



Episode 219: Why Everything We Know About Probiotics Is Wrong & How to Stop Leaky Gut With Microbiologist Kiran Krishnan

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Katie: Hello and welcome to the Wellness Mama podcast. I'm Katie from [wellnessmama.com](http://wellnessmama.com). And this episode is gonna be all about how so much of what we know about probiotics is wrong and what the current research is saying, because I am here with Kiran Krishnan who is a research microbiologist. And he's been involved in the dietary supplement and nutrition market for 17 years. He comes from a strict research background. And he's also established a clinical research organization where he has designed and conducted dozens of human clinical trials and human nutrition. He's the Acting Chief Scientific Officer at Positions Exclusive and Microbiome Labs. And he's a frequent lecturer on the human microbiome at medical and nutrition conferences. He's currently involved in nine novel human clinical trials on probiotics and the human microbiome, and is undisputedly one of the world's experts on this topic. So, Kiran, welcome and thanks for being here.

Kiran: Thank you so much for having me. It's my pleasure. Appreciate any opportunity to get to talk about this stuff.

Katie: I love it. It's one of my passions because I love researching this. And I feel like there's so much new research coming out every day about this, and you are leading a lot of this research. I have so many things to talk to you about. But I wanna make sure we've defined a couple of key terms that we'll be using a lot in our conversation today. And the first is leaky gut. I know a lot of people listening have a pretty good understanding of maybe what that is, but you've been involved in actual research on this. So can you define when we say leaky gut, what you mean?

Kiran: Yeah, one of the things I love about leaky gut is that the terminology is very descriptive, right? And it actually is what it sounds like. Your intestinal lining, which is really the defense layer between your blood circulation which is considered inside of the body and the outside of the body which is all the food and liquids and bacteria and viruses and toxins and all that that end up passing through your system. So they pass through your system for the most part through your digestive tract, right, because we're consuming foods and we're drinking things and we're putting things in our mouth all the time.

And inadvertently swallowing things like fecal matter and toxins and fungus and molds and so on. All of that stuff has to pass through our system. And as it's passing through the system, it's sequestered into the part of the intestines called the lumen. So the lumen is basically the hole in the intestines. That's the tube, if you will. The lining of the tube is lined with a mucus layer. And then below the mucus layer is a single cell line thick border. That single cell line thick border is the ultimate and the final separation between the outside world which is that tube and the inside world which is the blood circulation. If things are allowed to nonspecifically migrate past that mucus layer, past the cell line into our blood system, it causes significant disease.

And a leaky gut is a gut that has lost the regulatory mechanisms that govern and control what is allowed to pass through those layers. Because, of course, we want nutrients to pass through, right? So we eat food. We want to be able to absorb the calories. We want to be able to absorb the vitamins and minerals and the fennels and so on, all of the good stuff that's in food. We want those things to be able to move through. But we don't want bacteria, or viruses, environmental toxins and so on to move through. A leaky gut is one that just kind of nonspecifically allows things to move through because we've lost our defensive mechanisms.

Katie: Got it. And how widespread of a problem do you think this is currently in society? What would the progression look like? What might someone notice in their body if they had leaky gut?

Kiran: Yeah, so that's the difficult part about it is that for the most part, leaky gut will be subclinical, we call it, or asymptomatic. It's occurring on a regular basis. And what it's doing is kind of laying down the framework and the pathology of the pathway to chronic illness. So if you have the allergies or if you have any sort of sleep disorder, mood disorders, if you have a little bit extra weight, if you've struggled with weight issues all your life, if you have anxiety, depression, any sort of immune dysfunction, all of those things are related to the gut being leaky.

So you can very well presume that your gut is leaky to a certain degree. In our most recent study that we published, we published it in August of last year, what we saw is we took 100 healthy young college students. So when we say healthy young, we mean that they have no diagnosed diseases. They're of normal body weight. They're not taking medication for any chronic issue. So not even things like allergies, and so on. So they are what we would consider to be healthy normals. And, you know, being 22, 23 years old, you're essentially in the prime of your life.

Out of that population, 55% of them had severe leaky gut. And severe, when I say severe, means after they eat a meal, the inflammation and the toxicity that occurs in the body is measurable and exists for up to two weeks from a single meal, right? So it's a really toxic process having it in your body and having to go through this every time you eat food. And the biggest driver of when the leakiness in the gut occurs is during the process of digestion and eating food. Now, if you have almost any kind of chronic health condition, most of those are able to be tied back to leaky gut either playing a role in it, or even being the main cause of the condition. So you won't necessarily feel anything, but it's the spark that sets off chronic illness.

Katie: Wow, that is staggering, that 55% of seemingly otherwise healthy college students. Because what does that say for probably every other segment of the population? What do you think are some of the key drivers of why we're seeing such high rates of this?

Kiran: So the biggest thing, and this can be tied back epidemiologically to like a bunch of other conditions, right? So the biggest thing is a disruption of our microbiome. You know, and I mentioned earlier that there are protective mechanisms in place to prevent this leakiness from happening. For in large part, those protective mechanisms are controlled by the bacteria that live in your gut. You know, some people may not know this, but the gut is essentially covered with every square millimeter with bacteria. There's over 100 trillion bacteria in the digestive tract alone. And that's like an insane number to even try to fathom and wrap our head around.

But compare that to about 10 trillion cells that make up the entire human body, right? So there's 10 times more bacteria cell in our gut than human cells that make up by entire body. So that's how dense the bacterial population is in our gut that lines every square millimeter from your mouth all the way down to your bottom. And as it turns out, it's the job of a healthy population of bacteria in the gut to protect us from that leakiness. There's several mechanisms that they involve to rebuild that mucus layer to keep the single cell layer which is your intestinal lining from opening up and allowing things to leak through, from neutralizing things right in the lumen, which is in the tube part of the intestines. They play the biggest role in protecting us from this leakiness in the gut.

And we have done almost everything we can to destroy our gut bacteria, right? Starting with the use of antibiotics. And of course, you know, there are many conditions where antibiotics are necessary and can save lives. But we also use, about 50% of the time, we use antibiotics unnecessarily. And we know from studies that antibiotics can disrupt the gut microbiome for up to two years. So there's significant changes that they make. Of course, we've been consuming foods that have lots of pesticides in it. And those pesticides have been shown to have a significant impact on the gut. We've been consuming foods that have a lot of artificial

colorings and flavorings in them and chemical entities that we know impact the bacteria in the gut. We also use foods with preservatives in it. We utilize, you know, personal care products that have chemicals that have been never tested on the human body or in the human body and we inevitably absorb and consume those chemicals.

And as it turns out, many of them have a negative effect on the microbes that live in and on us. And then lastly, you know, we live in this kind of sterile environment. We've created this idea that we need to kill 99.9% of bacteria. Right? I mean, if you look at the Clorox Company, and all these companies that advertise these cleaning products, the big stamp on there's it kills 99.9% of bacteria, that when in most cases, that can be the worst thing you do. Because one of our essential design elements is our relationship with bacteria. And if we're killing bacteria all around us, we are disrupting that relationship. And ultimately, we suffer from that.

