Introduction and Speaker Background

Hi. This doctor can't hold her for another episode of the Peptide Summit. Today we have Kieran Krishnan. Today he's going to, talk about unhealthy gut equals unhealthy brain.

So thank you so much for being on and taking the time. I know we use your product. I know it's, number one seller to doctors and, well, research, which of course, we love.

Current research microbiologist has been, involved in the dietary supplement nutrition market for, the past 20 years. He comes from a strict research background, has spent several years with hands on, R&D in the field of molecular medicine and microbiology.

University of Iowa. He left the university research to take on several leadership positions in global companies and business development and product development.

Most recently, he's co-founder and chief scientific officer at Microbiome Labs. Leader of the microbiome and probiotic research. He is frequent lecturer.

We see him at all the conferences, on the, microbiome, epigenetics and, basically all the, the main conferences, we see him and he's a lecturer, and a great teacher.

He's an, expert, guest on national radio and satellite radio and has been a guest speaker on several health summits as, microbiome expert, seen him all over the place.

He's currently involved in over 18 novel human clinical trials. I'd love to hear about that. On probiotics and the human microbiome. He's also on the scientific advisory board at seven other companies in the industry, so.

Well, well respected. And he has published clinical trials, you know, peer reviewed scientific journals and has several global patents, which I did not know.

So thank you for being on, and it, it just, I think really fits with peptides with epigenetics and they really dovetail together and we talk about, you know, like gut brain axis and, and so much research on, you know, the epigenetics of the gut.

And you're right there on, on the cutting edge. So I can't wait to, learn what, what's new. And, for all our listeners and just kind of go through the basics, like what?

What is the microbiome? Because people hear it all the time. Microbiome. Microbiome. Like, what does that really mean? Yeah. And Ken, thank you so much for having me.

It's, it's such a pleasure to be here. It's always a great opportunity to be able to nerd out with somebody, on on this stuff. So I really appreciate the opportunity.

So. Yeah, that is that is a really important question. What is the microbiome? And especially, you know, what aspects of it are the most important to pay attention to as we look at health, wellness and our outcomes?

The microbiome is defined by the scientific literature is really the collection of organisms. And all of their genetic elements, in relation to the host.

And of course, we are the host. The second part of it is actually even more critically important than than the first part, the second part being all of the genetic elements.

Right? Because that's really where the rubber hits the road. What are the genes within the microbiome coding for,

you know, what are the activities and small molecules and metabolites and so on that they code for because as it turns out, we are really inadequate in terms of function as a human species.

Right. If we look at a at a human chromosome, we've got somewhere between 22 to 24,000 functional genes. And for those that are don't know, genetics, it sounds like a lot.

But when you look like an, an earthworm or, a rice plant, they have somewhere around 38 to 40,000 functional genes. So we are half as sophisticated as an earthworm is right from our from a genetic perspective.

So then the big question was, how is it that we do all of these amazing high order functions that we do during the Human Genome Project, when they first mapped out the entire human genome, the estimate prior to mapping out the entire human genome was that we would have somewhere around 150 to 200,000 functional genes just considering all of the biochemistry that happens in our body, right.

But as it turns out, we have a minuscule number of genes compared to the functions that we have. And that left a big, huge question as to how do we do the things we do.

Then when the Human Microbiome Project came about and we started to realize that, wow, we've got 22,000 to 24,000 human genes, we've got over 3.5 million microbial genes in our system.

What the Microbiome Is and Why It Matters

Right? So, so much of the activity 90 plus percent of all of the metabolic, biochemical, genetic activity that occurs in us comes from the microbes. And so what does that gene pool look like this.

Right. It's mind boggling. It is it's like when you when you think about it, then we look when you look at evolution, one of the, one of the interesting aspects of, the, the lineage of mammals, one of the things that made mammals much more sophisticated in general over non mammalian, species was the incorporation of a large ferment of base in our digestive tract.

Right. Because what that allowed us to do is it allowed us, number one, to utilize energetics and energy from a larger, you know, larger, breadth of, molecules, things like plants and seeds and nuts and all of these things that we can actually ferment and, and digest versus take an obligate carnivore like a lion, right.

Of a if the lion's food source is gone, the lion can't just go eat plants and fruits and survive. The lion's going to die. We are these amazing, omnivores because of this large ferment of base.

Then also we we create the symbiotic relationship where this large ferment of base provides us all of these unique chemical capabilities and biochemical capabilities that we've now counted on for our function.

Because we can't do these things for ourselves. Right? So we cannot overstate the importance of the microbiome when it comes to wellness. That's that's interesting.

So it saves us in efficiency or we don't have to make it. But then if we don't have the right microbes that we've been counting on for millions of years, we're in trouble.

Which seems like where we are right now. Right? Absolutely. And in fact, you know, if you look at some of the top microbiome researchers, one of the themes that we are dealing with that is scary for, especially from someone like me, from a microbiology perspective, is worst facing a mass extinction right now.

And and I'm not talking about, you know, animals that are out there in the ecosystem. I'm talking about our own ecosystem inside what we're seeing based on studies on, you know, hunter gatherer tribes like the Hadza tribes and the tribes in Papua New Guinea that live an ancestral life similar to what humans did for 99.99% of human existence.

That they have almost doubled the number of micro microbial species in their microbiome than we do. And every generation, it seems to be decreasing by a certain amount.

And every time we lose certain groups of microbes, we lose huge amounts of functionality because again, you know, 90% plus of all of our, biochemical metabolic processes are coded for by bacteria in our system.

So what is that going to look like, a few generations from now, when our kids, kids have half the microbial diversity that even we have, right. What are they going to be missing from a functionality standpoint?

And what is that going to lead to when it comes to disease? Wow. And so I could imagine they probably never had heart disease. And they're getting heart disease earlier and all these other of aging and yeah.

Well many, many estimates are that this next generation, our current generation of kids are going to be the sickest humans in the history of mankind, you know, and they're right.

It's it's absolutely mind boggling. If you look at the CDC, data, even from just a few years ago, six out of ten American adults have at least one chronic illness, right?

And four out of ten American adults have multiple chronic illnesses. 40% of the adult population is dealing with it. That's scary. Everyone's sick and younger and younger.

