



**THE SPECTRUM
OF HEALTH**
—PODCAST—

Podcast Session #16

What We've Learned About The Microbiome

With Kiran Krishnan

Dr. Schaffner speaks with Kiran Krishnan about current research in the human microbiome and how we can apply it to our own lives. This podcast also delves into the next steps for microbiome research.

To learn more about Kiran, please visit www.microbiomelabs.com

00:00 Christine Schaffner: We're on a little different schedule with the podcast this week. I had my first daughter on July 9th at 12:49 PM, her name is Ann Marie Claire Schaffner, and we could not be happier. I think this interview with Kiran is really great timing, especially since he goes over how important it is to establish our microbiome, and how that gets set up from conception to age two. I was even making some decisions this week to really support my daughter's microbiome, with getting some donor milk and not choosing to formula feed when her bilirubin levels were slightly elevated, and that really worked well. I just really am grateful for all of the support, and the team that I have, and all the resources that have supported me through this journey. I'm excited to share more about what I was able to do with this amazing support. So thank you, and I hope you enjoy the interview.

01:10 CS: Welcome to the Spectrum of Health Podcast. My name is Dr. Christine Schaffner, and today I am interviewing Kiran Krishnan. I heard Kiran talk at a conference a few years ago and was immediately intrigued and impressed with his depth of knowledge about the gut microbiome and the immune system. We started using a product that he developed called MegaSpore Biotic, using bacillus spores in practice at Sophia Health Institute and were immediately surprised and grateful for the response that we were getting from patients. Kiran has been really wonderful over the years, sharing his depth of knowledge. I hope that you enjoy our conversation; it was a real treat for me to get to pick his brain and to learn more about the microbiome, and I hope you enjoy our conversation.

02:03 CS: Kiran Krishnan is a research microbiologist and has been involved in the dietary supplement and nutrition market for the past 16 years. He comes from a strict research background, having spent several years with hands-on R&D in the fields of molecular medicine and microbiology at the University of Iowa. He earned his Bachelor of Science degrees in Microbiology at the University of Iowa. His undergraduate education was followed up with post-graduate research in molecular biology and virology. He left university research to take a position as a US business development and product development lead for Amano Enzyme USA. Amano is one of the world's largest suppliers of therapeutic enzymes used in the dietary supplement and pharmaceutical industries in North America. Kiran also established a clinical research organization where he designed

and conducted over a dozen human clinical trials in human nutrition.

02:57 CS: Kiran is also co-founder and partner in New Science Trading LLC, a nutritional technology development research and marketing company in US dietary, supplement, and medical food markets. Most recently, Kiran is acting as a chief scientific officer at Physicians Exclusive LLC and Microbiome Labs. He is a frequent lecturer on the human microbiome at medical nutrition conferences, he conducts the popular monthly microbiome webinars through the Rebel Health Tribe Group Practitioner Training Program. Kiran has been invited as the expert guest on national radio and satellite radio and has been a guest speaker in several health summits as a microbiome expert. He is currently involved in three novel human clinical trials on probiotics and the human microbiome. Kiran offers his extensive knowledge and practical application of the latest science on the human microbiome as it relates to health and wellness. He is the creator of Thrive Probiotic, PeakBiotics, and MegaSpore Biotic. I hope you enjoy our conversation.

03:58 CS: Welcome Kiran, I'm so excited to interview you today.

04:00 Kiran Krishnan: Thank you so much for having me, I'm so excited to be here. I appreciate the opportunity.

04:05 CS: Thank you. I think I first heard you speak, it was maybe January 2017 at Bastyr University. Maybe I have the year wrong; life goes by so fast nowadays. But it was for the Restorative Medicine conference, and I was just blown away about your research and your knowledge about the microbiome. We immediately brought a product you developed back into the office, and we're just so excited about our patients' response. We've been on this learning curve with you on how we can really make effective changes for many of our patients who have obvious trouble with gut dysbiosis and an impaired microbiome. So that was my first introduction to you, and I know that we've enjoyed getting to know you over the years, and you've shared a lot of information with our clinic. We really appreciate all the knowledge that you brought us, and I'm so excited to share that with our audience today.

