



# Essential Alchemy

The Ancient Art of Healing Naturally

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## Season 1, Episode 8: Microbiome and Your Parasympathetic State with Kiran Krishnan

**Jodi:** Hi, I'm Jodi Cohen, and I'm super excited to welcome Kiran Krishnan. He is a research microbiologist with extensive experience in probiotics and microbiome-related clinical research, including formulating what, I think, is the best probiotic on the market, the MegaSporeBiotic from Microbiome. So thank you and welcome.

**Kiran:** Thank you so much for having me, Jodi. It's great to be with you. And I love this topic. It is so relevant and so important, whether we're in a crisis or not, because this whole parasympathetic/sympathetic balance is a critical aspect for human existence.

**Jodi:** Yeah, and I don't think they realize—they get that there is a gut-brain connection—but they don't realize that it's bi-directional. And I was hoping that you could speak to that a little bit and really talk about the role of the microbiome in activating the vagus nerve and parasympathetic state.

**Kiran:** Yeah. So what's really interesting about it, when you break it down, is you've got the autonomic nervous system, which really houses the parasympathetic and sympathetic aspects of the nervous system. And the biggest nerve involved in all of that is the vagus nerve. It's the longest nerve in the body. And it directly connects the gut to the brain. And in the middle, it connects to the heart, and the lungs, and all kinds of other areas, too, because it has to trigger all of these physiological responses based on what's happening in the environment around you.

And what's interesting about the vagus nerve is it connects directly to the enteric nervous system, which is the nervous system that covers the entire lining of the gut. And the enteric nervous system has the second most nerve endings in the body, next to the brain. It has even more nerve endings than the spinal cord. So it's a very, very, elaborate neurological system that provides direct access to the brain, itself, through the vagus nerve. And the microbes in your gut have full access to it. So they have autonomous access to it, meaning outside of our own control in many ways.

So there's a few things we can talk about, but ultimately, I think, why we are designed that way is because of the same reason we have 70%, 80% of our immune tissue in our gut is our gut is the largest sampling site for what exists in our environment. Everything in the body--

**Jodi:** I love that.

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**Kiran:** Yeah, that's how your body and your immune system figures out what you're being exposed to on a regular basis. Our skin, which is the largest outward organ acts as a barrier really. It's not a very good sensing tool because remember the layers on top of the skin, they're dead layers. They're dead cells that come all the way out to act as like a buffer, a barrier, a protector. But they're not sensing a whole lot of things.

What is sensing things that's around you is your digestive tract. And think about where everything enters into your bodies. The most part, it's through your mouth, your nose, your eyes, potentially your ears, but somewhere in your mouth, nose, and eyes area. This is very relevant now with pandemics going on, we keep talking about don't touch your face because that's the main way the virus enters your system. And all of these areas drain into your gut.

So even your ears, the eustachian tubes in your ears drain into the back of your throat to go into your gut. Your sinuses and your upper respiratory tract drain into your gut. Your lungs have something called the mucociliary elevator. So they've got these cilia in your airwaves that move mucus up from the lungs to drain into your digestive tract.

Everything gets exposed into your digestive tract. That's where most of your immune system is. That's where your microbes are. So your body has designed itself to be able to sense the world around it, in large part, through the digestive tract. And then the microbes that exist in the digestive tract are the orchestrators and controllers of how your body responds to those things that are coming, whether it's an immunological response or a neurological response.

So they have direct access to your brain. They have direct access to your heart. They have direct access to your lungs, to your skeletal muscle system through this vagus nerve where they can send signals, good and bad signals to trigger physiological response.

**Jodi:** It's amazing, I've heard you speak before, but I've never heard you say it in a way that was so incredibly clear. Thank you, that was a brilliant explanation.