You know, you're at a cocktail party. What's coming up? And, I'm sick or my sister's sick or something. And I'm thinking, I don't think I saw that 20 years ago.

No, no. And you look at the incidence rate of allergies and asthma in kids. Of course, you look at things like autism spectrum and then anxiety and depression.

Oh my God. You know, both in the pediatric side and in the adult side. It's a absolute epidemic, right? Of of, cognitive dysfunction. And this microbiome starts in utero.

Correct? That's right. Yeah. So, you know, the kids microbiome, the infant or the, the child's microbiome in utero is already starting to develop. There's some evidence that, moms immune cells will actually grab bacteria from mom's gut and take it to the to the fetus and pass some bacteria through the cord, through cord blood, into the amniotic fluid.

You know, we used to think, back in the day that the amniotic fluid, cord blood, all of that was sterile. Well, none of that is sterile, right? We we couldn't culture organisms from it because all the organisms in there are anaerobic.

And so, you know, that we now know that it's loaded with bacteria. And just think about the, the implications of, you know, our our immune system is taking bacteria to the baby, right?

The immune system job is to fight against bacteria and viruses and so on. So if the immune system themselves is shuttling bacteria, there must be some great purpose for that, right?

It just indicates how important microbes are. And of course, more, mode of birth has a huge impact as well, Yeah. With all the C-sections and and I think too, that it kind of when you have this abnormal, you know, the gut seems to calm down.

The immune system modulates. And we're finding those are the kids who get autism, you know, the whole vaccine thing, but multifactorial. But with they have this immune system already hyper vigilant.

They're the ones that are more likely to have problems from whatever it is. Yeah. It's totally it's it's, it's an untrained immune system. What we what we know now, clearly about the immune system through lots of microbiome related studies is that, you know, when our thymus and our bone marrow makes immune cells, they really make very naive immune cells.

Right. And these immune cells then have to go to secondary lymphoid tissue where they mature. And they learn how to function within this really complex ecosystem, which is the, the body.

They go into er areas like the mesenteric lymph nodes, the adenoids, all of these areas where they get trained. And a lot of that training happens with the microbiome.

You know, one of the crazy implications of the immune system when you when you really look at it, is the inside part of the body's obviously covered with this amazing mucosal structure.

Right. Every square millimeter of the inside of the body is covered with the mucosa. In fact, there's almost 4000ft² of mucosa inside the body. It's a massive amount of surface area.

These things that you kind of go, whoa, wait a minute, you know. Yeah. It's crazy. It's mind boggling. We used to think the skin was the largest organ, largest barrier system.

Right. And the skin has somewhere around 20ft² of surface area. Compare that to almost 4000 inside the body. So it's mind boggling when you think about it.

And then every square millimeter of that mucosal layer is already covered in microbes. Right? Bacteria, viruses, amoebas, protozoa, potentially. We've got fungi, all kinds of stuff.

It's saturated. That is the area that the immune system is always surveying.

Microbial Diversity, Immune Training, and Early-Life Development

Right. So for invading organisms. So then the big question is how in the world is the immune system survey this huge surface area that's already covered in microbes?

How does it survey it for microbes? Right. If we're already full of bacteria and viruses, what's good. What's bad. Yeah, exactly. What's good, what's bad, how does it actually do that?

And when you look at the numbers, there's a 200,000 to 1 ratio for every one immune cell that you have that surveys the system. You have 200,000 microbes in that same area.

Right. So it's a mind boggling task for the immune system to survey that entire surface area. The only way the immune system does it is through crosstalk with the rest of the microbiome.

So the microbiome that exists in your mucosa acts as the neighborhood watch for the immune system. So the first organisms to identify the presence of a new pathogen, or the presence of something that needs an immune reaction are the actual, organisms, the commensal microbes around that area where this new organism comes in, and then they shoot off flares to alert the immune system that, hey, there's something here, you need to come and pay attention.

So there's this really emerging new immune system. Absolutely. Yeah. They're alerting the immune system. That's the only way the immune system can function.

There are studies that are no biotic mice. Right. So these are the mice that are grown with no microbiome, where the the mice will produce all the immune cells that that normal mice will.

So the thymus is producing all the T cells that are producing all the B cells and macrophages. And then when they inject a viral pathogen into the mouse, the immune cells basically sit and stare at it.

They have no idea what to do, right? They have no training on how to approach that invading pathogen the moment they implant in the microbiome. And then do the test again, the immune cells go and attack that new pathogen, because there are signals that come from the microbiome to instruct the immune system on how to

operate.

So when you think about that, when you think of this really intimate relationship between the immune system and the microbiome, and if we are devastating the microbiome from day one in the child, from C-section, from not breastfeeding, from giving antibiotics, all of the different things we do right then that cross-talk, that communication between the immune system and the microbiome ceases to exist the way it should.

So the immune system becomes confused. From day one, it doesn't know what to attack, what not to attack, how to process through the immune, the immune response.

And basically either things will get not attacked at all. In some cases where people have severe immune deficiencies, kids have severe immune deficiencies or everything gets attacked.

Right. And I think that what it's all exactly. Oh yeah. And then but all these allergies and out of unity and and then there's the, you know, the microbiome whether, you know, viruses and all these other things that we're we don't really we know very little about one sided with the bacteriophage, which is the virus that kills bacteria.

It was really interesting. It's sense like so one of the, the probiotics or, you know, one of the, bacteria in the gut may make butyrate, which is good.

But if that level all gone to a certain point, it turned on the bacteriophage, which then killed that bug. Yeah. So it kept it from being too high. Exactly. Yeah. That beautiful regulation.

Oh my God. It's like you couldn't program a computer program to do that, you know. No you can't it it's amazing. And you know and then and there's so many of these amazing feedback loops that that we have within this complex ecosystem.

And, and that in itself, you know, will will indicate that balance in the ecosystem is so critical to our function. Right? Because because there's all of these feedback loops.

So let's say we eliminate one species from the microbiome or a group of bacteria from the microbiome. Then all of the other microbes that are dependent on their function start to also get decimated over time.