05:05 KK: Absolutely, and so am I. Everything we do has no meaning behind it unless we have a venue to be able to get the information to people, so we always appreciate being able to work with shows like yours, practices like yours, and doctors like you. So thank you so much.

05:24 CS: Absolutely. I'm sure our audience would love to hear, how did you become interested in researching the microbiome?

05:33 KK: Interestingly enough, I ended up picking microbiology. I knew I wanted to do something in science, I was always a science nerd from the very beginning. My mom is a medical doctor, I grew up in Malaysia and India, so I spent a lot of time in her clinics with her, watching her do procedures on people and so on, that always fascinated me that she had the knowledge and understanding of the body and could do the things that she did to make people feel better. That was my big driving force behind wanting to get into the science field.

06:07 KK: Then when I first started college, I was trying to figure out, "Okay, what area in science am I gonna go into?" And the first day in the dorms, there was a movie playing in the communal area, and the movie that was playing was that movie "Outbreak". I don't know if you remember that, with Freeman and Dustin Hoffman. And it was all about this virus outbreak; it was a simian virus, it came in from a monkey that someone had illegally imported. And a lot of the people that were chasing this virus around and trying to find a cure and so on were microbiologists who worked either for the CDC or some other organization. And so right away, I was like, "That's what I want to do, I want to study microbes, I want to study illness associated with microbes, find cures," and so on. I went and I applied for the Department of Microbiology in the School of Medicine and started studying microbiology at that point and clinical microbiology in particular.

07:06 KK: Then my post-graduate research was involved in HIV vaccine development, so I was part of this international project where different research institutes were developing HIV vaccines, so that was really fascinating because it allowed me to get into the nitty-gritty of how viruses and bacteria and all that infect human cells and the impact it has on

our overall system. And at the same time you start to understand that the vast majority of viruses and bacteria that we come in contact with are all good; they're either benign or good in some way. 99.9% of the microbes you'll ever come in contact with are either benign or good for you. That aspect of it was not really understood at the time. We didn't really know what a good bacteria actually did for us versus the very well-known bad bacteria.

08:08 KK: So then when the Human Microbiome Project was launched by the NIH back in 2007, and I learned about that, that got me immediately interested in understanding, "Okay, what is going on in the gut, what are these trillions of organisms, how do they control health and wellness?" And that's when, back in 2007, I started jumping into the microbiome side of the research. My goal became to identify highly functional beneficial bacteria that should be a normal part of our system, but inevitably isn't because of our lifestyle, and these microbes should be able to come in and fix the disruption that we incur from the modern day living.

08:58 CS: I'm so glad your path led you to this, because as we all know, especially on the front lines of treating people who are way too sick, we know that the microbiome is such an integral part to our immune systems, and we're up against a lot these days, so I'm so glad that you took this research on and it became your mission. I think one of the things that we can start with is how your research has led you to really utilize and develop products around this idea of using Bacillus spores. Many people are familiar with probiotics, they're familiar with Lactobacillus and Bifidus and Saccharomyces and all sorts of different probiotic strains, but you have really shared in the natural product market something very unique around the use of Bacillus. Can you just introduce kind of a 101 about Bacillus spores?

09:57 KK: So these are really, really interesting microorganisms, these are microbes that in nature you'll find them fairly ubiquitous in undisturbed environments, so we're talking about if you go to the Sahara Desert and you look in the sand you'll find these organisms, and if you go for a hike in a undisturbed woods areas that have not been developed and tainted by chemical exposure you'll find these particular strains in rivers and streams.

They've actually found them with high abundance in the North Pole, in the South Pole, in the Tibetan Plateaus, so virtually every corner of the Earth.

10:36 KK: What's interesting is that when you look at glacial ice core studies, when they pull out ice cores out of old glacial ice, they're able to study what the environment was like 3 million years, 5 million years and so on by looking at the portion of ice that represents that period of time on Earth. What they were able to do is find what kind of microorganisms existed on Earth's surface at that time by studying glacial ice cores, and they found that these particular spores existed in high abundance all throughout the course of human evolution.

