Introduction and evolutionary mismatch

Welcome everyone to the Micro Talks and in Chronic illness Summit. I'm Doctor Christine Schaffner, and I'm here with my colleague and dear friend Michael McEvoy.

And we're going to be talking about how men think therapy at UN unity and evolutionary mismatch. Welcome, Michael. It's really great to see you. Thank you for having me, Christine.

Yeah. Well, I think you're in this beautiful setting for this amazing topic. And this is something that I've been continually intrigued by. And I just always trust your perspective.

And I know that you research an incredible amount before you become, you know, formulate an opinion. So I'm really excited to hear what you have to say today.

And as the title kind of alludes to, I want to, first dive into this idea of what you share as an evolutionary mismatch and its relevance to chronic illness.

So can you just set the stage for the conversation and share your thoughts about this? So evolutionary mismatch is a term that was sort of first used in the 1940s by, I believe, the person attributed as Ernest Mayer.

And essentially evolutionary mismatch has to do with the fact that there are certain inherited genetic traits that were once advantageous in a certain type of environment, which have now become maladaptive in a new or different or change environment.

And so this concept of evolution, evolutionary mismatch is we start to look at it, start to understand that it's really central to understand the genetic involvement with the rising tide of chronic disease in the modern world.

And it also leads us to envisioning new treatments that could potentially augment and fulfill the genetic code for certain individuals that are more in aligned with producing inflammation.

But if those individuals had exposure to certain types of helminths or parasites, that a lock and key mechanism is almost established to the point where if they're missing a certain environmental vector.

And as I want to talk about briefly, an article that I published in the, holistic Primary Care magazine that really ties this concept together. We really need to take a step back and look at how evolutionary biology has been very much relegated from the discussion of modern medicine in chronic disease.

And a lot of that has to do with politics, with the fact that, medicine, by its virtue of trying to identify pathogens as the sole vectors in disease, have become obsessed with that effort.

And in this process, medicine still, in my opinion, does not have the maturity to investigate the concepts of inheritance and genomics through the lens of evolutionary biology.

This has a lot to do with the creation of molecular biology, which is about 100 years old and I would argue that molecular biology, which is the template that we use to study genetics today, as well as the basis of modern medicine, is more of a technology than it is a fundamental science.

Pathogens, symbiosis, and helminth therapy

Molecular biology has a lot to do with neo Darwinism and the principles of neo Darwinists such as, survival of the fittest. The neo Darwinists got the upper hand in the creation of molecular biology, and as a result of that, became

obsessed with sort of their own personal eugenicist views of what they wanted medicine to become.

But in that process, evolutionary biology has largely been relegated from the textbooks as well as from the discussions in, modern disease and in modern medicine.

It's very interesting because if you look at the, if you look at the population data and the epidemiology between the first world countries and the third world countries, we see a large disparity in the types of diseases that show up.

And I specifically mean that the disparity is that in the first world nations, there is a high prevalence of inflammatory diseases. I'm talking about a high prevalence of allergy, ATP, eczema, psoriasis, autoimmune diseases.

Rupert Group, rheumatoid arthritis, lupus, inflammatory bowel diseases, on and on and on. Neurodegenerative diseases, inflammatory diseases like type two diabetes and cardiovascular disease.

These diseases have been largely minimized and to a large extent absent in third world geographies. And the question is always come up as to why is that?

Why does that disparity actually exist? And this was the basis of the hygiene hypothesis, which later became sort of the evolutionary mismatch hypothesis, which is that certain genotypes are predisposed to producing inflammation.

Why is that the case? Because our gene pool and our immune system has evolved specifically because of diverse pathogen interactions. We do not have an immune system unless we have millions of years of pathogen interaction.

And those pathogen interactions are not only capable of producing inflammatory immune response, but they also create adaptive symbiosis. The concept of symbiosis was really pioneered by a wonderful biologist by the name of Lynn Margulis, and she really led the flame to showing us that organisms evolve together, and that from this research, we have to very closely redefine what pathogenesis really is, because as we've come to learn over the past several decades now, and there's been many years of clinical trials that have been done in on helminth therapy, ingesting, either orally or cutaneous, inoculating yourself with various helminths or worms or their eggs to arrest various inflammatory, autoimmune diseases.

Many successful clinical trials have been performed, but through that knowledge, we have gained a deeper understanding that what we call pathogens needs to be carefully, carefully redefined because, for example, try curious Swiss, which is a helminth, is classified by the centers for Disease Control as a parasite.

