to go to Boston University and became the head of endocrinology here.

And it was his MVP thing and published literally hundreds of papers on the Sun vitamin and the advocacy. And

then lastly, as Colleen Hayes. Now Colleen Hayes, I don't think has gotten quite the notoriety maybe in the press.

The medical and research process did Dr. Holick and Dr. Heaney. But Colleen Hayes was really the first person. She has also was a faculty at the University of Wisconsin.

She did her Twitter page there, and she stayed on to become quite a renowned faculty member, focusing on the research that she did with Dr. DeLuca, with Vitamin D and Wisconsin.

And of course, he was one of the principal people that developed the Wisconsin Research Foundation. The work that was able to get actually small amounts of money from the dairy industry when they started supplementing with vitamin D, because Wisconsin, through DeLuca, had the patent on vitamin D.

So every every gallon of milk that was sold and vitamin D in the University of Wisconsin got a small royalty on that patent. And so they were able to build quite a large research fund called the war election.

So Alumni Research Foundation that was funding all sorts of work. And and Colleen Hayes Hazen stayed on after finishing her work and post-doc to be a faculty member, working more on Vitamin D and her contribution.

This is an AHA and I don't think she's gotten the credit she deserved as being really the first person to talk about the immunological impact of vitamin D, how it includes interferon gamma on certain types of white blood cells.

And she was really the the opening of the door. I mean, there were other people in the field, but I give her credit for being the first person to really start publishing back in the eighties about vitamin B impact, not just as a set of bones, but the impact on the immune system.

And she started talking about vitamin D and multiple sclerosis and actually did the first observational studies. And she was not a doctor. She was a science clinical scientist, but she did some early stage kind of preliminary investigative work and published some early papers suggesting that Vitamin D was a missing link in the immune story.

And so those three people then in 1997 all gave their presentations.

Vitamin D pioneers and immune health

And I think when I look back and I may be blowing smoke here, I sort of take this for what it is, but to that point, the vitamin D immune story was not at all, I think when we pulled those three people together and we had national media attention at that meeting of that meeting that fueled the start of vitamin D as the Darling Vitamin that it became over the previous 30 years or 20 years.

And before that, no one was really supplementing with vitamin D unless they were an older woman who was worried about that process. It was not in the top line of supplements now.

And, you know, vitamin D is in the top line of supplements. And I think it's because of of that early work and later following on with the work that you and others have done showing as part of this important, it's not the solution by itself, but it's a major part of the immune picture.

So then following my story here, just really quickly, it turns out there was another investigator at OSHA that came later after Dr. Huang that I, I interfaced with as I became a professor later.

And and that was William Connor. William Connor was really the first person to start studying salmon oil. And again, Pacific Northwest, Oregon, a lot of fish up there.

And so he got grants to study the role of unsaturated fatty acids of the omega three family and its relationship initially to cardiovascular disease as contrasted to saturated fat, that types of derivatives.

But then he went on and expanded the published over 100 papers over the years, really looking at the role that omega three fatty acids had on. So a membrane architecture, including cell membranes of nervous system tissues.

And so he started to show that you incorporate these things when you eat them. They're like, they don't just get broken down in color. They actually get incorporated within your architecture of your body.

And they have a structure and a functional effect on how these cells work. And I think that was a really another step forward in this whole probing literature and understanding of where mice could be tied in the diet.

Because now we're saying replace saturated with these omega three fats and also like alcohol and gas. And for vegetable products, you want to start putting fish, you can also get it from leather vegetable products.

So then that for me took that story on to the next level, which is to then start saying, well, in these these fatty acids are fat and things like salmon or hearing these cold water fish, is that the only thing that has impact upon the immune system and relationship to M. S?

So that takes us back historically to probably the first nutritional supplement ever used in humans, which is kamagra oil. It goes back 2500 years and kind of grew out of course, is very rich, not just in omega three fatty acids but also in vitamin D and vitamin K, both of which been associated with improved neurological function.

So you start asking, well, what happens in northern latitudes where people don't get exposed to sun and they have low vitamin D in their blood? Do they have increased amounts?

And the answer is yes, they do. Well, what happens if they if they're Nordic and they supplement kamagra o g, they have lower incidences of AMD. So now people started putting some epidemiological evidence together.