11:09 KK: So our ancestors got a lot of natural exposure to them because our ancestors were smart enough to eat dirt, and live in the dirt, and they became kind of one with the environment. They didn't sterilize their food supply, they didn't sterilize their caves and huts. And when an ancestral baby is born, that baby's put in the dirt, and like any human baby you see, they have this unique tendency of sampling the environment with their mouth. So imagine an ancestral baby is put in the dirt, and he or she picks up dirt and rocks and dry dung and all that stuff, and puts it in their mouth. And a lot of that is to get these kind of organisms into their system.

11:49 KK: So understanding that, looking at the evolutionary biology aspect of it, we were looking for strains that we thought would be the types of probiotics our ancestors were exposed to. We found these *Bacillus* endospores that were strains that were in the natural environment, but on top of that had the ability to survive through the gastric system naturally without us doing any engineering to them, and then actually get into the gut and function as a living probiotic.

12:20 KK: Now, that ability to survive through the gastric system is a really important feature of a probiotic because the World Health Organization defines a probiotic primarily as a live microorganism, so it has to be alive when it gets to the site of action. Now, these strains have developed this amazing capability of putting an armor-like coating around themselves when they're outside of the body. So they know that when they leave the body,

they're not in their native environment which is where they want to be, in the gut, and so they put this armor-like coating around themselves and they can remain dormant in the outside environment for up to 200 million years in this format. And then the moment you swallow them they go through your stomach acid in that format, the moment they hit the intestines they break out of this shell and they become a live vegetative functioning cell in your digestive tract.

13:13 KK: That's something that only nature can design. You could give me the best scientists in the world and billions of dollars, we couldn't engineer bacteria to be able to do that, to be able to exist in a dormant state with a protective layer around it from tens of millions of years, and then yet you could take that 10 million-year-old bacteria, swallow it, and then it gets into your gut, comes alive, and starts going to work for you. So they're really, really unique bacteria.

13:41 KK: Now, the other thing that's unique about them within the gut itself is they act as really the microbiome police. They get in, they use something called quorum sensing, they can read the microbial environment, they can identify overgrown or bad bacteria, they'll sit next to those bad bacteria and they'll produce up to 25 different antibiotics in that space to kill off the bad bacteria. Now, at the same time, they produce a whole bunch of prebiotics and other metabolites that actually grow your other good bacteria, so they help regenerate the good bacteria that are suppressed because of the exposure to things like antibiotics and glyphosate in the Roundup, that's in the weed killer, chlorine in our waters, fluoride in our drinking waters, preservatives in our foods, all of these things that on a regular basis seem to decimate the good bacteria, this particular type of microbe gets in there and reestablishes that balance.

14:37 KK: And then from what we're seeing, the other things it does is it seals up leaky gut, it improves the mucosal structure in the intestines, which is a protective barrier, and then it also modulates the immune response to the environment, because our body tends to, especially in this modern dysbiotic world where we have a flora that's not well-balanced, our immune system tends to react overtly to the environment around us, to food that's coming in, and all of these other things that we put in and on our bodies, and that

overt reaction leads to chronic inflammation. It seems to stop that kind of chronic inflammation as well. So they are fascinating organisms that have been designed by nature to be our probiotics. We were just fortunate enough to identify them and then put them back into our system.

15:33 CS: I love this, it's so much information, and it's really what we're seeing clinically, this positive effect using the Bacillus spores, so it kinda does it all, right? Being a naturopath, I have a tremendous amount of respect for nature...We try to outsmart it or try to think that we know better, but obviously this is a very great example about not only a perfect delivery system, but all of the benefits that we see. I know that we'll get into why we seeing this epidemic of leaky gut and gut dysbiosis, and what we're really up against in our environment, but one of the things that I continue to learn from you is how we develop our microbiome and how this kind of set point starts from conception. I think you said to age two on, as I recall.