**Kiran:** You're welcome. And that's where this whole gut-feeling aspect comes from. Everybody knows this. Everybody's experienced this. We've talked about this for centuries where people say, "I get a gut feeling about something or my gut's telling me that's not the right move." That's the instinctual part about it. And then there's a physiological change, too. When you're really nervous and anxious, you get loose bowels. We know that. And we know that digestive function completely gets attenuated in some way when our mood is different. So we are either A, because we're feeling depressed and anxious, we either eat too much to mitigate the feeling, or we have no appetite at all. It's right of those two extremes.

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**Jodi:** Right. Well, I think, that has to do with the whole safety. When you're feeling like you're in danger, digestion is downregulated as a priority.

**Kiran:** Yep, exactly, yeah. So the connection between the gut, and the microbiome, and your sympathetic/parasympathetic nervous system is so intimate we can't overemphasize it.

**Jodi:** Can we dig deeper into the role of the microbiome and especially diversity of microbiome in signaling the vagus nerve?

**Kiran:** Yeah. So there's lots of ways that the microbiome, itself, sends signals up in the vagus nerves and balance that, what we call, sympathovagal tone or the parasympathetic tone or sympathetic tone. So that balance. And we need the balance. We need both the parasympathetic and the sympathetic to function. The problem is we tend to be in a very high sympathetic state in the Western world. We're always activated in that sense. And we're not getting the rest and digest part of the nervous system activated enough.

The microbiome is interesting in that there are products of the microbiome that we can only get from the microbiome that have a real significant effect on the balancing between those two systems. One of them is short-chain fatty acids. So butyrate, propionate, acetate, these fatty acids that are made as a result of fiber and resistant starch digestion in the colon. These short-chain fatty acids have a profound role on balancing metabolism and balancing sympathetic and parasympathetic activities.

In fact, when you start digesting, the process of digesting, is supposed to elicit the production of these, what we call, postbiotics. They're called postbiotics because any time the microbes in your gut digest food and create a new active ingredient, that new active ingredient's called a postbiotic. So we'll refer to them as postbiotics for clarity sake.

So say you eat something. Just from eating something, your parasympathetic is supposed to be activated because at this point, you're supposed to go, "Hey, I don't need to elevate my heart rate. I don't need to elevate my breathing rate. I don't need my skeletal muscles to be activated. I need to rest and digest." That's the whole process of it.

One of the ways your microbiome triggers that is when the food enters into the digestive tract, they metabolize portions of the food, they produce these shortchain fatty acids. The short-chain fatty acids are released from the gut into the circulation. And then they go and trigger parts of the brain that create a parasympathetic state. They help you actually turn on that resting state. And that's all from signals from the microbiome.

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**Kiran:** And then another one is serotonin. Serotonin is a very important part of the parasympathetic state. The production of serotonin, 90% of serotonin's produced in the gut. That's just another example. There are cells called the enterochromaffin cells within the gut that are stimulated by the presence of certain amino acids and food like the presence of tryptophan. And then they get stimulated. And then they start producing 5-HTP, which then gets converted into serotonin, and then released into the system.

Serotonin also helps the bowels move. So it has dual effects where it tells the body, "Hey, we need to go into a parasympathetic state. We need to relax, chill out. And I need to get the bowels moving so we can have effective digestion." So all of those systems are intimately connected. Lots of them are triggered by signals from the microbiome from digesting things. And that's the key.

Now, why does diversity play a role with that? So the important thing to note is that when we have increased diversity in the microbiome, we have more players that can do these types of functions for us. They can create more of these postbiotics. What we see, across the board, in studies is as diversity shrinks, you get lower production of postbiotics. Important ones like short-chain fatty acids, like serotonin, at nighttime, things like brain-derived neurotrophic factor, GABA, these are all really important microbiome-derived components that we need to activate our parasympathetic. Those don't get produced at high enough levels when our diversity is low.

When our diversity is high, we've got more players. They are in the microbiome factory. And they're making all the stuff we need. So diversity is paramount to all of this.

