Food Talks: Choosing Health Or Disease For Us Transcript

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Introduction and Collaboration

Welcome, Jeff. and thank you so much for agreeing to be part of the MS and Neuroimmune Summit. you know, to everyone, this is Dr. Jeff Bland, who we all know and love as one of the founding fathers of the science of functional medicine.

he is a Ph. D., bio scientist. he is brilliant. He's taught me a lot. I'm so grateful for his mentorship and his friendship. Jeff, have I left anything out?

No. I think the fact that, we've been walking down this path together here, this journey for, probably more time than we really want to admit, but, it's been an extraordinarily enriching, both friendship and and, professional collegial shift that, that I've had the privilege of sharing with you.

And I think that we can see the, the influence of what happens when people work together from similar principles, and, start to enrich one another's ideas.

It has much greater impact. So I think that this is a model for many people as it relates to cooperation and and collaboration and communication. The three C's working together.

Absolutely. You know, and you and I both have an intense love of polyphenols and what they do for health. So let's sort of dive in. what is a polyphenol and how does that, you know, act with their health?

Yeah. Thank you. So I got very interested, as a consequence of, of your work and and the whole nature of this whole food is medicine movement that we're witnessing rise up around us.

over the last few years, as to what was the nature, if we would think of a mechanism that was observed. in the blue zones.

What Polyphenols Are

And Dan Buettner, his work and the blue zones are these areas around the world where people live, extraordinarily long and healthy and they don't have access sometimes to modern medicine, and yet they seem to live in through their Santeria years, still going outside and having community and work, doing stuff in the world and not being chronically ill.

And so I really started to to think about this much more deeply from a, a food as medicine perspective. What do we know about what they eat? What do we know about how they live?

The so-called principles that Dan Buettner talked about that are common among these groups. And interestingly enough, by the way, as you know, one of those blue zones happens to be not Sardinia, not, Costa Rica, but, Loma Linda, California, right in the middle of L. A.

County. And, you know, they breathe the air, they drink the LA water. So what the heck is going on with these people that suddenly they're found to have these characteristics of longevity?

And lo, the incidence of chronic illness and, when you look at the commonality, whether it's basically a seventh day Adventist community, the medical school there and the university medical school is the seventh day Adventist medical school.

And they have certain principles about eating, which are plant forward kind of eating and, a lot of, the things that are kind of comparable in nutritional, composition to what you find, in these other blue zone areas around the

world.

And so when I started to look at, analyzing the diets of these places, one of the characteristics I don't want to say it's the only one, but I think it may be an under, appreciated one.

Is it all of these blue zone diets, including people in, in Loma Linda, are very high in this family of, nutrients that you just mentioned called polyphenols.

Now, what are polyphenols as well? We would simply, I think, know them as, agents that add color to vegetable and fruit products. So this is the old, eating of the rainbow concept that when you eat, foods that are natural, grown in the soil, that come out as vegetable and fruit products, and they have colors ranging from purple to red across the full visible spectrum.

Those coloring agents are members of these, some of them are members of these, these polyphenol or flavonoid families. Some of them are carotenoids, which are interrelated. But, the majority of them have these polyphenol or, or flavonoid characteristics.

Now, it turns out if you're a food chemist, and study polyphenols, you suddenly learned that there are literally thousands and probably more than 10,000 different, polyphenol compounds in different foods.

So the first thing you know, as a person eating food is that the color of the food and the flavor of the food tend to be interrelated. Second, as a food chemist, we learned that those characteristics are to some great extent as a consequence of these polyphenols and flavonoids in the food.

And then third, as a cellular biologist, we learned that those polyphenols play extraordinarily important roles in how the cells work because they are epigenetic, modulate of gene expression.

Now, what I just said, right. That last part of my my soliloquy is a revolutionary new concept. I mean, I'm talking about it's still dripping wet with new discovery.

We have thought in nutrition that these polyphenols and flavonoids in foods were kind of, secondary things that were not really that primarily important for human nutrition.

And in fact, if you go back and you look at textbook of nutrition for which dietitians were trained or nutrition scientists were trained, you'll find the topic of flavonoids or polyphenols may occupy only a few pages in the whole of a several hundred page textbook, and the reason that it was found to be unimportant was or relatively unimportant was no one could find a deficiency disease that was associated with the absence of flavonoids.

So it was not like vitamin C was scurvy or vitamin B one would very, very or vitamin B3, niacin with pellagra we we couldn't find a deficiency disease.