Katie: Absolutely. I've written about that before. I think I have a post called "Why kids and adults need dirt," and how we've removed this interaction with bacteria from our world. And like how much of an impact that's having that we don't even fully, I don't think, realize yet. Another term we're obviously gonna talk a lot about today is the word probiotics. And this one's tougher to define because I'm guessing there's a lot of different types that get kind of lumped in together.

So my background is in nutrition and the idea of trying to say, like, what is probiotics to me sounds like trying to say what is food? There's so many different types within that category. But I also feel like there's so much misinformation and even just confusion amongst the research with this term. So can you take us from a general overview of what probiotics are on a basic level, and then maybe narrow down a little bit of what some of the different types are?

Kiran: Yeah, and that's really important. And to start that off, we'll give a little bit of a history of probiotics where they even came from. So the vast majority of probiotics that we use, you know, since its discovery in the early 1900s, the person that's credited for the discovery and the utilization of probiotics is a Russian scientist named Elie Metchnikoff. And what he was doing was using fermented milk to treat certain conditions. And he would ferment the milk with a bacteria that he didn't really define very well, didn't have the technology at the time to kind of identify and define bacteria, so he called it a Bulgarian bacillus. And he would make these fermented dairy products, and he would treat conditions with it.

And he put forth this idea that a lot of disease came about because of autointoxication. That means bad fermentation and purification of the gut by bad bacteria. And so he had the idea to utilize milk as a substrate to send in good bacteria. And so that's where the first idea of probiotics came from, is to use beneficial bacteria to combat the negative effects of bad bacteria. And he actually ended up winning the Nobel Prize for his work because that was a novel concept back then. But he wasn't using the term probiotic at that time. The term probiotic actually was derived in the 1960s by two scientists named Lily and Stillwell and they were the first ones to coin the term probiotic, which means for life.

And the idea was that there are bacteria present in our system and possibly available to us through fermented foods that are actually life giving or life supporting as opposed to antibiotic, which is, you know, antilife. So that's as simple as a term is, it means for life. And these are microbes that promote health and promote life. And, again, even up to the early 1980s, for the most part, probiotics were dairy fermenting bacteria. You know, if you look at the vast majority of probiotic strains used in the market today, there are *Lactobacillus acidophilus*, *Lactobacillus rhamnosus*, and so on. Many of these species were actually isolated and used because they're really good at fermenting dairy to create kefir, and to create yogurt and so on.

And the assumption was that when we drink these fermented beverages that these bacteria were going in and living in the gut. And that the benefit that we were seeing from the fermented yogurts and kefirs and so on came from the bacteria going and living in the gut. But that, as it turns out, is completely wrong. You know, and all of the bacteria that exists in fermented products die in the system, in the gastric system the moment you swallow them, right? So the stomach acid is a really harsh environment. In fact, it's the first component of your immune system. And it's referred to as the gastric barrier for that reason because one of its job is to kill bacteria that are entering into the system.

And so when you drink a fermented product, the benefits that you get from the fermented product comes from the ferment itself. So it's all of the organic acids and peptides and all that were created during the fermentation process. Those things are going in and causing benefits in the gut. The bacteria that did the fermentation ends up dying. So that's where the concept of probiotics came from was fermented foods. And the idea was that, okay, if the fermented food has health benefits, it must be because of the bacteria that are being used to ferment. So why don't we isolate those bacteria, concentrate them, put them in a capsule or pill, and then take them the same way?

The problem with that is we were assuming that when you take those types of bacteria, when you consume them, that they will get in, and they will recolonize the gut. And recolonize means being able to kind of hang in there and live there and live among the rest of the bacteria in your gut. And then if you take enough of them, they'll shift the balance between good and bad bacteria. And that's been the idea all the way up to about 2006, 2007, when we finally started to understand what our gut is structured like, and what's even living there. You know, so imagine most probiotics that you have on the market would develop well before we knew anything about the gut. We really didn't learn anything about the gut until about 2009, 2010, when studies from the Human Microbiome Project started coming out.

We didn't know what was living in there. We didn't know what amounts, what proportions. You know, what was the difference between the vector in the small intestine versus a large intestine? But we knew nothing. And yet, we were throwing in a whole bunch of bacteria, with the assumption that they will be going in living in the gut and creating this wonderful harmonious balance. And that's where most of the probiotic products in the market get their strategies for formulation. That's why we started seeing companies going from 10 billion CFUs a day to 50 billion CFUs a day to 200 billion to 800 billion, and so on. The numbers just kept going up because what we were thinking or what the industry was thinking was, you know, a little bit is good, then more has got to be better.

And then they were competing with each other from a marketing standpoint as to who would end up having the highest amounts for the cheapest price. And that's how you get the consumers. So that was the old thinking behind probiotics. And a lot of people are still perpetuating that thinking that we're receiving the gut with this high load of bacteria when as it turns out, and we've tested 40 of the top probiotic products on the market, as it turns out, all of them, virtually all of them die in the stomach. So it doesn't matter if you're taking 200 billion bacteria, or 50 billion bacteria, all of those are gonna die in the stomach because those bacteria, the lactobacillus and bifidobacteria are just not designed to survive through the gastric system.

And so then some smart person will come around and say, "Well, we enter coated and we wrap it in sea weed or we do all kinds of crazy things to it." And we say, "Well, we tested. It might survive through the stomach acid, but it won't survive the bile salts at that point." So there's all of these major gauntlets of the bacteria have to go through. So that's kind of the overall history of probiotics and why you see products the way they are, where companies are just throwing more strains, more cells in the product. Because the whole idea is more is better, more is better. As it turns out, probiotics, the real functionalities based on the type of strain that you're using and most probiotic studies are done with a single strain at four or five billion CFUs. There is no scientific validation for a 15, 17 strain product at 400, 300 billion CFUs.

There's no studies that show that 100 billion is better than 50 billion or that 200 billion is better than 100 billion. There's no dose dependency that way in that more is better, right? So a lot of it is just kind of common misconceptions. The idea that there are health promoting bacteria is still very strong and they're definitely are. There's a lot of researchers support certain strains providing certain benefits within the body. But it's very strain-specific. You know, I'll give you one example, Lactobacillus rhamnosus, Lactobacillus rhamnosus is a generic strain. It more than likely does nothing in the body. It more than likely just dies going through the stomach, and you'd basically poop it out 12 hours later.

But Lactobacillus rhamnosus GG, which is a variant of that species has been shown in clinical trials to be able to reduce the incidence rate of diarrhea in kids or up regulate some of the immune components and help fight off viral infections. But the regular GG...the regular rhamnosus doesn't do that. You know, Bifidobacterium infantis 35624, that's a very specific strain, it's a variation of the species of Bifidobacterium infantis. That one has studies to show that it has some benefits in the body. If you take generic bacteria infantis, it likely doesn't do anything. And that's where people end up getting confused.