And then, ultimately, what happens is when you don't have diversity and you don't have good ecological forces that maintains a nice balanced ecosystem, you start to get overgrowth of problematic bacteria because there are lots of bacteria in your gut that can also make postbiotics that activate the sympathetic part of your nervous system.

For example, campylobacter, campylobacter makes a toxin that creates all of sudden really profound panic attacks in people. Campylobacter is a contaminate in poultry. It's the second most common contaminate in poultry next to salmonella. And campylobacter infection in people will result in some degree of diarrhea and gut issues, but it will also result in a sudden onset of anxiety and panic disorders. So there are microbes that produce toxins that do the opposite effect. Those need to be kept in check by increasing diversity.

**Jodi:** This might be an oversimplification. But what it sounds like you're saying is that the good bugs breed the parasympathetic response and the bad bugs breed sympathetic.

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**Kiran:** Yeah. And I feel hesitant to name them good and bad because the bad ones still have important functions. We do have to have some sort of sympathetic tone.

**Jodi:** The imbalance.

**Kiran:** It's the imbalance, that's the key. This is an ecosystem. And with any ecosystem, we want to have balance. We also see the opposite effect. If you have too many of the good bugs, and this almost never occurs physiologically in humans, but you can view this in mice, where you completely eliminate all those other bad bugs and you only have the good bugs, then they completely lose any sort of fear response. So they do this in mice where they can just put in certain groups of good bugs. And then they release the mice. And the mice have no fear response. And they just walk right into traps and things that they know will kill them.

**Jodi:** I have a child like that. No fear response, it was scary.

**Kiran:** That may be the explanation for like crazy dare devil people who are trying to stoke that response. And again, that in a practical sense, that always never happens in humans because we typically have a good amount of the toxin-producing bacteria. But the big message here is, it's about balance. And the only way to strike balance, that we know of so far, is to do things that increase diversity in the microbiome. And, also, we have behaviors that throw off that balance.

So like you said in the beginning, this is a bi-directional system. There are things we can do consciously that actually has an effect on that microbiome population, as well.

**Jodi:** I love that you can signal the gut from the brain and the brain from the gut. And I want to make sure we land on leaky gut and how that compromises that communication.

**Kiran:** Yeah. So that's one of the biggest things. First thing, we found in the research is that our way of dealing with stress—let's say that you are a stressful person. Clearly, that is a sympathetic activation. But if you continue to allow yourself to be always stressed and activated, that signal from your brain releases things like cortisol, epinephrine, norepinephrine.

What those three compounds do is they actually increase the growth of more virulent bacteria in your microbiome. So there are microbes. These are what we call opportunistic pathogens. They're called opportunistic because they have pathogen qualities meaning they can make you sick. But they're weak enough pathogens that they wait to do that until your system is compromised. So they have evolved to wait for these stress signals to start producing the toxins because they know--

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**Kiran:** Right, isn't that amazing when you think about these microbes. And these are viruses, too. Like cytomegalovirus virus, Epstein-Barr virus, these are viruses that exist in us forever—we can't get rid of them—herpes virus like cold sores. We know that people who have herpes, oral herpes, when they're stressed, a cold sore pop up, right?

**Jodi:** Right.

**Kiran:** And we've seen that all day. Everybody knows that. And we've known that. Even in high school, you could tell. In the winter months when people's getting less vitamin D, and their immune's system's compromised, they're more stressed from the cold and so on, a cold sore pop up.

**Jodi:** That explains that whole like, "the straw that breaks the camel's back," of like how stress becomes the trigger. Or suddenly, they get a tick bite, and they have Lyme, and all these things pop up, it's that there were these opportunistic bacteria that weren't activated until all of a sudden you were an easy target.

**Kiran:** Yeah, your system is compromised. And they have learned to sense that. Most of them sense it through the production and circulation of stress hormones. So Epstein-Barr virus, streptococcus, prevotella, all of these types of opportunistic bacteria and viruses, they sit around, and they keep their numbers fairly low so the immune system doesn't detect them and cause problems for them.