However, Curious Swiss has clearly demonstrated the ability to arrest inflammatory bowel disease in a significant percentage of patients. I'm talking about colitis and Crohn's disease.

There were two randomized clinical trials conducted in 2005 that clearly showed that significant benefit. So we have to really now look at we have to really, in my opinion, revisit and redefine pathogenesis through these new lenses, because what we are learning from the clinical trials and what we're learning from metabolomics testing that has been done on how helminths interact with our immune system, how they down regulate and dampen the one autoimmune response, how they dampen and attenuate the sought after immunological pathways that are centrally discussed in these autoimmune diseases.

The lock and key mechanism of helminth therapy becomes more clear as we start to unravel this. Wow. You know, so that's a lot to take in because of the people who are listening, right.

This is focused on mycotoxins. But also the chronic illness world. Right. So this is a very Emma and I, you know, I have similar thoughts. I haven't delve as deep to you, but I do feel that, you know, our health is highly I mean, we've evolved, right?

We have microbiome environ. We have a microbiome. Like that's not this war against pathogen Morgan's microbes. Right. It's this, you know, evolution, as you said.

And then I you know how I've made sense to that modern life has kind of insulted our terrain so much that some of these things can become opportunistic.

And then, thrive in our body and, create symptoms. And so this is like a whole nother narrative, right? That we're missing, a potential parasitic infections that might not even be called parasites because they're offering value to the patient's health, because of our modern and maybe more sterile, less diverse world.

So it's kind of like this. There's some similarity in these themes because I think biodiversity adaptation, resilience, all of these things are key to health.

But, you know, we're we're looking at it from a whole different angle because parasites are really common, right, in this, patient population who are chronically ill.

And we have this, you know, all these antiparasitic strategies and cleansing the bowel and, you know, getting rid of things. And so, do you feel like these two ideas, still can interact with each other there?

Or is there a conflict there? So the difference between a parasite and a helminth is actually very simple. A parasite feeds off of the host. A helminth provides a mutually beneficial relationship between the host and the colonized worm.

And so as we begin to look back throughout history, we realized that protists and worms have been a part of the human biome for such a long, long, long time that their absence is only.

It's their. Their absence has only appeared within the last couple of hundred years because of sanitation practices, the increased incidence of the increased use of antibiotics and, other, other immunomodulatory therapies.

But the key distinction is that a helminth provides a mutually beneficial relationship, whereas a parasite feeds off of the host. So when I'm talking about helminth therapy colonization, I'm not talking about colonizing with parasites.

I'm talking about colonizing the biome with with ova or worms that are not capable of moving outside of the intestinal biome. And what are at the same time capable of releasing various molecules into the host, which regulates or modulates many of the inflammatory receptors that we know are involved in various autoimmune diseases.

Thank you for, the distinction of clarification.

SIRS, autoimmunity, and biome diversity

And Ken, is there ever a situation where a Hammond can become parasitic because of terrain or other conditions and you know, the god, or is that not a possibility?

Well, that's a great question. And it comes down to individual individuality. I'm not necessarily suggesting that helminth therapy is ideal for everybody, but I think that it's first important to ask, who are the patients that would, benefit the most?

And we know from what's already been published that type one autoimmune diseases, one driven autoimmune diseases are primary candidates. We know. Just speaking of, sirs, for a moment, I know that this, this is really about your your, summit is very much about that.

I wrote an article a couple of years ago on my website, Metabolic healing.com. It's a free article. It's available for anybody. And the title of that article is sirs and Helminths.

Is this the missing link? And I made the I just ask the question that, you know, is it possible that sirs, which is the chronic inflammatory response syndrome response to various either mold or mycotoxins or so-called bio toxins, can that be possibly related to a long term multi-generational biome?

Depletion of helminths. And as we start to peel it away, we realize it is. Richie Shoemaker has done his important research uncovering that chromosome six, the MHC two region which is the HLA class of genes HLA two is largely involved in the genetic association to Sirs.

What's interesting about that is that helminths directly act to inhibit the major histocompatibility complex two versus MHC. One is more driven by viral pathogen selection.

MHC two has been more driven by parasite selection and parasitic peptides. There has been a flurry of studies that have shown that, certain helminths can secrete cysts and protease inhibitors.

We know that one of the ways that fungi and mycotoxins can adversely affect the respiratory tract is by the secretion of various proteases. We know that helminths can directly interact and inhibit, this process.

We also know that, many people that have Sirs and autoimmune disease, many people that have Sirs may have autoimmune disease also or may have I whenever I work with clients, taking an inventory and just seeing if there is that going on or if it's in the family.