And that's what people end up getting...you know, wasting their money, really, because probiotic effects are very strain-specific and more strains perform very specific functions. Like rhamnosus GG does not do the same things in the body that infantis 35624 does. And so there's significant differences between what the functionality of the probiotic would be it. And sorry, that's a really long answer to your question. But, you know, I think that history is important where we came from with the idea of probiotics that it really came from fermented foods. And the whole concept was, you know, fermented foods have known benefits to them.

And the assumption was that the benefit of the fermented food was it's a delivery vehicle for the bacteria. When it turns out it's not, the benefit from the fermented food is the ferment itself. Studies have been done where they take fermented yogurt that has known benefits, and then they heat kill the bacteria in the yogurt. So it's essentially a sterile yogurt, and then they deliver it and you get the same benefits as the live cultured yogurt. And the reason is because the bacteria entering the body and performing a function in the body is immaterial. The benefit from fermented foods comes to the ferment.

And outside of that, there are specific strains of bacteria that have been identified to do specific functions in the body. There's almost no rationale for what I call these kitchen sink formulas, where companies just throw 10, 15, 20 different strains in it and some random dosing of 30 billion or 50 billion or 100 billion. There's no scientific rationale for that. Most of it is dying in the gut, and that's not really providing a benefit. And when we were looking at probiotics, we were looking for, you know, what are the bacteria that our ancestors got exposed to on a regular basis that have a natural ability to survive through the gastric system? And that's where the spores came from.

Katie: Wow, that is so fascinating. And a couple key things that really struck me on what you just said about fermented foods, because obviously, these have a long history of use in many different cultures. And so that's so interesting that you're not disputing that fermented foods are beneficial. It's just we basically drew the wrong conclusion in assuming what was causing the benefit. And then basically sort of created an entire industry reflecting that. And based on, I know, I've seen these probiotic bottles that talk about how many billions of CFUs, but really, there's no way to know from that bottle how much of that is actually even impacting your body in any measurable way whatsoever. And you mentioned at the very end there, you mentioned spore based probiotics or spores. Can you explain what makes that different than the other strains you just talked about, the lactobacillus or the bifida?

Kiran: Yeah. And that really speaks to our rationale when we started studying probiotics. And, you know, one other thing as a side note I wanna mention about those, what I call the kitchen sink formulas, one of the big issues that I'm seeing with it even as a researcher and in studying probiotics, you know, as early as 8 to 10 years ago, is that many of the strains that these companies are using in the products are completely undefined. University of California, Davis published a study in the Journal of Nature. Journal Nature is the top scientific journal.

So if you can get a study published in there, it means it's a very well done study. They basically took 16 different probiotic products from California health food stores. They bought some online and so on. And what they did was they did full genetic analysis on the strains that were in the capsule, and they wanted to see how many of the products had the right strains in the capsule, compared to what was claimed on the label to be in the product. And out of 16, unbelievably, only 1 matched what was claimed on the label. So 15 out of 16 products that they tested had completely different bacteria in the capsule than what was claimed on the label. And the scary thing about this is these were all children's probiotics that they were testing, right?



So imagine moms are spending their money buying these products thinking that they're gonna help their kids allergies or colds or flus or digestive disorders and all that. And they're buying these products with the fancy marketing that's touting so many strains and so many CFUs. So in your mind, you're being programmed to think that, "Oh, it's a really powerful product." As it turns out, it's got completely different undefined bacteria in the capsule that you have no idea what you're giving your child than what these companies are even claiming on the label. And so that to me, and this was published back in 2015, and we started seeing the same problem when we were researching probiotics even before that.

And that, to me, was one of the big defining issues of where the probiotic industry was going. Because it was just this frenzy to capitalize on something that's popular, and people were just throwing things together randomly without taking a scientific approach to it. And that, to me, is a very problematic thing. Because a true probiotic has significant promise, right? If you can find the right strains of like bacteria and use them for the right conditions, it can be extremely powerful. But people were kind of bastardizing that whole idea and just kind of throwing things together. So when we started thinking about probiotics, we kind of kept it simple.

You know, as a microbiologist, I always have been a closeted evolutionary biologist. I always look to see what did our ancestors did, right? How did we evolve? What were our behaviors and practices? And try to mimic some of those things. So I thought to myself, okay, probiotics are bacteria that have some sort of health benefit in our system. And if you are an outside bacteria that has the capability of coming in and providing a health benefit to the human, this type of intimate relationship doesn't occur over just a decade or two decades or even 1000 years. This is a long term coevolutionary benefit for our body and our immune system to allow a bacteria to come in and perform functions that ultimately help us. That's a significant coevolution. That's a significant commensal symbiotic or mutualistic relationship.

So in my view, you know, I kept thinking about where did our ancestors get their probiotics from, right? Because throughout the course of human evolution, our ancestors were exposed to bacteria significantly. And clearly, we've developed this beneficial relationship with bacteria. And then I started looking at studies that showed, you know, a significant beneficial impact on the guts and the healths of people that lived in rural areas compared to the same culture that lived in urban population. So there's studies on in Russia, where they compared the digestive health and the longevity of the overall wellness of people that lived in rural Russia versus urban Russia.

In Japan, they did the same thing and then they started mapping out the guts in the overall health of, you know, hunter/gatherer tribes like the Hadza tribe in Tanzania, tribes in Papa New Guinea. And it became really apparent that the closer you live to dirt to the ground, the more beneficial, the more benefits, the health benefits, you tend to obtain. And clearly, there are numerous bacteria in the environment. And so we focused in on environmental bacteria that seemed to be conveying a benefit to the host. Now, it's true also for environmental bacteria that the vast majority of them will die in the stomach, right? So if you just take a whole bunch of soil organisms and you consume them, the vast majority of them will die in the stomach. And because they're gonna die in the stomach, they're not really gonna perform significant probiotic benefit.

So what we honed in on was, what are the environmental microbes and microbes that are abundant in the environment that also have the natural capability of surviving through our harsh digestive system? And then once it survives through, also has the capability to attach to the intestinal mucus or the intestinal lining and live in the gut. And our rationale was simple. We said if the bacteria has that really unique capacity, that means it must be a vector that plays a significant role in the gut. And that's where we discovered the spores. So the spores are bacteria that are gut conventional organisms, meaning their natural home is a gut, right? And when they're living in the gut, they're not in the spore form. When they leave the body through defecation, they go into this really unique spore form.

What that means is the bacteria is metabolically inactive, so it's not multiplying. It basically goes dormant. It covers itself with a thick protein calcified layer. So it's like an armor like coating. And that will allow it to exist in the outside environment almost indefinitely. Because most of our commensal bacteria in our gut that naturally live there, most of them are very sensitive to oxygen, very sensitive to light, because there is no oxygen in most of the gut, there is no UV radiation or light. So the moment they come out of the body through defecation and they get exposed to oxygen and light, they die off. But these are commensal bacteria that have developed this unique capability of when they're leaving the body, they go into the spore structure.