Right. And then we pay for so the form of disease. Yeah. Because it's also interconnected. I mean, one example I can give you is, you know, we're all hyper vigilant now about respiratory illnesses and viruses and all that, right?

Because of everything that's going on. One of the ways, for example, that our body fights against influenza if we end up breathing in the influenza virus and it and it starts settling in the lungs, the lung microbiome will actually signal the presence of the influenza virus using, up regulating things like inflammasome to the gut microbiome.

And then the gut microbiome will then signal to the immune cells to make their way to, to the local area, and then also and then then and then also send signals to dendritic cells to go to the local lymph nodes that support the lungs to proliferate T-cells to come and fight the virus.

Right. So there's this amazing communication between the lung microbiome and the gut microbiome to recruit and, mobilize the immune system. And if one of those is compromised, then that chain of command goes away, and then you become so much more susceptible to the presence of this virus.

Right? So it's it's mind boggling. It kind of reminds me, like ancient culture, I think everything, whatever comes from the gut. But oh, now that's crazy that we're right, you know.

Totally. Yeah. Yeah. There's a certain amount of brilliance in that, in that human intuition that's been built over thousands of years, right? That they don't.

We know, even the father of of modern medicine. Right. Hippocratic said that that sits in the bowel and most

disease comes from this, digestive issues.

Right. So it's. Yeah. And it's, you know, I try to take a deep dive on. Okay, I'm going to figure out, you know, which probiotics I need. Oh my gosh, it's so difficult because like, so many studies use multiple strains.

And, this study shows this like, how the heck do you figure it out? Yeah. Well, you know that it's so hard. And when I, when I started ten years ago specifically focusing on probiotics, that was a big part of what we we looked at is what are some of the key fundamental things that we find to be dysfunctional across most people's gut in the Western world that we really need to address right.

And and that's kind of what we honed in on, because you can find different probiotic strains or different effects in the body and it and that will just get bigger and bigger and more confusing over time.

But we were like we were thinking more fundamentally, what do we need to fix as root cause, as part of the root cause medicine approach? And, and there were a couple of things that we realized, three things really that we really realized that needed to be done.

Number one was improving diversity within the microbiome because, again, that mass extinction is happening where we're really losing huge categories of bacteria, and that has real effects on our outcomes.

And that's transgenerational because as we decimate our microbiome, we pass down a decimated microbiome to our kids. They're getting there is get even worse and they pass it down.

And the humans, frankly those genes and you're we're finding now, you know, we're doing genetics, but your genetics actually play less of a control over your outcome than your environment, your microbiome.

Because matters of that genes turn on and off. You can have it. And two people have it, but one person's turned on, one person turned off. Yeah, exactly.

And you know, what we come to find out is there's good evidence that the microbiome makes up for a lot of our snips that we may have. Right. For example, if you're somebody that struggles with, with a, you know, methylation snap, is that detrimental to you if you have a microbiome that produces all of these methylated vitamins or does methylation itself.

Right. So it seems like there's this really interesting relationship between our own genetics and then the microbial genetics that exists where the microbial genetics provides us some redundancies and function.

Yeah. Hey, I don't have it, but I got these guys to do it. Exactly. Yeah. And and if we missed these guys, then all of a sudden that snap becomes a real problem, right?

I mean, how far can become a serious issue for people if they don't have the microbes to make up for it? Right. So, so those kind of things occur nonstop within the system.

And so this loss of organisms and loss of function from the microbiome is really a scary track that we're on right now. So we said okay improving diversity is critical.

We tend to have this over abundance of pathogens just because of our lifestyle, because of, you know, the use of antibiotics and the overuse of antibiotics, the use of them in our foods and water supply.

You know, all of these things tend to select for an overgrowth of pathogens. So one of the characteristics that we have in the Western world is an overabundance of certain pathogens and a low abundance of really important functional strains.

And so that was one of the issues of diversity we wanted to fix. The second issue that we we saw was the low abundance of keystone species, keystone species, or about a handful of species or so within the microbiomes that

have been identified that play a really critical role in maintaining the ecosystem of the microbiome.

Leaky Gut, Inflammation, and Brain Health

And also servicing something called crossbreeding across many different species and groups. So you've got this one keystone bacteria that supports a huge array of other bacteria from the metabolic activity that they perform.

And when you lose that keystone bacteria, you start decimating a lot of the other bacteria that depend on it. Now, also, certain keystone species are really critical for maintaining function.

So I'll give you an example. At Comanche, I'm using a filler at Comanche I'm using a filler is inversely correlated with everything under the cardio metabolic syndrome spectrum.

Right. I just can't take that directly. Right. You can't take it directly. It's a it's a, gut only organism. It's an obligate anaerobes, meaning it cannot exist outside of the body even for a few seconds.

And they've tried doing implementation or implanting with, killed versions of Aquaman's. Yeah. And the killed versions and comments are don't do anything in the system.

So you need live functioning at Comanche. And when you have high end Comanche, it brings down dramatically the risk of diabetes, heart disease, obesity policy, cystic ovarian, Alzheimer's, all of these things under that metabolic syndrome spectrum.

So that's an example of a keystone strain. And in the Western world we tend to have low levels of these critically important protective keystone strains.

So diversity keystone strains. And then the third thing which actually results in the first two how do you raise that. So that's part of our product strategy and lifestyle change strategies.

You know, so we can talk about that. I'll list the third one and then I'll give you how we, how we approach, dealing all of them. Okay. So the third issue that we look to solve, which actually is a factor of the first two, is leaky gut.

Leaky gut becomes the underlying profound, a profound problem that that stems from having low diversity and low keystone strains. Right. And then it's a vicious cycle.

And as you know, leaky gut then becomes the the really the foundation for most chronic illnesses, including things that affect the brain. One of the most toxic things for the brain is leaky gut endotoxin.

Yeah. Which we could chat about how that a dysfunctional got really feeds toxicity to the brain. But how do we address the first two things? That's kind of why we honed in on the spores.

You know, we use the mega spore. Biotic is what we work with. We do all our clinical studies with the spores were interesting because they are ubiquitous organisms in nature, but then they're also a normal commensal organism in the gut.

In fact, you find higher concentrations in the gut than you do in nature, which was which is indicative that these organisms use the environment as a vector to get into the host.