And then when people said, well, what's in that rose those oils, is it just so the omega three fats and vitamin D and CoverGirl and we probed more recently and I'm talking about for the last ten years it was found that they also contain a unique additional family of bioactive ingredients that are recalled that are Morrisons protections and resolving under the name pro resolving mediators.

And these pro resolving meters have now been found to have their own impact upon immune systems as it relates to males. So it's not just omega three by themselves, it's in their natural state when they're minimally processed, like in Whole Foods, where you get the full benefit of this complement of all these nutrients, working together as an orchestra to help nourish the nervous and immune system.

So that then takes us then to the next step, which is, well, what happens when you eat with it? These things always just go directly into your blood as whatever your nutrients are.

And of course, no, we know that's not the case. You've got a lot of things going on in your digestive system. And so now we start to see the emergence of the microbiome and how the microbiome has its influence on mice.

With this incredible paper that was just published out of UCSF, looking at that almost perfectly validates your work, by the way, except they were looking at the microbes that are influenced by the whole diet and how they influence the immune and neurological system.

So you have spawned an incredible revolution in thinking and let me just quote this monologue run on here I'm doing. So I have a female physician personally.

I've developed a really great working relationship with her and a personal friendship. And so she felt comfortable in telling me that after 30 years of being a physician, working principally in a very intensive situation in the VA system with a lot of patients with co-morbidity and a lot of complicated patients that she found that she was developing new neurological issues, it was getting neuritis in her hands and feet.

She was getting what she considered to be MDs like symptoms. And she recognized that she was probably on a

short track for retirement, which was then she was about 58 years of age and that wasn't something she was looking forward to for many reasons, obviously like your history.

So she then did what you did and that is she kept her whole diet. She got on to the The Walls program. She she really made a conscious commitment to really clean up rat, so to speak, and she completely resolved the problem to back in practice now.

And she gave up the VA to start a private practice in this kind of more complex lifestyle, dietary intervention and has a thriving practice up in our area.

And she brought in a colleague, another woman who was a trauma care nurse who was totally committed to her patients and had really sacrificed her health over the years.

And she convinced her colleagues. She said, you know, you need to make some changes to it. So this woman lives on on the program. Your program. She lost £137, £137.

And she's completely well. And she is now in full time practice together. You know, what has happened is that we've had so many physicians and outsourcers, say other health, other professions who've lost their profession because of their health challenge.

Omega-3s, cod liver oil, and the microbiome

Discover my work, heal. And then they're like, I can't go back to practicing medicine the way I used to or practicing nutrition the way I used to, or physical therapy, occupational therapy.

And so they come they they come get certified as a waltz practitioner and they now practice through that lens. And they help other folks with complex chronic diseases, M. S.

and other neuro immune diseases recover. It's immensely gratifying to do that. Well, let me let me just you're being very humble and very self-effacing.

It is gratifying. Yes. But it is also a contribution that very few people in their lives have the opportunity to make, to spread something now that has such a infectious capability of improving lives of millions of people.

And I think the way you have done this is is very, very important for the viewers of this program to understand. There are people, many of who I just mentioned, some of who I just mentioned, who have made observations that you've made and have tried to advocate certain things that would improve the difference between them and you, I think is it because of your academic medical background and because of your the way that you think about things and how you search solutions?

You have put your stuff to the test. You've published many research papers. I mean, I have a whole bibliography here of your of your research, which is heavy lifting.

It's hard to do that. You're clinician. But you know, this this most recent 2023 paper that you just published, which I think is powerful in frontiers in neurology association between improved metabolic risk factors and perceived fatigue during 93 relapsing remitting multiple sclerosis.

The secondary analysis of the way trial to me this is the type of work that characterizes and distinguishes that then makes people take notice. They can't just marginalize it.

And so I want to really acknowledge is that a that is another part of the of the portfolio of value that you brought to the transition in this field. And it's very powerful.

You know, I tell my post-docs, my medical students, that it's a 30 year journey to change the standard of medical practice. And you have to have peer reviewed research, randomized controlled trials, publish them, publish them,

publish them.

The very first study that we tried to publish took us two years to find a journal that would publish it because it was the multi-modal intervention in progressive Ms..

But now, you know, my lab just published a network meta analysis in neurology, the highest impact journal of all. And there was an accompanying editorial that said, You know what?