They cover themselves in this armor like coating. They go out into the environment and they can stay in the environment for a long period of time. Now, that same spore coating allows them to survive through the harsh stomach acid and the bile salts. And then they get released in the small intestines. And they go to work for us in the small intestines, basically doing a whole bunch of housekeeping functions in the gut. So that's how we honed in on these spores. We didn't try to outsmart nature. We didn't try to take a bacteria that doesn't have a probiotic function and wrap it in a fancy capsule or in seaweed. And I've seen all kinds of crazy things that people are doing to try to make bacteria survive through the system. Our simple approach was what has nature given us as a probiotic? And can we find that? And once we find it, can we study the heck out of it to figure out what it's doing in the system?

Katie: Interesting. And to circle back to our first point, that is the strain that you guys used in the leaky gut study. Am I correct on that?

Kiran: Exactly, yeah. It's actually a formula, a few of the strains. So we used a formula of four of these strains in the leaky gut formula. They're all of the same genus. So I don't know if your audience is familiar with bacterial taxonomy, but genus and then species. So like you might be familiar with lactobacillus acidophilus. So lactobacillus is the genus, acidophilus is a species within that genus. Like our genus is a homo sapien and we are homo sapien sapien. Not to get too nerdy on that stuff, but the genus that we're talking about is bacillus. Not lactobacillus, but bacillus. And then there are different species within bacillus. We have subtilis, coagulans, clausii, indicus.

So those are the different species. And what we figured out and the reason why we use a few of them together is when we were looking in nature for the presence of these bacteria, what you realize is they never exist by themselves, right? So these particular bacillus type species seem to be congregated together in what

we call a consortium. And when you look at their individual functionality, they each have characteristics that support one another. So we wanted to do a true nature like consortium product. And so we put them together in the proportions that we see them in either in the natural digestive tract or in nature. And that's the formulation that we use. So that's where the rationale came from. Again, it's all about just kind of respecting what evolution and nature has already provided for us.

And then our job is to discover what those things are, right, and not try to outsmart and undo nature. And so that is exactly what we used in the leaky gut study. And a lot of people ask me, you know, "Wow, how'd you come about doing leaky gut and versus, you know, your typical probiotic studies when companies do studies which is rare? But when they do it, they do studies on bloating gas and bowel movements," right? So frequency of bowel movements. And those things are important. Of course, none of us wanna bloat, none of us wanna have gas, and we all wanna have frequent bowel movements but our thinking was different.

Our thinking was if you have these really unique bacteria that have been designed by nature to enter through the body, get past all of the mechanisms that are designed to kill other bacteria and then go and be able to live in the gut, it's got to be doing something extremely special in the system, right? And so we were thinking, well, what would be the most important function of a true probiotic? And in my view, the most important function of a true probiotic is to protect the host. The host being us. And protect us from what? Well, protect us from the most toxic thing that happens to us every single day and this is that massive leakiness in the gut when we eat food. So the fancy term for that is metabolic endotoxemia and postprandial endotoxemia.

And if you are, you know, someone that likes to do research, if you type in metabolic endotoxemia, you will see the amazing amount of studies. And studies are being done by huge institutes like the National Institutes of Health, NIH, or the American Diabetic Association or the American Heart Association and the World Health Organization. Big, big research institutes are doing massive amounts of study on metabolic and postprandial endotoxemia because it's now believed that that is the major driving force behind most chronic illnesses. And so my view was maybe the reason that is so prevalent is because we're missing these bacteria, right? We've evolved to consume these bacteria on a regular basis because our ancestors are smart enough to eat dirt and not sterilize their environment, then they drank water out of rivers and streams where these particular bacteria are very abundant.

So the natural inclination was maybe these bacteria are the missing link to why we're having such severe leaky gut and babies are being born with allergies and, you know, crazy amounts of diaper rash and eczema and why is asthma an epidemic? Why is autism an epidemic? You know, all of these issues may be due to missing certain types of microbes in the gut. And so we immediately wanted to study adding back in these microbes, can they actually fix that core problem? And that's how we got to the idea of studying leaky gut in the first place.

Katie: That is super interesting. And so what did you guys find in this study? Because I know like many supplements are not actually backed by human studies whatsoever. So I'm super fascinated that you guys actually did this. What did you find?

Kiran: So it was really surprising. And I must say, I was nervous about the study because I wasn't sure that we would see anything because it was a tall ask what we were asking for, right? So what we did is we took 100 college students. As I mentioned, we screened them for massive endotoxic response to food. That means when they ate food, it opens up all of the barriers in the gut. They don't have the protective mechanisms. And then one very important toxin that is generated in our gut call LPS, Lipopolysaccharide, it's a bacterial toxin that's generated in the gut, is allowed to leak through that mucus layer, that intestinal membrane, and make its way into the blood, right?

And so what we can do is measure the amount of that particular toxin in the blood before the meal. And then we give someone a meal. And then after the meal, three to five hours after the meal, we measure again to look at the increase of that toxin that's now present inside the body. And along with looking for the toxin itself, we also look at a whole bunch, about 12 different inflammatory cytokines or markers that now show that the body is undergoing massive amounts of inflammation, both systemically and in certain acute localized areas as well. So that's what we're measuring. We're measuring, you know, taking somebody, measuring the baseline of all of those inflammatory markers and the presence of that toxin in the body inside the circulation, giving them a meal to eat and digest.

And then three to five hours after the meal, measuring all those things, again, to see how much of that stuff leak through into their blood and then how much inflammation their body is going through because of that. And what we found is when we added the subjects into the study, in the treatment group, we saw over 60% reduction in the amount of toxin migrating through when they eat food from the lumen tube and the intestines into the circulatory system. Over 60% reduction. And that's just in 30 days. And the reason I was nervous about it is because all they were doing was taking the probiotic, you know, every day for 30 days. They didn't change any of their other lifestyle behaviors. And these are college kids. They're not doing anything good for themselves or their gut in that 30 days, right?

So they're still stressed. They're still drinking. They're still eating fast food, you know, doing everything. Lack of sleep, all of the things that college kids do. And I was not sure. I did not have, you know, 90% confidence of just taking a probiotic in view of all of those other negative behaviors could actually have a measurable impact. And yet it did. Now here's the scary part about it is in the placebo group, the group that was not getting the probiotic, not only did we not see, of course, a reduction in the amount of leakiness in the gut and toxin moving through, we saw a 32% increase in the amount of leakiness and toxins moving through in just that 30-day period.

So that condition is steadily getting worse. And in the treatment group, that conditions got better by a huge margin. So that was very promising to us. And since then, we've done, you know, four or five other studies that looked at very specific components of that study in a larger scale to verify it further. But we're also doing a second version of that same study now for 90 days, because we wanna see how much worse will that leaky gut get in the untreated people, and how much better we can get it in the treated people. So that was quite significant.

So imagine you are a college student. You're in the prime of your life. And every time you eat food, you have almost two weeks of inflammation going on in your body. And that 55% of college students that we screened that have that, those are the same 55% in their late 20s, early 30s, and beyond, will start having, you know, immune dysfunctions, autoimmune disease, diabetes, obesity, you know, anxiety, depression, and all of this stuff that we start to see as we start getting older. And that's because that leakiness and that significant inflammation that it lays down is the root cause of most of those chronic illnesses.