And then the moment they detect cortisol, epinephrine, norepinephrine is high, then they go, "Hey, guys, this is our time. This system is weak. Let's do what we do." And then they multiply quickly. And they release all the toxins. So our own behavior, our inability to deal with stress, and not working on simple mindfulness work will give them the opportunity to be pathogenic.

Now, when they start to become pathogenic, it is a feedback loop because one of the ways that they service themselves is by increasing toxins that create more stress hormones because--

**Jodi:** Oh, it becomes a vicious cycle.

**Kiran:** It's a cycle, yeah. Our stress allows them to proliferate and grow. And then the result of them proliferating and growing is they create more stress hormone release. So we go on this downward spiral. And that's good for the microbes in the system, but it's not good for us as the host.

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**Kiran:** And then the other thing that stress causes is the leaky gut. That's one of the biggest drivers of leaky gut. In fact, a 2015 publication in *Frontiers in Immunology*, they went through and reviewed all the papers around this. And they, actually, concluded that stress-associated leaky gut was the number one cause of morbidity and mortality worldwide.

**Jodi:** Wow!

**Kiran:** The biggest killer of humans is stress-related leaky gut because...So what tends to happen, when you're stressed, you release all those hormones. The hormones then create dysbiosis in the gut. So it increases the presence of certain pathogens, which then, of course, cause you to release more hormones and starts causing inflammation in the lining of the gut.

When inflammation in the lining of the gut is realized, the tight junctions in the lining of the gut open up. Now, your gut is permeable and you get constant leaking in of a profound toxin called lipopolysaccharides. This is a bacterial-derived toxin that exists in the gut. But once it's in the lumen, which is in the intestine, the tube in the intestine is fine, if it's allowed to leak through, and into the circulation, it becomes a profoundly, significant issue. And it's very common. It then becomes the foundation for the vast majority of chronic illnesses that we have.

**Jodi:** Interesting.

**Kiran:** So it's stress-induced dysbiosis, stress-induced leaky gut, then becomes the foundation for clinical depression, for age-related disorders like Alzheimer's and Parkinson's, heart disease, diabetes, hypertension, cancers, all of these things. And there's tons of studies on this. So that mindfulness work becomes so important to stop that feedback loop. And then doing things therapeutically to modulate the gut microbiome and stop the leakiness in the gut becomes a really important therapeutic target, as well.

**Jodi:** Can we talk about that? About what you recommend, how you recommend activating the vagus nerve, stimulating the vagus nerve, calming the thoughts? And then, also, it's almost like a one-two punch, you're hitting it at the gut and at the brain.

**Kiran:** You have to do both, yes.

**Jodi:** Yeah.

**Kiran:** You can't do one with the other because it's a feedback loop. It's a continuous circle, right?

**Jodi:** Right.

**Kiran:** So if you're healing the gut and tightening up the tight junctions, but you're allowing yourself, from a stress perspective, to continue your stress, that will keep dislodging the healing that you're doing. If you're only doing the mental thing and your gut is still leaky, you're going to continuously feed the disruption and the stress hormone. So you have to do both.

The simplest way, and I'm sure you'll have lots of brilliant people on your summit that do a better job of talking about the mindfulness side of the work, but some of the things that I do, personally, that I find to be extremely effective, for me, is just simple breathing work. When you do really deep diaphragmatic breathing, it actually counteracts the release of stress-based hormones, deep diaphragmatic breathing and increasing the time between inhale and exhale. So that's where it comes from.

**Jodi:** Yes, because that activates the vagus nerve.

**Kiran:** It does. That's the biggest activator of the vagus nerve. The really rapid breathing, which is associated with panic, that is the deactivation of the parasympathetic and the activation of the sympathetic. It releases all the steroids, and the cortisol, and all that stuff to, yeah, increase basal constriction, and increase heart rate, and so on. So what you want to do is do deep diaphragmatic breathing rather than shallow breathing and you want to increase the time between inhale and exhale. Just that simple.