And oftentimes I find that's the case. So there's clearly a link between autoimmunity and Sirs and the possible interaction between diverse pathogen exposure versus not diverse pathogen exposure.

And what do I mean when I say diverse pathogen exposure. Again, when you have, a biome that has diversity, a diversity of microorganisms, the diversity creates a situation where you become less susceptible to the pathogenesis of single pathogens.

The less diversity of microorganisms you have, the more susceptible you are to the pathogenic effects of single pathogens. And that again has a lot to do with the fact that we have all evolved with microorganisms as symbionts.

What we call pathogens is sort of a misnomer because we can live with tons of. And I've run stool tests and I'm sure you have too. And, you know, we deal with a lot of sick patients so that, you know, whenever you see a sick patient, you run a stool test, you find, you know, you can find anything wrong with them by looking at a stool test.

But if you look at a healthy cohort, not too many good scientists are actually looking at controls. They're only looking at, let's just study the sick people.

Let's not look at the controls. But I've actually seen many healthy people, including myself, that would show various pathogens in the stool, yet we present no symptoms.

Why is that? How is it we present no symptoms whatsoever, but we have all of this colonized version of all these so-called pathogenic microorganisms. They've done studies in Africa that have shown that, healthy indigenous people living off of the land truly, in remote regions of Africa, are loaded with bacteria that are strongly associated with Crohn's disease, yet don't possess those symptoms of whatsoever.

How is that? And I think that what we really need to do is to take a step back and really redefine pathogenesis as different degrees of dis symbiosis, the ability or the inability to tolerate other microorganisms.

Because immunology is very much about adaptation, the ability to adapt and to get stronger, to learn literally biological plasticity, to actually learn from the pathogen exposure that you had, that your immune system gets smarter, it remembers what to do.

It remembers not to overreact next time. That's the level that we need to get because we can get rid of. We can try to get rid of mold from our environment.

But guess what? We'll never be able to do it. It's not possible. Mold is everywhere. It's everywhere. It's always been everywhere. Why is it a problem now is opposed to 200 years ago or 50 years ago?

Even. What has changed in the environment? What are the things that have changed, that have led to a dysregulation and a dis symbiosis to form that we now call Sirs, or we now call autoimmune disease, or we now called enter in the next disease label.

We have to look at the relationships between microorganisms in each person, because we're never going to we're never going to figure out these complex problems by using the old model of medicine, which is single pathogen vector oriented, which was good in the 1800s when you had acute illnesses caused by pneumococcus or whatever.

Today, it's a different world. It's a completely different micro environment. We have completely different biomes, which are completely depleted of helminths virtually. And that's been studied and proven.

Now you make an excellent point. And you know I think but you know I, I agree with you, I think I've just been thinking about this from a different angle, you know, and I've been thinking of, the increase in toxicity that we're all exposed to and that how that is weakening our trade and how that has been underlying.

I haven't and I you know, of course think about okay, biodiversity of the garden, you know, all of that. But, I guess maybe, how do you make sense of, like, the rise in toxicity and the absence of humans, in the body?

That's a really good question. And I, I just want to say that there is no question that the environment that we're living in is very toxic. And the interaction of various chemical toxins, many of which are not even detectable, microplastics, for example, that we're consuming on a regular basis for myriad number of sources that all of that is going to end is all of that is going to directly affect our microbiome.

It's all it's going to. We do know from other research that microorganisms have the ability to sequester different toxins. I remember years ago, you know, reading papers that showed that, 50% of the dry weight of a bacteria can be a heavy metal like mercury or iron.

Well, that's not necessarily any different from helminths or worms or any other microorganism that the world count. Colonizing. I think we have to start to look at these complex interactions.

With the environmental toxic factor is how it how that is affecting our biome. Because it is there's no question that it is. And the ability and when we talk about modulating the biome, most people think, oh, more probiotics or more prebiotics, well that's fine.

I'm not necessarily opposed to that, but we have to always remember that what what we have missing in the Western world that is not missing in the Third World are helminths.

Just talk for a moment about that article that I published in Holistic Primary Care. And I really think that it's it's a segue into this to kind of illustrate the significance of this.

Consider that the ApoE4 Ford type has a 20 fold risk of developing Alzheimer's dementia before the age of 65. That is specific to the First world, the United States, that if you have the ApoE4 genotype, you've got a very high risk of developing Alzheimer's dementia.