So people thought, well, they're interesting. They're there, but they don't play a really important role. Then people started to say, but hold it. Don't you think they could be antioxidants?

They could actually soak up oxidant, damaging things that in your cells. And so the work in flavonoids and polyphenols for a period of 20 or so years went heavily into looking them as antioxidants.

And all the literature that we might read, were focused on their antioxidant potential. But then scientists started to say, but you can't really describe the effect that they have on cells solely on the basis of them being antioxidants.

Epigenetics and Gene Regulation

And the reason for that is that, antioxidants would be like anti ricin factories. and we know that they're influencing things other than just preventing a cell from going rancid from, from injuring itself.

There are other things that are going on. What else could be going on with five and beyond? They're, serving as antioxidants. And that's where the story, just for the last few years, has gotten so remarkable, robust and exciting because now it's been found that these flavonoids, different members of the family, have differing effects around how our genes are imprinted.

Epigenetics to regulate how the genes and our cells express their function into becoming the cells that do the work in our bodies. So let me stop you for a moment, Jeff.

yeah. So epigenetics people, in the audience may not know what that term means. Yeah. Thank you. So you might think of our genetics, as being like, an analogy that people have used is like a computer system.

And so you have the, hardware of the computer, and then you have the software, the computer, the hardware. The computer is our genes and our genetic code that's locked that God set when the sperm at the egg.

We didn't get a choice. Whatever we got was the luck of the draw. And those genes are the 23 pairs of them make up our chromosomes. That's our book of life.

And that is the hardware of our genetic information. However, and this is the point that I think people are starting to now recognize that 23 pairs of chromosomes, it's our book of Life, has many stories in it.

The stories are our genes. Thousands of different genes, actually tens of thousands. And the genes are not all expressed in every cell all the time. Because if we were to read our book of life all the time, continuously in every cell, we'd be a mess.

Because in our cells are the are the book of Life stories for every cell that's different in our body, for the liver cell, the heart cell, the brain cell, the skin cell.

They all have stories in our book of life. But if they were all being read, an express simultaneously, think of what our body would be like. We'd be a total mess.

And remember where we came from. A lot of people forget this, that we came from a single cell that was fertilized, single ovum from our biological mother that was fertilized with a sperm.

and those combine together to form a fertilized ovum that started to divide, develop fetal development, that became every cell type in our body from that single cell.

Now, how did that occur? Because if it was a single cell, how did it become all these other cell types, of which there are hundreds of different cell types?

It did so by the fact that as these cells were dividing, and when we were in fetal development, that some of the messages of our book of life was not expressed in the next cell that was replicated, that was genetically modified.

There were marks that were put on the the Book of Life that allowed only the liver cell to be said, or only the heart cell to be said, or only the brain cell to be said.

And so we started to differentiate into this us what we are today. So when we finally were were born as an infant, we were the complex outcome from this developmental biology process of epigenetics.

Now here is where the story gets interesting. It was thought until recently that that process only occurred in fetal development, or maybe in very early infancy, but it stopped.

You weren't going to be changing the way you were epigenetic marking your genes after that, because people said all of that was to occur in your genes.

Were were being changed in the way they were expressed over the course of living. Wouldn't you start to become

a mess over time? So you must control the way your genes are regulated very carefully.

So the liver stays, the liver, the heart stays the heart, and so forth and so on. Well, that is true. 90, 98% of our genes are not being changed when we're later in in age, but now it's suddenly been found that there are these components of our genes that can be still modified by epigenetic marks in later life, even into age.

Life into a geriatric year. These are the genes that still are able to pick up messages from our environment, from our lifestyle, and alter their, their epigenetic means above the genetic code.

So this is the software. This is the software that lays on top of the hardware. The hardware is our genetic code. The software is our epigenome that tells the hardware how to work just like our computer.

So the food we're eating is talking to these epigenetic markers and, silencing some genes, turning other genes on, and so I'm assuming that some of the food will turn on disease promoting genes, and some food could turn on health promoting genes.

To make it. That's exactly. Yeah. That's the to me, that's the major discovery that's of our age. When I say our age, I mean the last 10 or 15 years. So when we talk about ultra processed foods, I mean, you've done such a brilliant job of educating people about, what happens when you eat these highly processed food diets very rich in sugar and processed fats?

Those can be a good examples of those kinds of foods. Jeff. Well, I would say these are your snack and convenience foods. Generally, the things that are made to be shelf stable for years, and you can put them in your camping kit and have them for years and pull them out later and eat them.