**Jodi:** You just said something really interesting that when you're doing the shallow breathing, it dilates. And that's another interesting thing. So what you're saying is that breathing correlates with blood flow.

**Kiran:** Absolutely, yes.

**Jodi:** calm. And blood flow's also important with the vagus nerve and the signaling.

**Kiran:** Absolutely. So one of the reasons why you'll get basal constriction when you're breathing shallow is that your heart rate goes up because your heart is trying to keep up with oxygen demand because in your body's concept, when you're breathing like that, it's a fight-or-flight response. There's something that's going to kill you,--

**Jodi:** Yes.



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**Kiran:** then you're designed to be able to run away from it. So your body's trying to constrict blood flow to skeletal muscles.

**Jodi:** Right, it's rationing it's resources.

**Kiran:** Exactly, yeah. And so it's losing compliance in the vessels trying to keep blood pressure high so that the blood is forced deeper into skeletal muscles, which is a hard place to get the blood flow to go to. That's why when you're exercising, it takes a little while to warm up. They say you can injure a muscle if you don't warm up adequately because the capillaries that service all of these skeletal muscles are really fine.

Some of them are so small only one red blood cell can go through it one at a time. So to activate all of them, you really need to take some time to warm up. The way the body activates that quicker is by increasing blood pressure, the pressure of the fluid. And the way that it increases the pressure is to constrict the vessels. So that the tighter the vessels are, the more of the pressure is going through the vessels.

**Jodi:** I love that.

**Kiran:** So that's a normal response, right?

**Jodi:** Right, right.

**Kiran:** But it's the response we need to run away from a Saber-tooth tiger. It's not the response we need when we wake up in the morning. That's not a good thing.

**Jodi:** Or to heal our gut, we need our blood flow going to our digestive organs.

**Kiran:** Absolutely. And, in fact, lots of now primary digestive conditions can be related to attenuated blood flow into the gut, itself. The cells in the gut and the smooth muscle cells that constrict that do the contractile force for the digestion, all of that gets restricted because blood is going elsewhere in the body, primarily to the muscles and the heart to try to get you to run away.

Now, when you wake up in the morning, if you are in that state, that flight-orfight state, then your nervous system and your digestive system's going to suffer for the rest of the day.

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**Kiran:** One of the things I try to do is when you wake up in the morning, the first thing you should do before you ever pick up these things and start looking at articles and so on, which is a tendency that we all have—like, “What did I miss in the morning?” And I’m looking at it, especially now, when we are hypervigilant with pandemics, and all that stuff—the first thing you should do is just do like three minutes of some deep breathing just to get yourself back into the more parasympathetic state. Bring down the flight-or-flight response. And then if you can, before you ever look at your phone, wake up, go to the bathroom, and just splash your face with cold water.

**Jodi:** To activate your vagus nerve, right?

**Kiran:** Activate the vagus nerve. So between the breathing and splashing of your face, those two are two things that are absolutely great and powerful for activating the vagus nerve. It starts activating your digestive system. It starts releasing more of the calming hormones like the brain-derived neurotrophic factor, and the serotonin, and all these good things so you’ll start off your day in a more relaxed state. And that’s really important for your gut and your microbiome.

So that’s one of the simple ways you can...Just two things that you can do to reduce your sympathetic tone from a lifestyle, perspective.

**Jodi:** Right, bring it down.

**Kiran:** Bring it down. And the other thing is exercise. There’s a good number of studies that show that actually the stress associated with exercise, the need for your body to increase heart rate and keep up with blood flow to the muscles, actually when you stop exercising will have the absolute countereffect going to completely reducing sympathetic tone and upregulating parasympathetic.