If you live in Papua New Guinea or if you live in sub-Saharan Africa, have that ApoE4 genotype, or if you live in the Amazon basin, you do not develop Alzheimer's disease.

Alzheimer's disease is negatively correlated to those regions. It is not correlated to that genotype in those regions. The reason for the difference this disparity is helminths.

And the literature on that is very, very clear.

Genetics, ApoE4, and deworming effects

There was a study done on Amazonian for horticulturalists, basically showing that the greater parasite diversity that

ApoE4 four genotypes have, the better cognition they had with age.

Not only did they not develop dementia, but their cognition actually improved with age in the presence of parasites. We know from other research that ApoE4 for carriers have the have a greater, stronger immune response.

They have a more they have a more of a recoil in their ability to to to to cut to combat different types of pathogens. We know that because we look at the mouse studies, in the human studies in the metabolome, studies on ApoE4, we know unequivocally that they have a very robust innate immune response.

That's good for one thing, but bad for something else. And and that specifically means that if that, that ApoE4 genotype that that many people in the Western world have, whatever it is, 15% or so, that genotype didn't evolve in the United States.

In the first World, that genotype evolved in pathogen rich regions of the world. And that's why those pathogen rich regions don't have a prevalence of Alzheimer's disease.

Transplant that ApoE4 genotype to New York City, and you're going to have the appearance of a new disease in the gene pool. I Alzheimer's disease, which for that genotype is relatively new, that is called mal adaptation or maladaptive genetics.

So just for that genotype alone, I proposed in this article that I wrote the need to look at helminth therapy as a viable treatment, as a necessary treatment to attenuate the inflammatory tendencies of the ApoE4 for genotype.

But it doesn't stop there, because as you start to really go into this, you realize that so many other genotypes that we now look at have specifically evolved because of parasites.

The HIF hemochromatosis, hemochromatosis gene is another one. The Larc two gene in it's associated with Parkinson's disease is also a result of pathogen diversity.

Genotype genes that are even the cluster genes that are that are copy number variations. Why did they copy? Because it was it was nature's way of saying we need more of this gene to fight this kind of infection.

And parasites are the modifying factor for these genotypes that are now associated with modern diseases. And what happens when you'd worm the Third World?

There's been a plethora of huge randomized trial studies in cluster studies in the Third World showing that if you have patients with, with, with, if you'd worm patients with helminths, they then do their evaluation to show glycemic markers.

Huge increase in insulin resistance when you do long term deworming protocols. Same thing with vascular disease inflammatory markers. So not only are helminths a modifying factor of our genotypes, but if you remove them in certain populations by deworming them because we think we're doing the right thing, you wind up creating a new disease that didn't previously exist.

Wonderful. If you're big pharma, right? In my mind you, the World Health Organization is very much aware of this subject because they have published these they have published articles linking to these specific studies and have funded some of these studies.

So we know that these large organizations have the, you know, the so-called philanthropic, you know, we want to be doing good in the world by deworming the Third World.

But what happens when you do that and the results of that are explicitly clear? So what we have to really understand that what we think of as parasites is being pathogenic may be true in some people, may be true in certain cases.

However, we have genes that we have clearly inherited that specific evolved because of parasite interactions. And you remove the parasite, eventually you're going to see evolutionary mismatch in real time.

And I believe that this is one of the more overlooked phenomenon in evolutionary biology and in modern medicine today. Yeah. No, I mean I mean definitely, my mind is open in a way that I haven't looked at this and you know, with all of your explanations, Michael, and, you know, I mean, we kind of think of like, also endogenous retroviruses or the virus, or, you know, this, you know, we vilify, you know, pathogen and then, you know, forget all of the, you know, the Alberts, you know, doing this to evolve and, you know, actually be more helpful than harmful.

In the end. And so I, I see your point, and I guess so walk us through how how many therapy, are you doing this? Have you, had experience with, clients and, collaborating with patients and just maybe walk us through this so we can, go deeper and understand how this works?

Well, yes. So I'd like to just mentioned you brought up viruses and retroviruses, and I do want to say that there have been studies that have shown that helminth therapy has the ability to attenuate the interferon response, as well as the innate immune response to viruses, in particular.

And this was also this was done there's human and some animal studies looking at this as well. So as you were mentioning, the Virome, you know, supposedly we have 380 trillion viruses or some, unfathomable number in our body, in our biome that makes up who we are.