And they are foods that are, ultra processed to have sweet fat and salt. That as the principle of taste, perceptions and the psychobiology of the human taste mechanism tends to love these because we are already seeking for energy, and these are foods that can carry a lot of easy, quick energy and sugar.

Okay, sugar goes right into our blood and goes right into our cells. And and so it's like an energy food, but it can also glut the cells. And so these highly processed sugar, fat and salt rich foods that generally come in grease soaked bags or, or sealed packages are the things that then contribute information to our genes, epigenetic that cause our body to think it's under stress.

And when that's the case, what happens? It goes into an alarm mode, which we call inflammation. So now the dominant themes we have in our culture eating these ultra processed foods are inflammatory diseases of the nervous system, of the immune system.

And so, you wanna talk a little bit about, well, the health promoting foods. And so if the yeah, the, ultra processed foods, snacks, etc. are talking to our genes in a bad way.

What? We'll talk to my genes in a good way. Okay. So let's go back to our blue zones again. So the people that have been eating these traditional diets and these blue zones have been sending messages to their genes, epigenetic Lee and why do I know what's epigenetic like?

I mean, someone might say, well, hello, Jeff. If you're born in Sardinia, you just have the genes of a Sardinian that may be resistant to these diseases.

But what happens if a genetic Sardinian moves to the Western world and starts eating these ultra processed foods? Their genes didn't change, but their disease profiles become like everybody else.

They get the heart disease, they get the dementia, they get the diabetes. They get the all the the, the kind of autoimmune diseases that we see in the Western world.

So it's the hardware didn't change. What changed with the software, which is the at the genome. So the people in

Sardinia eating the traditional Sardinian diet, are the individuals that are sending messages, epigenetic play to their genes to create what I call bliss outcomes, to create healthful outcomes, to see life as a journey of extraordinary joy.

And that's what we associate with health and resilience.

Ultra-Processed Foods and Inflammation

Now, what I've just said previously is the major new discovery is that these nutrients and foods, the so-called polyphenols and flavonoids, which we used to think of in nutrition circles as kind of secondary placeholders, they weren't really of that much importance in terms of cell biology or health.

Now we're saying, whoa, just a minute. These fibrates and polyphenols that are found in these diets, of people that live in the blue zones are actually modulating the epigenome to turn on the health genes, to turn on the resilient genes and to turn off the genes of alarm, the the genes of of inflammation.

That is a huge, huge advance in our understanding of how food and medicine plays out in our cultures and why we should do the things you've been talking about in the way that we design our diets to avert, then the catastrophe that occurs when you get inflammation present in your nervous system.

So can you give our audience some examples of foods? Richard. Polyphenols. Well, you could think of, the whole Berry family as being very, very, rich in polyphenols.

you could think of actually, dark green leafy vegetables as being very rich in and, polyphenols in the flavonoids. So things like, kale, spinach, Swiss chard, beet greens.

Exactly. Really? you could think of, certain non gluten, whole grains, seed grains as being very high in fiber noise and, you know, things like buckwheat.

Yeah. Buckwheat. Quinoa is very high in that, millet. Very high millet. You know, actually it's interesting. buckwheat and millet are the oldest known cultivated foods in human nutrition.

They go back 4000 years of knowing cultivation, and they're very, very high in these, epigenetic modulating, polyphenols. And they are foods eaten in people living in the blue zones.

So, you know, the story kind of fits together as we start to look at it. how about things like, walnuts? nuts? Yeah. It's, well. Maybe right at the head of the list. Walnuts.

I think the highest, the highest food or one of the highest foods, maybe we would say pomegranate as well, but one of the highest foods in ellagic acid.

So ellagic acid is a very, very important member of the polyphenol family. And ellagic acid, gets converted. by, friendly bacteria in our gut microbiome in a series of secondary, by, chemical secondary substances that have really powerful effects on immunity and on longevity.

So we start to say it's not only the consumption of these polyphenol rich diets, but it's also a friendly microbiome that plays an important role because the microbiome eat these polyphenols and produces its own secondary products, which are beneficial to our bodies function.

So it's a complex system. It's an interaction between these big molecules, the polyphenols that can't get into our bloodstream. But the microbes eat them, digest them, and then, those byproducts get into our bloodstream, or, they're just still talking to our immune cells to combination.

And that's a really good point that you made. you know, we used to think that things had to be absorbed into the blood to work, but now we recognize that our immune cells, pick up this information locally because they're right

next to the gut microbiome.