That really does matter. We've got great evidence now that diet matters for reducing fatigue, improving quality of life, and everyone who's diagnosed with M. S or neuro immune conditions should be referred to a nutrition professional to help improve their diet.

And so we're halfway there. It's now being talked about by other scientists. You know, Jeff, at the consortium of AMA Centers, that's going to be happening in Colorado this year, which is where all of the EMS clinicians and the research scientists we go there.

When I started going four years ago, my poster was the only one talking about food. Now, in 2023, my labs can be giving six oral presentations. We have four research abstracts that we've submitted.

We have another very exciting abstract that we want to submit. Hopefully there'll be a late breaking opportunity to submit that. And there are now a nutrition track that we have one track that is devoted entirely 3 hours of nutrition related research that's being discussed.

We are making progress. Oh, huge, huge. Yeah. It just delights me. It gives me goosebumps. I mean, this is why I got in this field was to have colleagues like you because I knew that there was truth in what we we observed.

The question is, how do you make truth obvious to others that are to people and I think that's it's it's a spreading effect of of extraordinary implication.

We're pulling all sorts of people in that if they have some modicum of neuronal plasticity still left, they can accept new ideas once they see this is I often say this is like putting a virus in your mind.

You can't escape from it once you get this is there. Well, let me just if I can, I'd like to just cite a couple of interesting study titles that is just been published.

It really bear on your work. So I talked about the liver oil story. So this is a recent paper on kind of vitamin D source, vitamin D in multiple sclerosis risk that shows that those individuals who take vitamin D and A from control have lower statistically in incidence of Alzheimer's.

Here is the more recent paper from Colin, his vitamin D and multiple sclerosis proceedings, the experimental biology and medicine. And a follow up paper occurs on multiple sclerosis, lipids, lymphocytes and vitamin D is a neuro immune substance.

Here's a study of OSHA now recently been funded of Omega Threes for the treatment of MSK Depression. Actually looking at a therapeutic intervention here is a study on high dose omega three fatty acids plus vitamin D supplementation affecting clinical symptoms and metabolic status of patients with multiple sclerosis.

So this was a randomized clinical controlled trial, this published. And then here it is. Lastly, this this portfolio of papers, a paper on specialized pro resolving mediators.

These other constituents of natural visuals are emerging as therapeutic candidates for multiple sclerosis. This was just published last year. So you use from all sorts of other disciplines to be involved now with looking more seriously at how these things fit together.

Clinical success stories and evidence-based nutrition

And that then leads us in our conversation to something that I have a little personal pride in, because in 1993 or maybe it was 94, I introduced into the Institute for Functional Medicine.

As far as I know, the first discussion clinically of the role of mitochondria in before that it was a very esoteric topic, but inborn errors of mitochondria apathy is associated with lever's optic neuropathy and various plexus syndromes that were genetic.

We started talking about functional mitochondria of these are associated with insufficient mitochondrial bio energetics. That was 1993 or 94 when we started that.

As our and I have them, I invited some experts to present it was like Greek or foreign language. How many people are there group what is this guy talking about?

Mitochondria. So since then that has grown up. So now we see targeting mitochondria, the regulation of multiple sclerosis, a comprehensive review that was this problem.

So that, you know, and you've talked about this extensively. So now we have kind of a little bit of a mechanistic understanding at the cellular level and Siddartha Mukherjee just authored what I think is one of the most beautiful books that was just published in this year called The Song of the Cell.

And, you know, he's a Pulitzer Prize winner. Arun wrote The Emperor of All Maladies about Cancer. He's an ecologist, oncologist, molecular biologist, wonder, can.

But this song of a cell is such a powerful book because it describes how medicine has transitioned to understand the importance of cellular biology and how cells are influenced in their personality by the environment in which they find themselves and therefore what we believe the cell and will determine how that cell functions and what we really should be looking at is to how to send the right signals to cells so that their function is optimal relative to their generative potential.

And this concept that really relates to what you do and how you teach people to take these are very sophisticated scientific concepts, but still broken down to the plate and to the garden and to make them very consumer accessible, they don't need to have to know all the things of mitochondrial, oxidative, phosphorylation and all that stuff we can we geeks can get and get really correct.

But for the average person, the way you're delivering it, your whole social media, how you use your your garden and your lifestyle and your exercise and all these things that exemplify what what are signals that we're sending to our bodies to really alter how the genes in individual cells are expressed.