I mean, we're we're literally comprised of more micro organisms and viruses and bacteria than we are human cells by an enormous order of magnitude. But there is a direct, helminths definitely have an inhibitory effect on viral activity and the innate immune response to viruses, which means that there are potential benefit for various so-called viral infections and may also be a totally overlooked treatment in that regard.

Getting into treatment, I want to first give a real, shout out to an organization that I think is doing tremendous work. And in the if you're on your browser right now, go to helminth wiki dawg helminth helminth I c therapy wiki.org.

This is an organization of a community of people that have aggregated thousands of patient testimonials from people that are self treating using helminth therapy, and if you go through the testimonies, you'll be astounded at what you read.

As I was and as I continue to be. They've also done a good job of aggregating about close to a thousand published studies on helminth therapy in animals in pre-clinical studies, as well as in human studies.

So helminth Therapy wiki.org is an absolutely phenomenal resource for people to get familiar with this concept. And also there's a Facebook group there that of people that are sharing their own experiences doing it.

Because I have to admit that, a lot of my patients don't want to do helminth therapy because it's still too much of a foreign concept. However, those that have done it have gotten benefit, and it's simply because there is a huge potential to attenuate complex signaling in the body using something very simple.

The other the other limitation with helminth therapy as it is today, is that the cost to do it is still relatively high. And because of the fact that there are certain FDA regulations on the culture and the sale and distribution of helminths in the United States, many people that are doing this kind of therapy have to source helminths from outside of the country, from labs coming from outside of the country, which, is totally feasible.

But the cost of all of this can get a little bit exorbitant. But if your health is at stake, if you have multiple sclerosis, of which there's been at least 3 or 4 clinical trials in humans showing major benefit.

And I just want to tell a quick story on that. When I was about about 15 years ago, I was contacted by a 22 year old male who had been recently diagnosed with multiple sclerosis.

And he told me that he was going to enroll in some clinical trial happening in a major university, United States,

using helminth therapy. And at the time, I hadn't heard of it. I wasn't familiar with it.

And I said, well, good luck, I hope it works for you. Six months later, he calls me back and he tells me that five of his six brain lesions were gone and the six one had shrunk by 50%. Wow.

I said, that's pretty dramatic. So that was that was my first experience with, helminth therapy. And ever since then, I've been very interested in this concept.

But the ability to do that is, you know, the ability for helminths to work on these levels. Again, people out there thinking, well, who what what kind of disease do I need to have to have worms, I can't wait get me started right now.

Do I get started? Well, I would say this is that we don't yet know who is not the best candidate for type one for, helminth therapy. Because as you go through the list of testimonials, anecdotal reports from individual self treating, you see an enormous amount of categories here.

It's not just type one autoimmune diseases, it's also pandas. It's also salicylate sensitivity. It's also neuro neuro neurological symptoms. And but it's mostly it is mostly autoimmune disease because I believe that that is that the genes that we've inherited that are the links to autoimmune disease are the immunological genes.

And those are usually the ones that are associated with Hhla2 or HLA one or RCC or cytokine genes or etc..

Practical helminth therapy and resources

So I would just say this is that for inflammatory bowel disease, if you are, if you're if you're looking for a treatment, if because I would unequivocally say give it a shot because there is no question it could save your life.

And as you read the testimonials on the helminth, therapy wiki pages, which I encourage you to do, I was just perplexed at how many people have gotten benefit and why this therapy is not more widely used is really, really something that I want to get behind and promote because we need from just from a scientific perspective.

We need more data, we need more clinical data. We can't move forward unless we get more clinical data. And so I really encourage you to, to to just be open to this concept, because I think it can really save people's lives.

And it already has. Yeah. No, no, I think it's really, important, especially as you said, like, I mean, if your life is on the line, if you're really, having one of these really, you know, grave diagnoses that doesn't have a lot of treatment, I think when you weigh the risk benefit, it absolutely should be considered.

I mean, my my brain is going and I'm sure you've even gone there to like, okay, very different, but let's say, okay, you know how probiotics. We made a supplement out of them, right?

Is there any kind of, like, forward thinking, like some of the anti-inflammatory agents that the helminths produce? Like, we can encapsulate or peptides or, you know, things so that we can, have this or is that like that's too reductionistic.

That's a really good question. And I'm glad that you asked that. So obviously when there's been a, there's been thousands, probably tens of thousands of studies pre-clinical studies, animal studies using helminth therapy, metabolomic studies, investigating all of the, you know, for example, one helminth that's commonly used by curious Swiss is capable of secreting 250 or 300 different peptides into the host.