And they are universal colonizers. Because I didn't get a very particular type of bacillus from my mom, I actually got bacillus from the environment. So you picked up the same bacillus from the environment as I did, right?

So most other species within the gut microbiome are kind of unique to us because we got them from our mom, she got them from their mom, we got them from close interaction with our mom and dad.

So most individuals, when you look at their microbiome at the species level, they have a different microbiome. Even

identical twins will have up to 50% differences in their microbiomes.

But there are certain organisms that are called universal colonizers because we all pick them up from the same source, the spores or one of them. When we started digging into the spores because of their ability to survive through the gastric, some of the system and all that, we found that the, a couple of big pharma companies had launched them as prescription probiotics since 1952.

And so they've been in the market for a long time. And they're used to treat gut infections because they have this unique capability of going in the gut, doing something called quorum sensing.

Where they read the microbial environment, they can find overgrown or pathogenic organisms. They will sit next to them, and they will actually bring down their levels by producing things like antimicrobials and all that in that local area to change their, their secret.

And yeah, absolutely. Got some bad bugs here. We're going to get rid of them. We're going to get rid of them. We actually did a study, with Cleveland Clinic on C diff, where we wanted to study how the how did the spores actually fight against c div?

And it's absolutely fascinating. So what we were able to see in this study actually has been published. Now, what we were able to see is, when the spores enter the gut, they will actually find the C diff bacterial colonies.

They will go and they will actually surround the sea diff colonies. And they will collate iron away from the C diff. And C diff requires iron for metabolic function.

If it doesn't have iron it dies off. So it actually, you know, changes its genetic expression and produces a key later and pulls iron away from C to kill it off like, you know, the best employee you've ever had, right?

Like, and and it goes the other way too. And I was reading some studies on like know had C diff patients out just no matter how many antibiotics. And I saw that you know for the vector did uni which they say well it's just the it's kind of there but it's not terrible.

But if you kill that you like Kelsey diff and also pseudomonas which is not a bad bacteria. So certain things need certain things to live. But that is incredible. Yeah. Said.

And so their ability to do that is really mind boggling. And so our hypothesis was that if the spores knew how to figure out what vector shouldn't be there, maybe they also know the opposite.

They can realize what back there should be there, and maybe they have tools to actually increase the growth of those bacteria. Right. So so that was our hypothesis.

And sure enough, we we published now at least one study. We have a second on the way publishing that that demonstrates that, that when you add the spores into the microbiome, they actually increase the diversity of the microbiome because they can bring down overgrown and unwanted microbes, and then they produce compounds to actually increase the growth of other functional bacteria, including the keystone species.

And so we see that think you just get all those that you're giving. Yeah. You're not you're getting all the other good ones as well. You are. Exactly.

So that was really profound for us. We said, wow, that is a huge implication to what it's doing in the gut, because it's fundamentally changing what the microbiome looks like.

Right. So we're not counting on just their effect. We're counting on their ability to influence the rest of the microbiome product with, you know, 50 of them.

Oh, this one's better, you know. Yeah. And which I have a doubt that many of these everyone make it through the

gut. Right. And they don't. And like the liquid ones okay.

That refrigerator. Yeah they probably shipped of non refrigerated, you know. And that's why I think the spores are really the way, way to go. You know in terms of like modulating the microbiome it just it's that the, the right way to go.

And then when you, when you look at the ones that have, you know, 2535, 40 strains, it sounds like a lot. But the problem is that's typically of a single genus or maybe two.

Genus is right. It's like it's like 20 different lactobacilli strains and maybe ten different bifidobacteria strains. So that only covers two geniuses in the gut microbiome.

Your microbiome could have anywhere from, you know, 150 to 200 different geniuses. Right. So what about all of those other microbes? You're not really expanding diversity in any measurable way.

And so we were looking at it from a different perspective. And we said, okay, we can increase diversity with the spores. We can increase keystone strains.

We can bring down pathogenic organisms, which is fantastic. Does that lead to the to alleviating the third problem, which is leaky gut. Right. That would really be the the impact that we're looking for ultimately.

And sure enough, we published our first study on this in 2017, showing that in as little as 30 days, the spores reduce intestinal permeability by over 60%.

You know, in that study, when I met you in Hawaii and you gave that study and I'm like, damn. Yeah. Which is crazy. It's right there at third party, you know, and university done. And.

Yeah, published in a major, gastroenterology journal. And the and the awesome thing about that is, yes, we were able to reduce intestinal permeability.

We were able to reduce LPs, which is the lipopolysaccharide endotoxin that's produced at high amounts in the gut, in the lumen that then moves across the barrier because of barriers dysfunctional into circulation.

We were able to reduce that. But the even more profound effect is we then saw all of the benefits from reducing the permeability. Right. We saw this huge modulation of systemic inflammation of the people on the spores compared to the placebo, had a huge drop in all of the critical inflammatory cytokines like interleukin six, interleukin one beta, interleukin 12.

They started to see an increase. And that's the cause of so many things were finally, you know, heart disease, cholesterol. It's like cholesterol and inflammation.

Yeah. Yeah. Yeah. Exactly. And that's and that's a foundational thing. Right. Even even now there's something that just published, a couple days ago called the, it's called a Dublin.

I think it's called the Boston, Dublin, score on Covid. There's this, research group between a US university and a university in Ireland. That has been. What?

What is it now? I'm guessing that whatever the inflammation you start with is going to put you in trouble. That's my guess. But. Oh, right. Right. Yeah.

In terms of what we're saying, you mean. No, I'm just I'm just guessing what the outcome is going to be. Yeah. Oh, yeah. So it's it was mind boggling because they, they put out this index or the score to try to assess which patients would have the worst go at, at run with Covid.

And what they found was very clear that if the, if the individuals had elevated interleukin six and low interleukin ten,

then they had a much worse go at Covid.

If they had the reverse lower interleukin six and elevated interleukin ten, they had a much easier go with the disease. Right? So the the baseline of where the inflammation is really determine how well their immune system worked and how well their body dealt with all of this.

So essentially you look at a few markers and say if you are at risk or not, we're looking at all these different, you know, things where you can boil it down to one marker and you have a treatment.