So think about it this way. Back in the day when we actually had real flight-or-flight reasons--

**Jodi:** [crosstalk 24:12].

**Kiran:** Right, our flight-or-flight response was developed to keep us alive from things that would literally kill us like predators. And we don’t have that so much anymore. Now, we are having flight-or-flight response to things that are not even going to damage us in any way. It’s what did this person say, or what did that person say, or a comment on Facebook?

**Jodi:** Yeah, it’s anticipatory and emotional.

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**Kiran:** It's totally emotional and anticipatory. And so think about the evolutionary connection. It's like you were walking down this path. And then all of a sudden, you saw a predator. Your instincts kicked in. Your sympathetic system kicked up. And then you start running to save yourself. Save your life. So your heart rate goes up. Your body is flooding a bunch of oxygen and nutrients to your skeletal muscles to get you out of that danger.

The moment you are clear of the danger, because that's an unhealthy state to be in, your body automatically triggers to parasympathetic in a much more profound way to bring you back down--

**Jodi:** Where we get stuck. And I love that you really addressed the brain down. Can we talk about the gut up? Like Terry Wahls says to eat 200 different vegetables a year, which is challenging for some people. They need an assist. You have an amazing tool. Can you speak to how you can support the diversity in your health and the health of your gut microbiome?

**Kiran:** Yeah. So when we started working on probiotics and the microbiome, in general, we had two goals, two big goals in mind. One was to find a way to increase diversity that was more practical. You should always try to continue to get it through food. I'm a big advocate of that. You always try to add in more foods into your diet. That's always a good thing. But like you said, that's a hard thing for lots of people.

But we wanted to see, "Okay, is there a way we can utilize a probiotic and/or prebiotic to increase diversity? Number two, can we stop leaky gut?" Because leaky gut is such a driver, not only of dysbiosis in your microbiome, inflammation in your body, but then it is counterproductive to all of the sympathetic/parasympathetic activation you're working on doing because it increases adrenaline, it increases cortisol, it increases epinephrine and norepinephrine.

So what we found is that the spore-based probiotics that we work with...And these are interesting because we started looking at the environment for clues as to the types of bacteria that can really help because there's all of this data on gardening therapy. How gardening therapy actually increases parasympathetic activation, makes you more calm, being something associated with the soil and the dirt. There's also all these empirical studies showing that populations that exist closer to nature actually have better mood and better mental cognitive response versus people that live in cities and are more clustered.

So we started looking at the environment and saying, "Are there bacteria in the environment that can trigger the influx of diversity and can also seal up the gut lining?" And then we found these spore-based probiotics that are commonly ubiquitous in the outside environment, but also act as commensal bacteria in the gut.

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**Kiran:** And so what we've started seeing is that when you take them, they enter into the gut and they read the microbial environment using something called quorum sensing. And just from that, alone, they can start modulating the rest of the microbes. They will sit next to--

**Jodi:** Wow, they're leaders!

**Kiran:** They are. They are like...I started calling them early on, "the Seal Team 6 of the gut or the Orchestrators of the Gut," because they will go in and they will hone in on overgrown problematic bacteria. They will sit next to them. And they will produce antimicrobials in that little micro environment to bring down those bacteria. At the same time, they produce postbiotics that feed lots of groups of good bacteria. So we saw, in a three-week study, in that period, almost a 30% increase in the diversity of your microbiome just by adding in the spores, without even changing the diet.

**Jodi:** That's amazing. Like for anyone who's listening who suffers from anxiety or has a kid with anxiety, if they can just teach them to breathe, splash their face, and take this...How often do you recommend they take MegaSpore?

**Kiran:** So they do it once a day. That was plenty. And in that three-week study, it was just once a day, the equivalent of two capsules a day. And then you combine that with an increase in your diet, in the diversity of your diet. And you'll see profound changes. You're stopping one big part of the cycle of anxiety, depression, mood disorders.