Katie: I love that you just brought up the anxiety and depression link because some of my early research when I first got involved in the nutrition world and health world was on the gut brain connection. And I read when my third child was born, I read gut and psychology syndrome because he was my only one that was born via C-section. And he was exhibiting some problems that my other kids didn't have. He had eczema. My other kids never had that. And so I was trying to research to be able to help him and really came across all of this research that's now much more well known about the gut brain connection, and just how drastically our gut microbiome really impacts our brain on a daily basis. And I know you are an expert in this topic, but can you kind of give us a primer of how important that connection is?

Kiran: Yeah, absolutely. And in respect to the gut brain connection as it controls mood disorders, you know, one of the things that's been well established now is that serotonin, which is our happy hormone, is predominantly produced in the gut, right? So we always start with serotonin because it's always been measured in the synapses in the brain. And, for example, in depression and severe anxiety, what they're looking at is how much serotonin is actually in the synapses and between the neurons in the brain. And when you have low levels of serotonin in the synapses, then it's correlated to having high anxiety and depression. And so they give you something called an SSRI.

So those are the antidepressants. SSRI is a selective serotonin reuptake inhibitor. And so there are these pumps that pull serotonin back out of the synapses and get them back into the neuron. Those are called the reuptake pumps. And so what those drugs do is they inhibit the reuptake pumps with the idea of allowing the body to try to build more serotonin in the synapses. But as it turns out, you know, that's all targeting the brain. As it turns out, that 95% of the serotonin in the body is actually made in the gut. And so if your gut is dysfunctional and not producing enough serotonin, you're always gonna have issues with serotonin levels in the synapses in the brain.

And then the other happy hormone or the hormone that serves the reward centers of the brain, a hormone called dopamine. And low dopamine function is directly impacting things like addiction behavior. So people, for example, you know, with opioid addictions, right? And we're seeing that. That's a massive epidemic going on right now is the opioid addiction epidemic. People who are susceptible to opioid addiction or alcohol addiction or porn addiction or whatever it may be that they're addicted to, even things like anorexia nervosa, which is an addiction of its own, those are all people with severe dopamine dysfunction. And most of the dopamine in the body is made in the gut as well.

So, you know, our happiness, our ability to cope with stress, something called the HPA axis, the hypothalamic-adrenal-pituitary axis, the control mechanisms in the HPA axis starts in the gut. So when we disrupt our gut, we are screwing up our ability to be happy about things. We're screwing up our ability to cope with the normal stresses of life. And we're screwing up our ability to get the reward sensation from doing normal things. So we seek out more extreme things to try to service that dopamine sensation. So addiction, mood disorders, anxiety, depression, all of that is related to gut. And this has been, you know, quite well documented even in the case of antibiotics.

For example, there are several antibiotics where their main side effect is severe anxiety or depression. So imagine taking an antibiotic. It kills off that bacteria in the gut. So it screws up your gut population. And as a result, the side effect you get is not diarrhea, but you get anxiety. Campylobacter. Campylobacter is a common pathogen infection in poultry, for example. In some cases in swine and pigs as well. But Campylobacter, when it infects, you don't get the same kind of diarrhea and vomiting and all that you get from other foodborne illnesses. The main effect of Campylobacter infection is severe anxiety. Like just random, immediate, severe anxiety that it's coming out of nowhere, you know, and panic attacks and so on.

So it's the connection between the gut and the brain is very clear. There are a couple of mechanisms by which the gut and the brain that directly connect and from a physiology standpoint, one of the most well-known ones is something called the vagus nerve. So the vagus nerve is a direct neurological connection between the gut and the brain. And all of the bacteria in our gut have direct contact with the brain through the vagus nerve. So they create hormones and neuropeptides and neuroreceptors, all of those things, they can create and send it up the vagus nerve directly to the brain to influence us in many ways.

One of the ways that they do that is through influencing our cravings and our hunger. You know, and we actually saw that in our leaky gut study. I mentioned that piece of data. But the vagus nerve is one of those two way highways, directly between the brain and the gut that circumvents everything else in the body. And that gives the microbes in our system, in our gut, direct access to our brain.

Katie: Wow. So you mentioned the vagus nerve, which is definitely getting more press right now. I think people are starting to finally understand that. And I feel like we're also just now starting to really understand the research is really supporting just how important that gut brain connection is. And I didn't even know the statistics about some of those antibiotics actually leading to anxiety and depression. But it makes sense in light of everything you just explained.

This episode is brought to you by Branch Basics. They are one of my favorite companies because they are tackling two major problems with one simple solution. We've all heard about the problems with single use plastic and how they are polluting the environment, how overuse of plastics is bad for us as humans. And if you've read my blog, you're also well aware of the potential pitfalls of harsh household cleaners, especially if you have kids in the house. Branch Basics helps on both of these fronts. They have the worlds safest non-toxic cleaning concentrate that is plant based, biodegradable so it's safe for the environment, it's non-GMO and it's not tested on animals. Since it is a concentrate, a single bottle lasts a really long time which drastically cuts

down on extra plastic bottles that you would get if you bought cleaners already pre-made. It's gentle enough to be used on skin, even on babies, but strong enough to clean floors or greasy messes and even treat paint stains. And I use it to make an all-purpose cleaner to treat stains in the laundry and even use as laundry soap. Their bottles are all reusable or you can do what I do and mix everything in reusable glass bottles instead. And when I say it is good for everything, I mean it! I carry a travel size foamer pump when I travel for use as hand soap instead of using nasty soaps in bathrooms, I use it as a face wash, shampoo, eye makeup remover and stain treatment, and so much more. I use the same concentrate at home to make practically every cleaning product in my home. You may have seen on my IG how I used their cleaning concentrate and oxygen boost to wash my white couches naturally and I use Branch basics in some way every single day. Check it out and grab some of your own at [branchbasics.com/wellnessmama](http://branchbasics.com/wellnessmama) and save 15% with the code Mama15.

This episode is brought to you by Alitura Naturals skincare. You guys loved the founder, Andy, when he came on this podcast to talk about his own skin healing journey after a tragic accident that caused massive scarring on his face. From this experience, he developed some of the most potent and effective natural skin care options from serums and masks and a lot of products in between. The results are visible in his perfectly clear skin that is free of scars! I love the mask and use it a couple times a week, and often use the gold serum at night to nourish my skin while I sleep. All of their products have super clean ingredients and they really work! Andy is absolutely dedicated to creating the highest quality products possible and it shows. Check them out at [alitanaturals.com/wellnessmama](http://alitanaturals.com/wellnessmama) and use the Discount code "wellness" to get 20% off.

Katie: And I know that another possible connection there, both with the immune system being in the gut and also even the vagus nerve, I've seen some research, is just how important our gut health is for overall immune function. And there's speculation on why this is such an important link with, for instance, autoimmunity. So I have Hashimotos and I've seen a lot of research about that potential connection. But can you speak to the importance of the gut for immune health?