You know, we're totally and that's the idea, is that the you know, when you look at interleukin six, that is the quintessential systemic inflammatory marker, right?

It is present in all of these chronic illnesses. And that's the big problem with Covid too. That's the big problem. Exactly. That's why people with certain, preexisting conditions have a much worse go.

These are conditions like diabetes, obesity, hypertension, heart disease. All of those are characterized by elevated interleukin six, right. So they are starting at that bad stage.

And then that is going to, create a profoundly bad experience with this, with this particular pathogen. So the end and then the big issue here is that, gut leaky gut is the big driver of this systemic chronic interleukin six, elevated.

And it's what they call the chronic low grade inflammation. Right. So that exists in large part because it's being driven by endotoxin or leaky gut. And so, you know, when it comes down to it, just looking at being able to modulate the microbiome, modulate the leakiness in the gut has profound impact on people in general, whether they're looking at a crazy pandemic that's going around or they're looking at all of the chronic illnesses that American adults are facing and dealing with all the time, right, 60% of which are dealing with it.

So that was our whole approach, the idea of the microbiome, probiotics, you know, and then coming back to the brain, this LPs in circulation is one of the most toxic things to the brain.

When LPs is allowed to leak from the lumen of the gut into circulation, it gets into all kinds of crevices in the brain. Right. So studies show, for example, in, paper published September of 2017, showed that the, the inflammatory process that starts the degeneration in the case of Alzheimer's in the Perry nuclear region of the brain, what they found was the thing that started the the inflammatory process was the presence of gut derived LPs.

So people who have the early, signs of Alzheimer's pathology starts because gut derived LPs leaks through, goes up either the vagus nerve or through circulation into the brain, and starts triggering an inflammatory response in the brain.

You know, same thing happens in Parkinson's. They find that LPs in the central nervous system creates micro glial activation that starts the process of neurodegeneration.

Right. So the gut derived toxin, but we can't get away from because it's called an endotoxin. It's made on the inside, if that's allowed to leak through, becomes the most toxic thing that was, you know, of some iOS patients who do much better, you know, and same thing.

They all have leaky gut and associated with particular, pathogens. And it seems to start everything. And then though it seems like a vicious cycle, the brain also controls the gut.

So if you fix the gut though doesn't let's say you fix the gut doesn't, tend to go back to where it was because the brain is dysfunctional. So like a two way thing.

Yeah. It can. And one of the biggest ways that the brain can impact the gut is really the sympathetic parasympathetic tonality. Right. If we tend to be, more often in a, in a sympathetic state that actually creates a release of stress, hormones, things like epinephrine or epinephrine, cortisol.

One of the things that occurs when that, when those, hormones are released, is that opportune istic bacteria and viruses within the gut and within our system in general.

Spore-Based Probiotics and Gut Repair

They read those signals to them. That means the host is compromised. That's when they turn on their virulence genes. Right. So so our, brain response, our sympathetic response can create further dysbiosis in the gut and overgrowth of pathogens, which completely changes the metabolic response in the gut.

Right. And then because the opportunistic microbes are overgrowing now, they create more inflammation and more leaky gut that actually drives more dysfunction in the brain.

So it's like a vicious cycle. You know, like you said, and some of the other things that LPs can affect. So we know that LPs can get into the amygdala and the hippocampus in the brain.

It triggers inflammation in the amygdala and hippocampus and has been demonstrated to cause, memory recall issues, cognitive functions, the ability for the a slowing down of analytical, capability in the brain.

That whole brain fogginess LPs can also inhibit Serato in binding and dopamine binding in the brain which and and anger. Exactly. So the and compromised the whole HPA axis.

The hypothalamic adrenal axis. Right. Yeah. So all of it I mean it's just it's it's mind boggling when we think about, you know, how how we're seeing earlier and earlier onset of of issues like anxiety and stress in kids in, in our teenagers.

Of course there's lots of things in the social world that drive that right, but their guts are decimated and making them more susceptible. Almost every study I've seen with, like, you know, just across the board, all these new diseases, whatever, you know, are help with improving the gut.

Totally. And, you know, even things like, the, the military has studies on leaky gut and, and then post, post-traumatic stress. Right. So what they've shown, is that when you put, soldiers through basic training, the stress associated with basic training, the poor nutrition, the conditions, the lack of sleep, all of that actually causes more intestinal permeability.

And when the intestinal permeability is high, after basic training, then they put them into stress, areas like combat zones and all that. It makes it really hard for them to deal with the stress.

They become far more susceptible to post-traumatic stress. Right. And all of the other, emotional conditions got gets worse because they have post-traumatic stress.

Now. Yeah. It's crazy, it's crazy. So, I mean, we cannot, overstate the importance of the gut, and we cannot overstate the importance of focusing on the gut along with the other therapies, you know, things, awesome stuff that you guys, put together and make all of these things.

Will becomes, will will be much more synergistic and work in a in a much more profound way. Let's work together. What use tithing and probiotics and and and that's things like, you know, I was on a CBO thing and I said, well, I think C was more of a symptom, you know.

Well, it's both it's, marker it's a symptom. It's because, you know, the gut's dysfunctional because they have some other issue going on, but you got the other issues going on because you have the gut problem.

Right? Exactly. Oh. So what what do you do and what, you know, you find, like, you know, certain like I say way, you know, like, like, overall obese patients have this particular microbiome.

And so they've trying to, you know, switch it and give a lot of this hasn't been as successful as we had hoped. Can

you comment on that. Yeah. We actually have a study completed that, finish at the end of last year.

We're hoping it'll be published soon, showing, something that we call metabolic reprograming. Right. The whole idea was that when you struggle with weight and metabolic disease, you have a certain signature within your microbiome.

Those that tend to remain lean and never struggle with weight in their life have another signature, right? So the idea was, can we do things to switch the signature of your microbiome without dieting and exercise and all that yet, and start to see improvements in how your body responds to food, right?

So we're doing, again, a foundational fix before we do all the the things that are difficult for the person, like dieting and exercising and all that.

Yeah. Because right. We know that dieting and exercise will get you to lose weight. We know that restricting calories, burning more calories will get you to lose weight.