60% or more of our immune system is clustered around our intestinal tract and so-called, gastrointestinal associated lymphoid tissue. And so those cells can pick up the information directly.

Blue Zones and Health-Promoting Foods

But then there is also trans, cellular, absorption of these, these metabolites into our blood that then distributed, throughout the whole of the body, so it can influence immune cells that are in our brain, like the microglia immune cells that exist in our liver, the Kupfer cells, immune cells that exist in our muscles, the myo kinds.

So all of these can be nourished by the, proper metabolites that occur from eating, polyphenols and, flavonoids and having a healthy microbiome. this is wonderful.

So to the audience, thank you so much for joining us today. I hope you found our conversation to be, insightful, engaging. and if you're a summit purchaser, stay right here, because we're about to dive even deeper into this wonderful conversation.

And if you're not, click on the button below or on the side and get access to a world of wonderful information, get ready to reclaim your health. Now, if you're watching us, thank you for being a valuable member of our community.

And let's continue this great conversation. You know, we've been talking about policy and oils and flavonoids. Could you clarify, is it the same thing or are they slightly different molecules?

Jeff. Oh yeah. Thank you. That's a great question. So, flavonoid is kind of the general, descriptor of many subcategories of molecules that are found in plants.

and so there, there are subcategories like flavonoids, flavanols, flavonoids, still monoids that there are many subcategories, those kind of grouped together around a chemical, structure that are term polyphenols.

Polyphenol is kind of a chemical nomenclature for the structural, similarity among these different families of molecules. So the flavonoid family or the thousands of different food ingredients that fall into this chemical nomenclature that we call polyphenol.

So if we really wanted to be specific, we would talk more about the individual flavonoid families that are all members of this broad class called polyphenols.

Yeah. If I remember, these are ring compounds that are connected together. You know, go ahead. I was going to say we, we have just recently had the benefit of a discovery that I think is frameshift.

And it's so relates to your remarkable work that you have contributed to the evolution of our field. This is a collaborative, study, a study that I thought would probably never, ever be done because I thought technically it was impossible, but it has been done.

It's a collaboration between investigators at Harvard University School of Public Health, Harvard Med School, Mass General Hospital, Rush Medical Center in Chicago.

and it's, looking at the impact of the so-called mind diet on, cognitive and neurological function. But let's stop let's let's explain what what does mind stand for?

Yeah. Thank you. So mind is an acronym that refers to a diet. It's a combination of the Mediterranean and Dash diet principles. So it's a plant heavy plant forward diet that's been we all know about the Mediterranean diet.

The Dash diet is a diet to stop hypertension, so it's low in sodium, high in potassium, low in saturated fats, more in poly unsaturated oils. and it's the combination of the Dash diet, along with the Mediterranean diet produces what

they call the mind diet.

Mindy. It's an acronym for that. And it's been, studied extensively over the last ten years, with a lot of, clinical human work, actually, that has evaluated its effect.

But this most recent study to me is it's mind blowing. So what this recent study has done just just published in pre-print this last month, in December of 2023.

is they looked at 1024 people who were deceased, who they had been following for 20 years on the on the mind diet or on the, on the on ad lib diet. And they then once they had passed away, these are individuals that had signed a agreement to have biopsy done of their brain.

So brain tissue was taken postmortem and it was analyzed. I know this is going to be a little geeky here. So hang with me here. It was analyzed by, transcriptomics, meaning it was asking how the genes are being expressed in these brain cells of people that were on the mind diet or on the ad lib diet.

And when they did this transcript, transcriptomic analysis, which is pretty detailed, evaluation of how the genes are being expressed in the cells of their brain, they found out that there was a very significant difference that would separate the people on the ad lib diet from the main diet.

They were their way that their genes in their brain were being expressed, which is different. We should remind people that ad lib means you get to eat what you want, right?

Yes, exactly. So the traditional, American diet, right, that some people call that said Standard American diet. and so what they found is that you could separate these two based upon the way their genes are being expressed.

Now, the question was, well, what genes were being expressed differently in the brains of the people that ate the mind diet versus the people that ate the standard American diet?

And they found the genes that were being expressed were genes that were related to cellular repair, to immune vigilance, to and DNA repair, to repairing genetic information in the mind diet.

You had people who had their body, their their brain cells were being rejuvenated basically by the consumption and the diet. Now, here is really the takeaway clinically, they also did cognitive function tests on these individuals before they passed away, obviously.