Kiran: Yeah, absolutely. And that's a really important point. So if people aren't familiar with the physiology of the immune system, about 80% of all of your immune tissue in your body is actually in your gut, right? So imagine your gut, your intestines are lined with immune tissue. All types of immune tissue. There's something called the mucus associated lymphoid tissue, the MALT, or the gut associated lymphoid tissue, the GALT. That's one very important area in your ileum, which is the last part of your small intestine called the Peyer's Patches.

So your digestive system is covered with immune tissue, and there's a lot of immune activity going on in there to up regulate or down regulate certain parts of the immune system. And since the immune tissue is in the gut, it means that the immune system is completely covered with bacteria. So imagine you are an immune...put yourself in the position of the immune tissue, imagine you are an immune tissue and you're sitting around and you're trying to figure out what is friend? What is foe? Do I have an invading bacteria? Do I have an invading virus? Is there something I need to react to? And the whole time you are covered by trillions of bacteria, right? Most of which are friendly good bacteria.

So the ability of the immune system to function properly meaning not becoming autoimmune, meaning not accidentally starting to attack its own tissue, or being able to defend against chronic or acute infection. So chronic infections like Epstein-Barr virus or cytomegalovirus or acute infections like the flu, like influenza, or a streptococcus infection in the gut, being able to identify those things and not attack things that it's not supposed to, that kind of tutoring actually comes from the bacteria that is in the gut. So it's something called immune tutoring. And the ability of the bacteria in the gut to kind of stimulate and teach and train the immune system on what the world looks like, what is friend, what is foe, and what shouldn't be attacked, and what should be attacked is something that's very, very well documented.

So without a healthy diverse microbiome, which is the collection of organisms that live in and on us, without a healthy microbiome and a diverse microbiome, our immune system simply cannot function. I always explain to people that your immune system is like an army with all of the equipment. You've got soldiers and you've got tanks, and you've got, you know, missiles and bombs and all that. So you've got all the capability but you have no plans, no war plans. The army is just sitting there waiting for general to tell them what to do. And the microbiome is the general.

So if we disrupt our microbiome, if we're constantly negating important exposure to other bacteria, we will be traumatizing and negating that important tutoring and learning that our immune system has to go through. And because of that, we can now tie back virtually, you know, every immune dysfunction as simple as an allergy or a food sensitivity or eczema, psoriasis, or autoimmune diseases, like you mentioned Hashimotos, all of those can be tied back to dysfunctions in the gut.

Katie: Yeah, that makes perfect sense. And I know we've made a really strong case for just how important gut health is to at least a few aspects of our life. And then I know a question that is coming up increasingly that I wonder is, with all of these problems with the glyphosate, with overuse of antibiotics, with the lack of beneficial bacteria that we're exposed to daily, are these problems fixable based on what you're seeing in the research? Do you think we can actually move the needle and go backwards once we experience leaky gut or once we experience autoimmunity or once we experience a gut brain issue? Is it something that we're seeing actual...the research is showing we can reverse?

Kiran: Yeah. And that to me, it's that's the most exciting thing about the age that we're living in. So we're living in this like renaissance of discovery. Because what we're learning now about the human body and about how it functions and the origin of disease is way higher volume of information than we've learned in the 100 years previous combined, right? So we are in a real renaissance of information. And to me, the most exciting and promising thing of everything that we've learned is that most chronic illnesses are due to an ecological issue in our body. And because it's an ecological issue, we can always learn how to fix that ecology. And if we fix the ecology, as it turns out, most of those issues are either preventable or reversible.

And we used to think, you know, and this is where the Human Genome Project came in. I was still at university in the early 2000s when the Human Genome Project was the hottest thing going on in research. And that was the whole concept of, you know, mapping the entire human genome, because the idea was every disease that



we knew about at that time had a gene that was associated with the disease, right? So if you had heart disease, there was one or two genes that were responsible and messed up that gave you heart disease. If you had an autoimmune disease, or if you had allergies or whatever the condition was, if you had depression, there was a gene associated with it that got messed up.

The problem with that view is when your genes are messed up, when you have a mutation in your gene that leads to a disease, there's nothing really you can do about it because you can't fix your genes. But as it turns out, fortunately, we were completely wrong about that. There are very few genes that code for diseases, but the microbiome and the disruption of the microbiome, the ecology in the body is what drives diseases. So imagine Parkinson's and autism had a very similar start in the body. Alzheimer's and heart disease have the same disease pathology. It starts the same way, it manifests differently in different people based on other lifestyle issues and other things that are going on in their body. But those very different conditions all start the same way.

Rheumatoid arthritis or your knees getting arthritic and painful has the same starting disease pathology as gum disease, gingivitis. And seven years ago, we would go, "What in the world is your knee and your gum have to have in common? Like how can that be connected?" What they are, both of those conditions start in the gut. And so what's really awesome about this is when we understand what the ecological problem is that is driving these conditions, we can also figure out how to fix that ecology and those conditions will go away. So conditions that we thought were incurable, were lifelong things that people had to deal with like Parkinson's, you know, you'll see in the next few years, there's gonna be a probiotic solution to Parkinson's. You know, and same thing, there's gonna be a probiotic or some sort of probiotic like therapy for Alzheimer's that's gonna be way more effective than any drug or any other thing that they've come up with. Because now we know what the ecology is that's driving that condition.

And so that's the biggest promise, and that's the biggest hope out of all of this, you know, as people are sitting there and they're listening to this and they're suffering from some sort of chronic illness or they're working with their kids that are suffering from some sort of chronic illness, one of the biggest things that people end up losing and suffering with is the loss of hope in it, right, because they try so many things. They go to all the medical establishments. They see all the specialists and the doctors and a lot of times, they come back without any answers and without any hope.

The best part about all of this is we're getting more hope into this area of chronic illness because we're understanding now that we can probably fix most of it if we do the right things, right? And one of the fundamental things in all of that is bacterial diversity. We know that diversity in the microbiome plays a significant role in our risk for most chronic illnesses, including longevity. So I was just meeting with a researcher at University of Arkansas earlier this week. And he had just published a couple of studies showing that people that tend to live, you know, much longer who lived in the 90s even to the early 100s and live a healthy life, meaning they're not bedridden, covered in...you know, consuming 13 different types of medications just to maintain life, those people tend to have very high diversity in the microbiome and maintain that diversity throughout their lives.

And we see that with cardiovascular disease, with diabetes, with allergies, with immune dysfunctions, all of these things, the diversity and complexity of your microbiome is paramount to help. And so our goal at Microbiome Labs is to figure out how to increase your diversity. We're publishing a paper this year. We just completed a trial. I just went through the final manuscript. And that study shows that when you add spores into your gut, it dramatically increases the diversity of your microbiome. So it's one major step towards figuring out how to fix the ecological problems that are driving most chronic illnesses.