But then the biggest struggle is people can't keep it off because their microbiome is still that of an obese, individual. Right? So their body responds to food differently.

So we did this study where we looked at the fundamental differences. There are there are really three big things. One is an increase in acromion sia that same keystone strain.

We need to see an increase in bifidobacteria, especially before the bacteria anomalies within the microbiome. And we need to see an increase in the production of short chain fatty acids, especially butyrate.

Right. So those three factors will determine in large part what your body composition looks like and how you respond to food. And so in the study, what we did is we took two of our spore strains, the subtilis and the coagulant.

And then we took, a prebiotic, a xylem oligosaccharide between these three. We knew that they would feed Aquaman. Yeah, they would feed Bifidobacteria, and they would increase the production of short chain fatty acids.

What is the name of your product? That product. So we have a name that. Yeah. It's, because we were still going through, the clinical trials, but the two strains that we use are two of the main strains in Mega Spore.

So you can get the same effect by just taking the Mega Spore. And then we have a product called Mega Pre that has four different, oligosaccharides. For the study we only use one of the four.

So if you do the Mega pre you'll get more than enough of the prebiotic effect. So here's what we did. We took obese individuals. And, and this was all on women.

So we the control measures are a little bit better if you keep with one gender. We didn't have them change anything about their diet. We didn't have them add in or do anything different with exercise.

And we use Dexa analysis to look at body composition, fat change. We looked at things like C peptide, insulin levels, triglycerides, all of that. And we did a 90 day study where all they did was took the probiotic and prebiotic and didn't change anything else.

Right. For the study. This was a smaller pilot study. I think we had about 20 patients just under 20. But just tell all the people, we all listen, these are not cheap to do.

No. Oh my God. Yeah. It's actually a study of this caliber for 90 days in itself is like $400,000. Yeah. So I mean, you guys are putting a huge amount of money back, and you guys are doing that constantly, and we're doing that in our next leaky gut study.

Has over 200 patients in it, you know, so we're we're really investing in research. Nobody proven that in the probiotic space. So, you know, and part of it is because we like we really want to make discoveries.

We want to find ways of helping people like yourself and all of these, health care practitioners that are out there, you know, fighting the good fight.

We want to give them the best tools to be able to do that. But what we saw that was fascinating in this study is in the 90 day period, remember, these people are not doing any dieting, not doing any exercising.

They're still living the lifestyle that got them obese in the first place. And so what we saw in that 90 day period was that the people on the probiotic and prebiotics lost 12% of visceral fat mass, right?

A huge reduction in dieting and so that again, and what period of time in a, in a, in a three month period 12% crazy. It's insane. Right. And it's all visceral fat.

Most of what they lost. So it's the most dangerous fat. And then the placebo group because this was a randomized controlled trial, the placebo group obviously didn't lose anything.

They gained 11%. This is someone we say diet or anything. It's like I gained weight, like I'm on a diet. I keep going, right. And you know this. So when you compare the two, the difference is huge.

Now the other things that we saw that were really exciting was things like C peptide and insulin levels were change, meaning that their bodies were producing less insulin over that three month period than the placebo group.

So their insulin spikes were not the same as well. We also saw triglyceride levels coming down. So the liver and the liver fat and the fatty f three fatty acids in the circulation came down quite a bit.

So their initial resistant went down. They didn't have because people think oh your you know doc standard doctors look at their sugar level with their insulin levels.

Crazy. Totally. Yeah. It's all the body store fat. So the fact that those patients had low insulin had lower sugar, that's huge. That's huge. And so and again, without any lifestyle change and what it's showing is that because we're making a change in their microbiome, their body is responding differently to food.

Right. So now the idea is that, okay, you start making that fundamental change in the microbiome. You add upon that some minor dietary changes, some little bit of addition of exercise and movement, you know, increase it over time.

Think about the profound change we can make. And, just a little different. So I think if people lose weight, they get more motivation because people have tried to lose weight and it doesn't work.

So I got a business proposition for you. Put it in a packet for a beer. We can put it in beer. Yeah, exactly that way. An easy way to consume it. Absolutely.

You know. But but yeah, what was exciting about that to me and our big purpose of doing that study was to, was to prove our hypothesis that if we could, that we could metabolically reprogram the individual.

You know, that by changing certain signatures within the microbiome, we could actually change how your body responds to food.

Metabolic Reprogramming and Weight Loss

And it totally does. Right. When's that coming out? So the study is done. It was finished, at the end of last year. We're hoping to have it published hopefully in the next 3 or 4 months.

We did this insane RNA blast study to to look at the metabolomics of all of the things that change in the individual that's not, you know, and that's super complicated.

I mean, they, we looked at, hundreds of thousands of RNA molecules and our programs and look at all that stuff and the computation needs for that are mind boggling.

Right. So so we're running through some of the RNA analysis still that's taken like nine months to do because of the amount of computational needs that it has.

But we're really hoping to have that all put together. And it'll be published sometime early next year. And do you have any prepublication? I'd love to see it if you.

Yeah, I can send it to you. Absolutely. I could send you a PowerPoint of it. That's fascinating. It's mind boggling that we could do that. Right. And and again, it speaks to the power of the microbiome that if we can make small changes in the microbiome, the the effect on the individual is really profound.

You know, because we're just tweaking little things. And I think we can do that with virtually every condition out there. We can think of how much money we're spending on all these Alzheimer, Covid, you know, we're waiting till they're so sick.

It's almost. And that's why I talk about peptides. I take it early. Yeah. And there is some shift by some physician. But off we're all minority right. Yeah.

Yeah I was just thinking what if we take your product, give it all the nursing home, you know, what would the, death rate all of a sudden be? You know, probably drop dramatically, or if we just give them zinc and, you know, it just. But we don't work that way.

We don't. Yeah. Unfortunately. And and, you know, and the whole thing is like, the disease doesn't exist until it's really apparent. Right? We have no way in modern medicine to to grade stages of the disease.

Right. We somebody could be, in autoimmune syndrome, meaning they're moving towards a defined autoimmune disease for a decade before lupus shows up or before rheumatoid arthritis shows up.

But we have no way of measuring that progress and stopping the disease at an early stage. So. And it would be so expensive. It is such a long study to show we prevented this, this, this.