And the gut is playing that really important role in perpetuating it, but you can instead change the gut so that it orchestrates calmness. And then that serenity feeling, and that feeling that you're grounded, all of that stuff comes, in large part, from the gut. And, of course, you have to work on that mentally, as well.

So one of the things that I love about programs like yours like this summit is that lots of practical things are going to come out of it for people.

**Jodi:** Yes, everyone should go buy MegaSpore. Forget the toilet paper [crosstalk 29:36] that's what you mean?

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**Kiran:** Exactly, right. And the thing is, you'll have much cleaner bowel movements where you need less toilet paper to clean yourself when you use the probiotics. So that's the important thing is that as you learn other things, in a summit like this, where you have all these practices you can do to try to improve your stress response, activate your vagus nerve, and all that, all of that stuff becomes more profound and effective if you, also, are focusing on healing your gut because if your gut is not healed, it's going to keep pushing that cycle.

**Jodi:** That's what I found, actually. I call it layering. But if you can attack the problem from more than one angle, it resolves itself much more quickly.

**Kiran:** Yes, it does. There's one of the more common and sinister categories of antibiotics, the most recent ones that cause the tendon rupture and so on...

**Jodi:** Oh, flora, it's like Cipro

**Kiran:** Yeah, like Cipro, for example, one of their very well-documented side effects of taking them is anxiety. So you take this antibiotic, because it causes such profound dysbiosis in the gut, it gives the chance for certain types of opportunistic pathogens to proliferate. And then they, in turn, produce toxins that cause anxiety.

So there's so much data on the role of the gut microbiome, leaky gut, the systemic inflammation associated with that, and mood disorders, and sympathetic/parasympathetic balance. And our gut wants us to be in a relaxed state because that's better for the microbiome, because in that relaxed state, we're going to be feeding it, and we're going to be providing it with food, and we're going to be providing resources to be able to help them digest the food. And so a diverse healthy microbiome tries to keep you in that parasympathetic state, more often, than not.

**Jodi:** Thank you so much. I am so grateful. You did such an amazing job making a very complicated topic very accessible. And I'm sure everyone's going to want to learn more from you. How can they find you?

**Kiran:** Yeah, please visit [MicrobiomeLabs.com](http://MicrobiomeLabs.com), our website. If you Google my name, either YouTube or Google, itself, you'll find loads of interviews, and articles, and talks, and presentations. I do all kinds of talks on all types of topics surrounding the microbiome. But come visit our site, too. Come to [MicrobiomeLabs.com](http://MicrobiomeLabs.com). We have a number of webinars and write ups on there, as well. And I do about 150 talks a year.

**Jodi:** Oh, my, goodness, that's like every other day. Wow!

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**Kiran:** Literally, yeah, it's amazing. I absolutely love it. There's nothing I love more than sharing knowledge. None of this stuff is helping anybody sitting in my head. So I need these kinds of opportunities to share it with people. And so I appreciate this opportunity to be able to do that.

**Jodi:** Well, and this was amazing because it gave people a really easy bidirectional strategy, too.

**Kiran:** Yep, and you have to do that. You have to attack with a two-pronged approach because one will negate the other if you only do one of them. And that's why people don't have as much success in treating mental illness, and cognitive dysfunction, and so on, because we're always going after one or the other. Typically, it's the top down. And certainly, all of the drug-related therapies are focused from the top down when it's really a systemic issue. And its coming from both ends.

**Jodi:** Well, and, also, not all probiotics are created equal. I love that you created spore-based solution because I think that's really effective.

**Kiran:** It's the only one in published clinical trials that has been shown to increase diversity in the microbiome and reduce leaky gut, which are the two things that you need from the gut to help you get over the issue of sympathovagal tone, and activate the vagus nerve, and activate the parasympathetic. Those are the two important things is that diversity and stopping that leakiness in the gut, and we're able to do both.

**Jodi:** That's amazing. Thank you.

**Kiran:** My pleasure. Thank you so much.