Katie: It's so, so interesting. And I know like from the nutrition side as well, we could all probably do better consuming a wider variety of foods that then support different aspects of gut health, and especially things like vegetables or like micro-nutrient rich foods. We kind of are a little bit lacking in that, especially in the U.S. But I think you're so right on the hope side. Because when we're reading the research, we're seeing the headlines more often of how, like you mentioned, antibiotics can destroy gut bacteria for up to two years.

Or we're seeing that this vast number of children will be affected by autism in the next couple of decades. Or the rise of autoimmune disease. It's so wonderful to have this hope that we're gonna actually see a way to start reversing these trends, hopefully, in the near future. And I know something else that I've come across in researching your work and the strains that you guys have researched, is that there's also basically an antioxidant effect. Am I understanding that correct?

Kiran: Yeah, that is fascinating to me. And that was one of the things that really drew me to these types of species. One of them is called *Bacillus indicus* HU36. This particular species of bacteria can actually get into the gut and colonize or meaning it lives there. And when it colonizes, what it does is it takes in incoming carbohydrates and proteins from your diet and converts it to really important carotenoids or antioxidants. So things like alpha carotene, beta carotene, lutein, lycopene, astaxanthin, zeaxanthin. All of these really, really important antioxidants for health are being created for us by these bacteria. And they're doing it right at the side of absorption.

So the bio-availability of these carotenoids are way higher than even carotenoids you can get from foods and certainly much higher than you can get from supplements. And that's what's so fascinating is because, you know, we feed those vector by good complex diet. And what you mentioned about the complexity of diet is paramount. To me, one of the biggest driving forces behind the reduction in the diversity of our microbiomes is the severe reduction in the diversity of our food intake. You know, our ancestors, if you look at anthropological studies, our ancestors consumed up to 600 different types of foods every year. You know, they were foragers, and gatherers, and hunters. Our modern American today, a standard American is consuming maybe 15 different types of foods.

So that loss in diversity in our consumption of macronutrients is driving a lot of the loss in diversity in the gut. And that kills off these types of beneficial bacteria like this *Bacillus indicus* because they need certain types of carbohydrates in different plants and all that to convert it into these really important antioxidants. And

oxidative stress in the gut is one of the biggest drivers of inflammation and dysfunction in the gut. And we think that this strain played such a critical role in the results that we saw on the leaky gut study that we think it's absolutely paramount to see that kind of leaky gut benefit.

Katie: Wow, that's really staggering. And I know another area of research with the microbiome that is particularly relevant to a lot of the people listening is that of the microbiome transfer during the birthing process and during the early years of life. A lot of moms are listening and people who are in that phase of life. And I know that's something I came across a couple of years ago, was the idea behind the micro-birth of that that's baby's at least paramount first exposure to different bacteria, like you mentioned a little bit earlier. And I'm curious if you in your research can speak to that at all, any ways that moms can, especially during that phase of life, make sure that they're optimizing their gut bacteria for an effective and healthy transfer to baby.

Kiran: Yeah, and that's so paramount because the baby is gonna get most of their bacteria, and therefore, most of their health wellness, or disease risk from mom passing on the set of microbes, right? So as we know, our set of microbes makes us more susceptible to certain things or protects us from certain things. So there is a confirm microbiome for those that struggle with weight. There is a confirm microbiome for those that struggle with immune dysfunction like allergies and asthma and all that. So it becomes paramount for mom to understand that she needs to enhance her microbiome prior to birth in order to pass on the healthiest, most diverse type of microbiome. One of the things she can think about doing with regards to that is, of course, increasing the diversity of her diet during the pregnancy phase.

And I know that can be really hard especially in the early parts of the pregnancy phase because there's a lot of food diversions and smell aversions and all kinds of things that go on with the hormonal changes, and respecting all of those difficulties. When it becomes easier to eat a bigger variety of food, it becomes really important for mom to do that. It also becomes really important for mom to limit her exposure to glyphosate. So that roundup glyphosate acts as a very potent antibiotic. It kills off bacteria but it does it in the worst way, because glyphosate as it turns out or roundup specifically kills good bacteria, and allows bad bacteria to flourish, which is the worst kind of antibiotic you can think of.

All of the antibiotics just kill all the bacteria. And then as bacteria trying to grow back, the proportions of the bacteria get a little screwed up and that's how you end up with a dysbiosis. But the glyphosate or the roundup, that stuff specifically kills good bacteria and allows bad bacteria to flourish. Especially the types of bacteria associated with things like autism and immune dysfunctions like certain types of Clostridia or Klebsiella and so on. So how should mom avoid exposure to glyphosate? Well, if you can, if you know you're gonna be pregnant or you're gonna get pregnant, if you can, you should start trying to build a small garden and grow some of your own produce.

So if you can grow and control some of your own produce, you will minimize your intake of glyphosate because most of the U.S. produce is covered with that stuff and you can't wash it off. So you can soak it in as much apple cider or vinegar you want, you're not gonna wash off the glyphosate because glyphosate has gone

into the cellular structure of the foods and remains there until you consume it. So that's another thing. So one is trying to increase some of the diversity in the diet.

And then if you're buying foods out there, choose organic. That becomes important because that'll help reduce your exposure to the glyphosate. And then, if you can, and I know doing this during certain phases of pregnancy it'd be tough, right, maybe beforehand or at some point, you know, trying to do some of your own gardening, consuming some of your own food that you produce will be paramount to passing on the right microbes, taking the right probiotic, like the spore-based probiotics which can increase diversity, prevent any leaky gut that you might have, reduce inflammation, help increase the growth of some of the good beneficial bacteria that can be really important for mom to pass on the right types of bacteria to the child. And then also just kind of cleaning up your environment.

And when I say cleaning up, I don't mean sterilizing and disinfecting. I actually mean being really conscious of the types of personal care products that you're using. You know, if you go and look at your bath gels and your shampoos and your lotions, you know, if they have a whole bunch of chemical ingredients in them and you wouldn't feel safe eating it, then you shouldn't feel safe putting it on your system. Because that stuff does get inside you and it will kill off bacteria when it does get inside you. So, you know, there are lots of companies now making cleaner, better, more natural personal care products.

It's so important what kind of impact those kind of personal care products can have on your system. And then the last part is you don't really have to sterilize your home. You know, I clean my home for the most part with water. So you just put water in a spray bottle. I might put a few drops of essential oil in it just to give it some smell. And then, you know, you spray it on surfaces and wipe it down. Of course, the inside of your toilet, if you want to clean that with an antimicrobial, that's fine. But your countertops and all that stuff does not need to be sterilized.

There are exceptions to that. If you bring home a raw chicken and you're cutting a raw chicken on your countertop, and you've gotten some of their raw chicken juice or raw beef juice on your countertop, you do wanna sterilize that because that's not good bacteria that you want exposure to. But for the most part, you don't need to be sterilizing and disinfecting your homes. Studies show that households that use chlorine based cleaners tend to have kids with higher incidence rate of viral infections and asthma and allergies. So we know that that lack of exposure to bacteria can have that negative impact. So those are the top, I think, five tips I would have for mom, increasing the diversity of your diet. So going out and finding more interesting fruits and vegetables to add into your system, eating some seeds and nuts and fruits and so on.