You know, one of the things that I've done that at the time was so incredibly radical was I decided that I'm going to do these experiments, I'll do my clinical trials.

I will keep telling the public what I'm doing, why I'm doing it, why I'm designing my research the way I am. I will teach the public and have courses that I teach the public who want to learn these things.

And I'll do social media at the time. But you know, my university was a little nervous about that, so I kept having to have little conferences with my chairman to be sure I was behaving appropriately, disclosing everything, having all the conflict of interest managed.

And then I started having some patients on the side. I got to have my own little private practice and my patients. So my grateful patients said, I believe in your research.

I'd like to support your research. And I started getting these cold calls six figure donations to my research lab, which was, let me do some very interesting, innovative work.

Then I got an appointment with the chair of the Dean of the College of Medicine that oh my gosh, what have I done

now? And he was like, No, no, I want to know what you are doing, because the university has never had anyone receiving this kind of support for research, cold calls.

And then they got I got somebody from the foundation assigned to me in that helped me fund more of my very interesting research studies. So I still have a hard time getting the NIH to fund my very interesting point of view.

But I'm having remarkable success with having private philanthropy fund what I'm doing because, you know, I'm transforming lives and people understand the the importance of doing the kind of research that I do.

Absolutely. You know, it's interesting. I just finished a couple of books on when the most recent ones were on long COVID. And the author who has had long COVID, he had chronic fatigue syndrome before that.

So he has a history of post-viral type of chronic illnesses. He was describing the fact that these great movements going all the way back to HIV, AIDS and the chronic fatigue syndrome now into long COVID are not being driven by nature, driven by patient centered activism.

And these these groups like patients like me. And if you go to the Web now, you find these very, very powerful groups that are really advocating because they know they're not getting answers that they need from the people who have other kinds of things on their plate of their attention.

Correct? Correct. You know, and I think that's part of why I was successful. It was the walls protocol, the tremendous success of that book that drove the NASA side to become aware that their their constituents want to have diet and lifestyle research.

And they made that a research priority, which then funnels a significant amount of money into pilot studies in our lab was one of those that the M. S.

Mitochondria, cellular signaling, and research advocacy

Society funded, which is why there were 12 dietary studies that we could analyze in that network, meta analysis and all of that really was driven by social media and driven by books like The Walls Protocol that made apparent to the decision makers.

This is important to our constituents. We should be putting dollars here. Absolutely. As I said, you're genius in your strategic approach to this, as well as your genius in developing the program coupled together is a high impact.

That's what's really shifting the paradigm. You know, early on I was and I'm I'm curious, Jeff, if you encode this, I was condemned. There were people who said I was a fraud, that I never had M. S., that I was exploitive because I taught classes to people.

And, you know, I had to meet with my university folks several times because of this extraordinary claims were being laid on me to in terms of how to respond to that.

And, you know, fortunately, I just felt it was morally obligated to keep doing the research and to keep talking where I was invited to give people hope with very careful disclosure about the limits of what I was talking about.

Yeah. Did you I assume, Jeff, that you've had similar attacks on your character, your professionalism for the messages that you've put out? Oh, yeah, it's historic.

It goes way, way back for me and to the end of the eighties because, you know, I broke from the ranks. Right? I broke from the guild. And once you break through the guild and even Dr.

Linus Pauling, ironically, you know, this two time Nobel Prize winning laureate with a record of science, it is very few people in the world ever achieve.

Even he was considered a heretic, considered he you know, he had it actually lost his ability to win his visa, to travel, to get his second Nobel Prize in Stockholm, because he was considered to be a a communist sympathizer because he was talking about nuclear disarmament.

He was talking about in Albert Sweitzer and Albert Einstein, they were in 30,000 signatures of scientists to stop atmospheric testing of nuclear weapons and even picketing around the White House.

And because of that, he was considered a heretic. And and, you know, so this comes, I think, as part of the territory of saying things that are different and are not in the field.

The guild will protect itself. But if you step out of the guild, then you become a heretic, and now suddenly you're an alien force. Now, with that said, I want to be cautious saying that just because Galileo had stepped out of convention and started talking about the heliocentric view of the universe, that was not well taken by the church at the time doesn't mean that we're all Galileo.