MIND Diet and Brain Health

And they were able to show that there was a correlation between the alteration in the way their genes were being expressed and their higher cognitive function, greater short term memory, greater, neurological function, more resilience.

I think this is an unbelievably important study for us to understand that somehow we are epigenetic, modulating how our brain is actually expressing its function by the foods that we're eating.

And it can be demonstrated in the laboratory by analyzing gene expression patterns in people that have passed away, who had higher neurological function.

By the way, the mean average, age of these people was around 90 years of age. So they've been following them from from 70 to 90. You know, I've looked at several of those studies and I was looking at, the, parameters that they use to track diet consumption because they're using food frequency questionnaires. Right.

And so they were measuring, were they having green leafy vegetables? I think it was three times a week, where you having, a serving of berries, every day.

and I as I was looking at all of this, I was like, you know, this sounds remarkably similar, to another dietary pattern of which I'm familiar with. And that's the last dietary patterns thing, figures that I was.

I was not surprised that they had done so well because, they, they also stress, you know, getting rid of the, added sugars, getting rid of the, ultra processed foods, flour based cereal spreads, pastas, white flowers.

so why don't we talk a little bit about the difference between the Mediterranean diet, the mind diet and the paleo diet. And so what's different and what's somewhere between those three diets?

Yes, as we know. And again, you are one of our champions for this whole area. So I, I'm deferring a lot of this to your knowledge. But, there is this, this debate that's going on now between, I guess, the strict vegan and the omnivore, you know, can you eat animal products and still be healthy, or do you have to be just a strict vegan?

And I think that your work and, and, you know, Mark Hyman wrote a book called The Keegan Diet, which is kind of a combination of vegetable based and paleo.

I think that the work is showing and your work is as the central, I think, in this area, is that the appropriate use of animal products, hopefully, has been incorrectly or organically raised and I go way back in my history.

I was very fortunate, some 30 years ago to be on the, the board of the first organic meat company, Coleman Natural Meats out of, Colorado. Swatch, Colorado.

And I, as a consequence, had the chance to hang out with their cattle, in their, in their ranch in Colorado and see the difference between the animals that were raised antibiotic free, that were raised on natural pasture, that, didn't go into feedlots and get fed corn, and didn't get a lot of that.

Well, they got no veterinary medicines. They would be culled from the herd if that. And so they were certified to, to fulfill these criteria. And there was no question in my mind that, the quality of the product that was produced by them, both in taste and in composition was entirely different than the commercially that meat.

Now, we had a very, very big challenge in getting the USDA to agree that there could be an organic certification for animal products, because the Cattlemen's Association resisted this vehemently.

They didn't want some classification version of meat that would look like it was different than traditional kind of, raised meat. And eventually and when I say eventually, I mean over 20 years, it was a it was a long term effort.

we eventually developed enough momentum, energy and science to support that this designation could be applied and used for, animal products. And now it's used with chicken as well.

that was raised under these kinds of conditions. So I, I am a strong believer that it's not just meat, it's it's how it is raised, where the animal come from, how it's processed, and the appropriate combination of that within the diet, making sure that plants become a major part, minimally processed, full range of the rainbow and whole whole, seed grain gluten free is is really the diet that you've been advocating as the the diet that emerges from the science to be the best approach for sending the right epigenetic signals to our gene?

You know it again, for everyone who's listening to this, think of our evolutionary history. You know, we, diverged from our other primates and, you know, about 7 million years ago, we've been eating plants for a long time.

We gradually started eating more and more meat. and we migrated all across the globe with, reproductive success, eating a wide variety of foods. So there are many diets that are healthful.

Mediterranean, Paleo, and Quality Animal Foods

But the one diet that is not is a diet that's rich in added sugars, rich in flour based products that are used to create cereals, breads, pastas that are delicious but devoid of nutrition and don't have those signals that Jeff's been

talking about.

Those polyphenols that speak to our genes, that tell us to maintain and repair ourselves so we can stay healthy and vigorous this whole time. What you just said is a transforming principle.

I think, Doctor Wahls, for the health of the planet, I was going to say health of the of the United States. But I think if it goes to across every human being, you know, I, I'm reminded I was introduced when I was a starting young professor back in 1970.

I was introduced by, actually a dentist in our community who came to one of my lectures and he said, Jeff, are you familiar with Weston Price and Nutrition and Physical Degeneration?