That's 300 bioactive immunogen immunomodulatory molecules into the host by a single colonizing helminth. So, of course, most of the funding for this research is coming from drug companies or subsidiaries of that.

So they're always looking for the patent, the single thing that's the most effective protease inhibitor. And let's patent it and let's put it in a supplement or a drug of course, is where it's going to end up.

So, you know, this is going to eventually happen. Eventually it is. This is inevitable. We'll be talking in five years is. Oh yeah. No. Do you hear about you hear about this new drug that they got.

Oh yeah. It's derived from the this this world of this worm. But I, I honestly whether what's a yeah. Yeah. Just I honestly think that nature is primed when best and while it may certainly be beneficial to have some drug in the future that is derived from a worm, there's, there's many nonlinear interactions between the, the helminth and the host that are not even studied and understood.

For example, the prostaglandins that certain worms can secrete have completely different effects. As our own knowledge of our own prostaglandins, we think of prostaglandins as mediating the cycle oxygenation pathways.

And all this, but is here to look for reasons. I'm like, wait, this doesn't even seem to make sense from what I knew about prostaglandins in humans. So these worms are doing something completely different with their own prostaglandin secretion.

So there's so much that we don't yet know about the complex nonlinear interactions of how worms have co-evolved with humans for millions of years. And I'm not talking about just humans, but I'm talking about I'm talking about all life on this planet has microorganisms that have symbiotically cold walled with them, and that includes worms in different species.

We're no exception to that. We're not separate from this Earth or from the guy in, super biome that makes up all of life. We're not separate from it, and we have to realize that we've become separate from it in many ways because of iatrogenic medical treatments, because of toxins that we've been exposed to that has led to this symbiosis, the inability to tolerate other microorganisms.

It's not getting rid of them that I'm interested in. It's how can we increase tolerance, Genesis. How can we increase adaptation? And how can our bodies learn from the symbiotic relationship that all organisms that inhabit us, have with us?

Yeah. I, I have a very, you know, this is just a new tool to think about, but I have a very that's my belief in health. You know, I, you know the bio regulatory temperature looking at you know, regulation and resilience and adaptation.

And I think you know that well there are many takeaways for people to take from this conversation today. But, you know, I think we have to give up, the war or, you know, give up that kind of, you know, war idea on, microbes.

And we have to think about also, like you said, like we can't live in these bubbles or these Faraday cages or these, you know, sterile environments, you know, if we have a mold issue or, you know, it's like, how do we, create a more resilient terrain, right?

So that we can walk through whatever life brings and, you know, respond, adapt and move forward. And I think this is yeah, this is I mean, I, you know, to be very honest, I'm like, I'm always, you know, because I do treat parasites and I do get results with that.

But I know it's not the same, you know. But it gave me that kind of thought of like, you know, is this something to think about? How many there be or is that going to are we just treating one problem in for another down the road?

But I mean, I, I hear you, I mean, we like we look at microorganisms all the time. And it's the balance of these microbes in our body that, you know, provide health.

And I think just because helminths are a little bit more unsightly than, you know, lactobacillus or, you know, like these other, you know, you know, microbes that are, not our own, you know, our human cells.

I think it's probably, you know, it just, you know, we need to be educated. So I so appreciate you educating us today. Thank you for letting me speak on the subject.

I appreciate very much. Yeah. Yeah, definitely. Michael and I just you mentioned a few articles and you have a phenomenal website. I always love reading your articles and you've opened my mind up on many topics, and you have a really wonderful way with words and distilling really amazing, you know, boiling down a lot of research into an article.

And so I would love for people to, learn again how to find you and your work and anything else you'd like to share. My website. My. I have two websites.

My main website is Metabolic healing.com. That's metabolic healing.com and my other website is true dot report. That's true dot report. That's our genomics analyzer software.

So we actually have that going on as an ongoing research project to help to have basically patients or practitioners upload their patients genomics and and or blood chemistry to get an analysis.

And then the metabolic healing site is, is largely for practitioners. We do trainings. We have a number of different clinical training courses that are created over the last eight years.

And, lots of free content, 13 or 14 years worth at this point. So there's three specific articles, helminth therapy that are up there. And you can look for them just by going to all articles.

There's the one on ApoE4, which just came out, I republish that from Holistic primary care. Really interesting. And then there was that was published a couple of years ago, and then, one on Evolutionary Mismatches, which was published, just last summer.

Well, thank you, Michael, for being on this summit. And thank you for your passion for diving so deep into these topics and educating us. I really appreciate it.

Thank you very much, Christine. Thank you.