Exactly who's going to have that. Yeah. You're pumping a lot of money back in into your, thing, so. And that's awesome. So how does what we eat? What is that a thing?

Yeah. So that has a profound effect on the microbiome. What we eat can change the microbiome within a 24 hour period, or at least change a portion of the microbiome within that period.

The biggest issue that I see when, based on the research between what's going on with our diet today and what happened with our diet through the course of evolution, is the diversity of things that we eat.

Right? So, anthropological studies showed that humans, typically ate close to 600 different types of foods on an annual basis. And, our modern humans now, in the Western world, we might eat 15 different types of foods.

And the way the diversity in our microbiome developed was every group of bacteria kind of feeds differently off of different foods, and each food has its own different structure and bonds and all that.

So each bacteria has developed their own unique enzymes to be able to metabolize different food sources. Right. So even when you look at within a certain category, if you look at roots and tubers, you know, sweet potato is going to feed a different type of bacteria than the regular white potatoes that we're used to, because the structures, the carbohydrate structures are different enough.

Right? So that is one of the big areas that we are really like. Everything's processed. So taken out all that other stuff where the bacteria used to live and everything sterile.

Now, you know, we're not getting microbes in our food. Absolutely. And and, you know, I mean, the basis of most of our, foods and meals, especially if people are eating processed stuff, is really comes down to soy, wheat, you know, that or that's really most of what it is, more than 85% of Americans get all of their fiber from wheat, right?

Like wheat. It's in everything and it's in everything. Aren't even wheat based? Yeah. Yeah, exactly. You look at spices, you know, like, you might think I'm going gluten free, right?

But you look at the spices in your cabinet. They're the carriers. Wheat flour. Right. And you're getting gluten and wheat through that. And so it's really, a big issue, the diversity in the diet, and then overfeeding, you know, that's another big issue.

So we're not doing enough fasting. We're not giving our bodies enough a period of time. Yeah. So, you know, that that, that that's another issue that we have to deal with.

We're overfeeding the microbiome. Wow. And is there any issues? How can you take too many probiotics? Yeah. So one of the things that keeps me up at night a little bit is these what I call the kitchen sink probiotic approach, right where it's like more is better behind it.

The psychology of it, where you do 1525 strains, 400, 500 billion, you know, 200 billion. The doses just keep going up and up. The big problem with that is, you know, we talked earlier how important the gene pool is within the microbiome because a gene pool dictates so much of our functionality.

If we're throwing 200 billion curfew's worth of genetic, bacterial, genetic elements into our microbiome gene pool each day, over time we are accumulating a very different set of microbiome genetics.

You know, even if those bacteria don't survive, right? Even if they're dying the stomach, they're releasing all of their DNA into our microbiome. So how does that DNA impact the function of our microbiome over time?

And people don't study that when they produce these kind of kitchen sink probiotics. So to me that becomes a little bit of a concern because we may be inadvertently altering what our microbiome is supposed to look like over time, because it's not natural.

There isn't anywhere in nature where you would get these types of 2025 species. Lactobacillus combinations at that high of a dose every single day. Right. Our ancestors didn't do that.

You don't find that in the natural environment. You don't find that when you eat off of the land. And so on. So it's an unnatural exposure to those category of bacteria.

So to me, the difficult thing is what does that do to the microbiome over time? And with probiotic companies not really doing studies, you really have no idea.

Yeah. They're just I'm glad you lost sleep over because I tried I'm going to figure this thing how many weeks I'm not sleeping. And I'm like, oh my gosh, it's I can can you talk about the difference?

You know, the genus and the strains there, you know, how important is the different strain and what's different genus strain. They absolutely. So when we look at bacteria, we of course can categorize them between gene, genus species.

And then there's the subspecies within the species. Typically the subspecies is identified by a unique strain number. So if we take for example Lactobacillus ram gnosis the genus being lactobacillus, the species being ram gnosis.

But then there are new variants around gnosis, like the G, g variant that has a number of studies on it. Right. And when you look at the genetic map of a regular Ram gnosis versus a g g variant, they can have as much as 4 or 5% different differences in their genetics.

So even though it's a ram gnosis by category, it performs differently. Yeah, it's like more than us and an eight and an eight. Absolutely. Right. And so what's really important about that is when a company does studies on Ram gnosis GG and shows these beneficial effects, the assumption in the industry is, oh look at these Ram gnosis.

Yeah, I'm just going to take the cheapest Ram gnosis and and claim that I have the same effect. But it doesn't. It's super species a super strain dependent.

Same thing with, you know, Bifidobacterium infantis 35624 or BL P1. All of these different species have subspecies. She's have their own unique effect.

And it's absolutely clear from studies that you cannot translate that effect to a normal version of that strain. And most of what is sold in the market under normal generic versions of these strains.

You know, I I've had conversations before with, people in the industry and they say, you know, well, there's lots of studies on lactobacillus ram gnosis.

So why do you say the products on the market don't really do anything? But my response is, well, there's lots of studies on Ram gnosis, GG. But when you look at the number of products that are using that variant, it's minuscule compared to the number of products that are using the most generic cheap version of G.

Ram. People say, look, we're the same as Magus born. Yeah, exactly. And it's not, you know, you have to have the right species.

Diet, Probiotic Strain Specificity, and Testing the Microbiome

And then and without actually testing the formulation in, in both humans and gut models in animals, you really have no idea what it does in the system, right?

So one of the other things that is a bit of a pet peeve for me in the probiotic industry is companies will put together products and they'll say clinical, validated or clinically tested.

What they mean is 2 or 3 of this, of the strains that they have have clinical trials independently, right? So they have clinical trials on this strain by itself, on this effect.

And then they have clinical studies on this trained by itself. And then they'll combine them together with a bunch of other stuff and assume all of those effects are still there.

You can't do that. That's a major leap, right? Because you don't know what's going to happen to those microbes when you combine them and put them into the system.

They're living organisms. And so that that's another part that the, you know, kind of the industry tries to pull the wool over people's eyes by seeming like they are well researched now.

But really, what they're doing is that a lot other things look are the same. And, you know. Yeah. And just kind of lastly, any particular, gut tests that you, you recommend?