I mean, we might have ideas that we think are right, but they're not right. And so we have to put things in balance and and recognize that sometimes our critics are good for us because they sharpen our the tip of our spear.

And I've always looked at that way in my life that I try to look at what my critics are saying about me to say, okay, I don't accept like a great percentage of that, but there are certain things in there that maybe I can sharpen my game by listening.

Yeah. You know, I think my message to my post-docs, my students are like, you do the research, you publish it, and then you do the next experiment. You publish that.

And if your ideas are valid and you, you, you can build the case for your vision of the future. And as you keep adjusting based on what you're learning and you're going to make mistakes, you'll test some hypotheses that turn out to be like, well, that was not the result I was expecting.

So what does that mean? What should my next next experiment look like? Yeah. But you just keep plodding along. And I mean, to everyone who's listening, I care about this so deeply because I had years and years of immense suffering.

But, you know, now I'm jogging in my neighborhood. And so I have to let you know that there's plenty of reason to have hope, that there's so much that you can do.

And while I don't know what will work for you in your case, there is a lot that you can do. And I want to be sure that you understand there's all sorts of reason to have hope.

Can I play off that word? Because I think that's the word of our time. Now, that's I have been using that word a lot in my daily vocabulary. Hope so. Randy Journal, who is arguably the father of nutritional epigenetics, he did the agouti mouse studies showing that you could change the outcome of the mouse into a whole different phenotype, whereas their parents historically were always fat and got your life and got cancer and diabetes that the offspring of the mice when the mothers were nourished with folic acid b probably sex these methylated nutrients said that not only was the birth color different of the offspring, but they didn't get fat.

They lived about 40% longer than their parents and they didn't get diabetes and cancer. And so that that was this concept of nutritional epigenomics. And and so he recently has authored a paper published last year actually called The Biology of Hope around epigenetics, saying that, you know, this is not a one way street disease and the genetic determinants of disease are most often not a one way street sick of mono genetic diseases, gene diseases that are tied to one gene that are like inborn errors of metabolism.

Hope, epigenetics, and immune rejuvenation

He's pointed out that even those are modified in their severity teach scenario kicked down the list, and based on

the way that that child was raised, you can have a very significant difference in the outcome of the child.

So the construct of the biology of hope is present. It's a two way street. It's not a one way traffic to demise. We can turn things back. But we've been studying. In my group, I.

I couldn't help myself. I started in another company to really explore our immune function. Probably will help and the big will help is really focusing on immuno rejuvenation.

What are the principles that allow us to turn a damaged citizen immune system back into a younger, more resilient immune system? And it turns out that the processes of science has helped us because a Nobel Prize is one for the discovery of one of the processes that does that called autophagy and mitophagy.

And we now know that are specific diet and lifestyle principles activate the process of that. And then lenses our immune system gets rid of damaged, scarred immune cells.

So we've really been spending quite a bit of time exploring how this works and how it ties to kind of lifestyle principles. So we just finished the first clinical trial of its type.

The results are, I think, quite exciting. We have about a terabytes of data. We followed 50 subjects, 50 humans that were apparently well, we looked at their immune system epigenomics using a gene chip that was put together for us that have 850,000 CPG sites on this gene.

So we're able to look at the methylation patterns before and after intervention with a high polyphenol containing amino rejuvenation or food formulation.

And lo and behold, we've been able to show we'll be publishing this soon, that we're able to alter this supplementation, the actual architecture of the epigenome in these individuals to give their immune system more resilience.

So we turned back the immune aging clock, so to speak, immuno senescence. I think that's what your program does. I think we studied your program using this analytical tool, this ginger tool that we're using.

We would see the same thing with. So we will have to collaborate on a clinical trial sometime. Jeff That would be so much fun. Well, Jeff, this has been just so gratifying, so wonderful.

I'll have to wrap this up because otherwise you and I would talk on for another four or 5 hours because it is so much fun. And again, Jeff, how about you give us our website where people could go find you for more information?

Yeah, there's two places they can they can find me. One is Jeffrey Bland, dotcom, Jeff, Ari, $1 billion indeed. Dot com. And the other is big bone health dot com.

Bone health dot com. We have quite a portfolio of information available. Either are about what we've been doing over the last 30 years. Wonderful. Thank you so very much, Jeff.

Thank you. And keep up the fantastic work we're following you. Everything you do.