Keeping organic and going organic only as much as you can, growing some of your own foods to a certain degree, cleaning up your personal care products. And then the last thing is not having to sterilize your home all the time, and certain conditions, you want to clean up and sterilize that particular area. But you really don't have to sterilize at home. And if I could throw in one more, number six would be getting a dog. Studies show that households that have inside/outside pets actually tend to have better microbial environments and less incidence rate of flus and viral infections and so on. Because the dogs are so wonderful. They go out there,

they pick up all this bacteria from the dirt and they bring it into our system and into our homes. And that gives us a better microbial environment in the homes. So that's six. Hopefully that made sense.

Katie: Absolutely. And I definitely echo all of those points. And that's something I've written quite a bit about is switching out the personal care products and the cleaning products. And I think most people who are listeners now understand that often, the air inside of people's homes is more contaminated than the outdoor air. And kids are in more danger actually a lot of time in our own homes than outside.

So I love that you brought all those up and related them back to gut health. I also cannot believe we've been talking for over an hour and I haven't even actually mentioned the product that you helped create, which was what I was so excited to talk about. Because it's the one I've been taking for a couple of months. For anyone listening, the link will of course be in the show notes. But you can also go to [thriveprobiotic.com/wellnessmama](https://thriveprobiotic.com/wellnessmama) and there is a discount code `WellnessMama15`, which will save you 15%. But I want to make sure we talk about this one specifically. Because this is the product that you did the studies on and from what I understand, there's nine more studies that are kind of in the pipeline, I believe. Is that correct?

Kiran: Yeah, yeah. Actually, we finished four of the studies and I think we have six more now ongoing. So a total of 10 altogether that are in some phase or the other. And it's super exciting because we're doing such very things like...you know, some of the studies we just completed were on elevated triglycerides. So people with very high triglycerides or moderately high triglycerides. We did a study on pre-diabetics to look at if we can help restore some of the glucose function of the body and the sensitivity. We did a study on autoimmune syndrome. So people who tend to react in to the environment in a more autoimmune like fashion.

We did a study of Rheumatoid Arthritis. And then we also are undergoing...there is a study undergoing on gingivitis gum disease. There is a dermatology study going on in the Cleveland Clinic where we're looking at changes in the skin microbiome, the lipidome in the skin, that's the fat content in the skin and the sebum content. And that's from ingesting the probiotic. We're doing some really cool stuff on glyphosate and we're looking to see if the probiotic can fix all the damage that the glyphosate and roundup is doing to the gut microbiome. So we've got, yes, a tremendous amount of work going on. I would say within the next eight to ten months...become the most well studied probiotic on the market and in a significant way.

Katie: That's amazing. And I know questions I'm going to get from the audience. I'm gonna ask them to you now to get them out of the way. Because we have a lot of people coming from autoimmune disease or food sensitivity or the autism spectrum. Are there any issues with, for instance, dairy or histamine or any common allergens that anyone needs to be aware of before they take this?

Kiran: Yeah, and in fact, that's really important to note, and there isn't. And in fact, if you do have dairy intolerances or histamine intolerance, all those issues, eventually, these probiotics can actually help fix those. Because we shouldn't be sensitive to dairy and we shouldn't have histamine intolerance. All of those things

are measured dysfunctions in the body. And, again, most of them are related to a dysfunctional gut. And what you'll find is that once you fix your gut and you increase the diversity in the gut and you restore the conditions in the gut, you have resilience.

You know, and that's really how human beings evolved. We moved up to the top of the food chain and the evolutionary ladder because we are these amazing omnivores that can eat all kinds of stuff and have significant resilience to things in nature. And so all of this sensitivities that people nowadays have is a measure of dysfunction in their system. And the spores will actually support, you know, your body releasing some of those sensitivities and becoming more resilient.

Katie: Got it. And I know we talked in the beginning about how with other strains, more is not better. And, you know, wanted to just throw 200 billion CFUs. But is there like a dose dependent studied guideline that you guys have found with the spore based ones or is more okay? Do you have any guidelines on dosing?

Kiran: Absolutely. So more can be okay in certain situations. So, you know, the product is simple. We made it as simple as possible. It's just one capsule a day, right? And that delivers three billion CFUs. Which is a relatively small number when you think about all the other probiotics out there. But that's the effective dose. That's a dose that's gonna give you all of the benefits that we've talked about. Now acutely, and I do this for example because I travel a lot and, you know, I'm exposed to all kinds of stuff all over the world. You know, I go through varying sleep cycles because I travel through lots of different time zones internationally, and so on.

So when I'm putting my body through a lot of stress or I feel like I ate something that was unfavorable, I'm getting the sniffles a little bit, I will bump it up to two or even three capsules taken at once to help kind of kick off some deeper protection for that period of time. But usually, that's just for, you know, maybe five or six days. And then go back to the normal maintenance dose. So you can do that. You can up the dose. If you're going through certain things acutely. You're going through the flu or you picked up an infection or you're travelling, whatever it may be, or you're going through a particularly difficult time in your life.

Again, up regulation of stress is the same as getting an illness, right? So stress causes all kinds of weakness and inflammation in the body the same way an infection can. And so if you're going through an extra stressful time in your life, you can up regulate your dose to help protect against some of the damage that the stress is doing. So it's perfectly fine. There is no kind of maximum dose. But I would say, if you're bumping it up, bump it up to two or three caps at the same time. That should be about as high as you'd ever need to go.

Katie: Got it. And, like I said, I cannot believe we've flown through an hour and a little bit more even. And I think we'll have to have you back one day because I wanted to really also get to delve deep on the gut and autism connection. And also, we didn't even touch on vitamins, and calcium, and vitamin D. There's so much I could talk to you about. But I also want to respect your time and everyone listening's time. So I will start to wrap it up there. But I want to thank you so much for your time and your expertise in all the research that you're doing. I think you guys truly are on the cutting edge of some really important research that hopefully,

like we mentioned, is going to really change the course of some of these statistics we're seeing with disease that I'm really appreciative of the work that you do.

Kiran: Yeah, thank you so much for that. And thank you so much for giving us the opportunity to talk and the work that you do. I mean, everything we do would be meaningless unless there were people like you to get it out there to the masses. So we're always very appreciative of opportunities to get on a platform like yours and talk about what's going on. So we're very grateful for that. Thank you very much. And I would be delighted to come back and talk about all those other topics as well, which are all equally important.

Katie: Absolutely. Well, I have to get this on the schedule. And, again, anyone listening, make sure you check out the show notes at [wellnessmama.fm](http://wellnessmama.fm). The link to this product will be there along with the discount code, but also links to more information about all the topics we talked about and all of these studies that are in the works. And, Dr. Kiran, thank you so much for being here. This was absolutely fascinating and riveting and I appreciate your time. And thanks to all of you for listening. I appreciate you sharing your most valuable resource, your time, with both of us today. And I hope that you'll join me again next time on the "Wellness Mama" podcast.

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