His book. I said, no, I, I've never heard of Weston Price. Well, it turns out Weston Price was a that was a dentist at the turn of the century, in the last century in in Baltimore, Maryland, and, he and his wife, he was a very successful and and so they were able to travel widely.

So they they had a lot of travels, but not your normal kind of tourist travels. They went to, areas of the world to visit that were still traditional living.

And you might even say they were like the first of the Blue Zone visitors. And so they would go around the world and they would visit these, individuals that were consuming diets and living lifestyles that were consistent with, you know, hundreds of years of history.

And they did very detailed because he was a dentist, they did very detailed measurements of their oral health and and measurements of their, mandible and their maxillary regions in their oral cavity and their teeth and their gums and, and, you know, they found no periodontal disease.

These are not people that blister flossed and didn't go to have their teeth cleaned. And and they found healthy bone structure. And they didn't have asthma.

They didn't have respiratory problems. And so he wrote this, this up. This was a course of a number of visits, that he and his wife took in these, these travels into this book and nutrition and physical degeneration.

And, and he lived at a very important time because what was just being introduced, in the 30s was the first a food processing that really started to become, ultimately going to the shelf stable foods that made our grocery stores of today to be for we didn't have the kind of growing supermarkets that we we have today.

So he was living at a time where those were just being introduced. So as he came back later in his versus the same communities that he'd visited pre industrialization, that the food now it was post-industrial ization and he could watch the degeneration of the people.

And these are the descendants, the second generation. So he he made photographs and measurements again of their oral health and so forth, demonstrating clearly that as the diet changed in these processed diets, their health changed, their physical structure changed and their longevity changed.

And so this is kind of a classic work. I know the price of your foundation has kept this alive, these, these documents over the years, but that that book and nutrition and physical degeneration is, I think, a classic, that really capture this time in history where this transition was being made.

and for the audience again, when was this published? Was this like in the 19, 40s that this was published? Yeah, 30s and 40s, I believe. Exactly. And again, this is a wonderful, wonderful book.

yes. Amazing photographs. it'll certainly change. your thinking about disease and health. It'll change your thinking about your dental, care, is the most important thing we can have for better dental care.

Has to do with eating tough, chewy food, eating lots of plants, eating, berries. and, getting rid of the sugar. Processed foods. Yeah. If you're here and, and you know that we're tied together later with, Pottinger's work.

That's why it's called the Price Pottinger Foundation. So Robert Pottinger was a physician in, in, Los Angeles area. and he had a tuberculosis clinic.

He was because that was, disorder in the 30s. It was still very prevalent. We we didn't have, really good therapies for it. And so sanatoriums were the place where people often went, to get over tuberculosis.

And so he started doing studies, looking at nutritional relationships to recovery from tuberculosis. which was, as we know, is a is an infectious disease.

And as a consequence of that, he started this. He said, well, I need to do a study with an animal model. So he chose cats.

Weston Price, Pottinger, and Epigenetic Recovery

So this is the classic plot, mature cat studies, in which he started feeding cats highly processed food rather than raw food. And he studied what happened to the cats over generations of feeding this highly processed food.

And he was able to produce the first, as I recall, cat with autoimmunity that, there was a third generation cat. And so then he found that if he wanted to replace the cats, by the way, this is all epigenetics because he's not changing the genes.

It took three generations to replicate the cats back into health after it had had undergone degeneration over three generations of feeding, depleted food.

And much later, then Dr. Lucille Hurley, who was, a highly regarded nutrition research investigator, University of California, Davis, she's she's now deceased.

But, she had been doing work on nutrition and immune function, and she was she confirmed in very controlled studies that if you retard, specific nutrients over the course of three generations of a specific, animal species, that it will develop these chronic immune dysfunctions, and it takes 3 to 5 generations to replace them by giving them back the nutrients. So this is the example, I guess the good story epigenetic is two way street.

You can either take it down the road towards ill health, or we can turn around and go the other direction on the street towards regaining epigenetic health by giving the right information in our diet and lifestyle.

A very powerful part of history that we're learning again today. As the epigenetics becomes more well understood. Well, that is a great place to end our conversation.

Jeff. so everyone who's listening, there is so much that we can do, even if you have, poor health now, by depleting your nutrition with these great compounds, these polyphenols, we can reset your, epigenetics and begin sending, the better software, towards your immune cells in towards your, repair and capabilities.

Perfect. What a great summary. Thank you. Jeff, this has been wonderful. Thank you so very much for being part of the MS and Neuroimmune Summit. And my great privilege. Thank you so much.