Yeah. You know, I worked a lot with gut tests over the last few years because I was really unhappy with what they're offering as gut tests in the marketplace at the moment for a couple of reasons.

Number one, all of these gut tests on the market use technology called 16 s ribosome RNA sequencing. Right. So the problem with 16 S sequencing is that it cannot identify, bacteria down to the species and definitely not to the

subspecies level with any accuracy.

Right. It's pretty good at identifying bacteria to the genus level but not to the species level. Right. It can tell you lactobacilli is there. But it doesn't tell you which lactobacilli is there and and what amount.

So that's really problematic because when it comes to the microbiome, what matters is what species are there and what is all of their relative abundance.

Right. You have to understand the whole ecosystem and map out the whole ecosystem to understand what functions are missing or what functions are tend to be, overrepresented in the microbiome.

So that was the first issue, is that using the 16 as sequencing, the other issue was most of the tests on the market are heavily focused on pathogens.

Right. Most of what they test and show you is where are these pathogens in your gut? And the problem is, number one, most of in most cases, these pathogens not aren't necessarily causing the problem.

It depends on what the rest of the microbiome looks like. Right. Pathogens exist in everyone's got. That's a given. They are normal. Part of our commensal flora, like Clostridium difficile is going to be there in most people's gut.

Right? Salmonella. Most people's gut, Klebsiella. Everyone has these within their microbiome. The question is, what does the rest of the microbiome look like? Because pathogens are only a problem when the rest of the microbiome is diminished.

I picture those surrounding them. Yeah, yeah. And we call that our path or biome index. So it really tells you whether or not pathogens are an issue. So because these tests are just heavily focused on pathogens and they give you kind of this arbitrary high and low reading of pathogens, what it tends to do is make people look at a microbiome test and go, oh crap, I've got high levels of this pathogen and that pathogen.

Well, what are you going to do about it? But take a bunch of antimicrobials all the time, right? There's no other solution to it. And so yeah. Exactly.

And then and the antimicrobials, even with the, natural ones, are going to kill off good and bad bacteria. Right. They're not hyper selective just for good for bad bacteria.

So more than, more often than not, what we found in looking through all of these tests, you know, interacting with our with the clinicians we work with, with the patients we work with about these tests, is these tests aren't really telling you much about the microbiome, and it's not giving you, opportunities to find areas of healing.

Right. And so what we decided to do is we came up with a completely new way of doing the microbiome that is like, okay, what do you do about it? Yeah, absolutely.

Because what we said is, okay, there is better sequencing technology and 16 s. Right. It's and it's called whole genome sequencing. Whole genome sequencing can give you absolutely accurate identification down to the species level.

So we already we made a big improvement saying we're going to use the best version of the technology to give you accurate results. Then the second part of it is really mapping the microbiome because it doesn't really matter who is there, it matters who else is there.

Right? So the ecosystem is critical. So what we did is we worked with the most preeminent researcher in the space, for, for microbiome mapping. Her name is Rita Colwell.

She's got over 800 published studies, in this space she's received. Yeah. She has 60 honorary degrees. Right. She's got a couple of her PhDs of her own, but 60 honorary degrees on top of that, she's won, you know, Medal of

Science at the highest recognition of science from President George Bush and a number of, you know, massive accolades like that.

She is the go to person for this. So we work with her and her team to figure out how to map the microbiome so we can give you real ideas on the functionality of your microbiome.

So what our test focus is on is the functionality. And what does the ecosystem within the microbiome look look like. And what does that ecosystem convey in terms of function and symptomology in the patient.

And so and everything we test for, we provide actionable steps. Everything has a diet, lifestyle supplement, actionable steps so that you can do something.

So what what's the name of that? So that's called biome effects biome and the letter F and letter X. It's a full functional microbiome analysis that really talks about functions and mapping within your microbiome.

And again everything is actionable. Physicians and patients or through physicians just through health practitioners for their patients. Yeah. We can can you, say it again.

And we're a website. So you can go to the website biome f x.com or through our own website, website Microbiome labs.com. You'll find it on there. Yeah.

And if you just Google biome effects you'll find it as well. But what what's so exciting about it. And we've now done a few thousand tests already. We've got lots and lots of clinicians that now use it regularly as their preeminent test is that it really provides you somewhere around 37 different functionality analysis of your microbiome.

So it gives you an understanding of what your microbiome tends to do a lot and tends not to do very well, you know, and that's how you kind of adjust your approach to the most important things to start to fix.

Oh that's great. And I ask because you know that a lot of these and like, okay, it's helpful. But I haven't done that. So we'll start ordering in. Yeah, yeah I would I can't wait for your feedback on it.

We've got nothing but awesome feedback on it. And it's really providing insights for clinicians into what's going on with their patients, you know, and it really provides a number of healing opportunities for them.

That's great. I think it was just fascinating. This is just, one of the best talks and really got down to, I think, just the core and the key to the, to the gut and really how important, it is.

And, you know, just just just just right to the, core of it. So. Yeah. Yeah. And I just love the idea. So research based and and knowledgeable. I mean, you know, everyone's, like, throwing around probiotics like crazy.

And, I think you make people feel comfortable, so it's like this one you got to go with. Yeah. Thank you so much. Yeah. So thank you I just I am I, I'm blown away.

So I, I think it's great to read again. One study you did. Looking forward to the other ones and just how much, knowledge and just good research because there's so much stuff out there.

But it's it's just all over the place. It is. It is all over the place. And, ultimately, it's about making it simple, accessible both for clinicians and then their patients.

You know, I mean, clinicians have so much to learn and deal with that it's so hard for a clinician to spend their time grappling this concept of the microbiome, right.

When you're spending most of your day dealing with patients trying to find the perfect probiotic, it's I almost went crazy. Exactly. Yeah. You were coming up with to do it.

Absolutely. You know, and we call ourselves Microbiome Labs for that reason. You know, it was it was our mission to make sense of it and provide tools that can really make changes in the microbiome.

So, we're excited to continue the work we're doing. And thank you so much for the support. I thank you so much for being on. I think this was this was great.

So informative, and I appreciate you taking the time. Thank you Ken.