16:30 CS: I think that's a really interesting point, as I'm going to be a mom in July. I've thought a lot about how I can support my child in developing her microbiome and everything. I would love to hear your perspective on how we can really set up our future children for having a healthy microbiome.

16:56 KK: That is one of the most important things, because at the end of the day we know that our microbiome controls the vast majority of how our body reacts to the environment around us and also sets us up either for continued longevity and wellness or sets us up for chronic disease; it's one of those two things. The microbiome is really complex, there's over 100 trillion organisms that exist in and on the body; compare that to about 10 trillion organisms that make up... Ten trillion human cells, sorry, that make up the entire human body. So we are far more bacteria than we are actually human, we actually have about 150 times more bacterial DNA in our system than we have human DNA. So the types of microbes and the DNA that they have are paramount to our health and wellness, and there's just tons and tons of evidence of that.

17:51 KK: Now, where did all of these complex microorganisms come from? Well, the vast

majority of them come from mom and dad during the birthing process and shortly after. Now, in utero itself during the gestation process, there seems to be evidence that there are macrophages and dendritic cells in mom's immune system that can go and pick up bacteria from mom's gut and actually bring it and deposit it into the birth canal through the amniotic fluid and the umbilical vein. So it actually deposits it into the baby so that the fluid that the baby's swimming around in, is actually exposed to some degree of bacteria to begin with, and that actually gets the fetus prepared for exposure to microbes.

18:41 KK: Now, when the water breaks during the natural birthing process, that actually helps detach a lot of the bacteria that's in mom's vaginal canal and then that makes the bacteria more susceptible for detaching and attaching onto the baby's skin. So when the baby passes through the vaginal canal, he or she gets a huge inoculum of bacteria from mom's vaginal canal, and incidentally the mom's vaginal canal bacteria have shifted since the second trimester of pregnancy to be more accommodating to the types of bacteria that the baby needs. For example, there's a bacteria called *Lactobacillus johnsonii*. *Lactobacillus johnsonii* in a non-pregnant woman is not really found in any measurable amounts in the vaginal canal. That's because one of the things that *Lactobacillus johnsonii* does really well is digest milk.

19:29 KK: Women, when they're not pregnant are not digesting milk in their vaginal canal, so there's no need for that bacteria there. However, as it turns out, by the end of the second trimester, you start seeing a higher incidence or an increase in the growth of *Lactobacillus johnsonii* in the birth canal. And then by the end of the term of the pregnancy, the *Lactobacillus johnsonii* population really increases dramatically. And that's just the elegance of nature, basically setting up mom's birth canal to inoculate the baby with the right types of microbes. And so as the baby passes through the vaginal birth canal, baby gets a huge inoculum on his or her skin, mouth, eyes, nose, and virtually everything.

20:13 KK: Here's a very important aspect that most people don't think about, one of the things that happens more often than not during the natural birthing processes is mom defecates, right? And the defecation, mom's stool, actually contains high levels of bifidobacteria. Because stool ends up being a really good sample of what's going on in the

distal bowel.

20:35 CS: So now the baby comes out, there's all of this amniotic fluid that comes out with the baby, the baby gets a good sampling of mom's vaginal bacteria, but also ends up coming in contact with mom's stool, which actually contains very, very critical Bifidobacteria that are going to populate the baby's gut for the next six months. And then close interaction with mom and dad, the baby picks up a bunch of bacteria from mom and dad. The other very important part is breastfeeding. Breast milk contains six to eight hundred different species of bacteria in it, that are absolutely critical for the baby's health. Not only that but it contains over 200 different prebiotics, which are absolutely paramount to the baby's health. Now, those prebiotics can't be digested by the baby for energy, it's there purely to seed the bacteria within the gut.

21:24 KK: The process of birthing, the close interaction, the skin to skin type of interaction with mom and dad, if we can avoid cleaning the baby off, right when he or she is born that's good, because it's good to give the bacteria a little bit of time to settle on the baby's skin. And then, of course, close interaction, and breast milk are huge, and that's what nature's designed, as a process through which we pick up this complex microbiome.

21:54 KK: Now soon after we're born, there are some other organisms that we end up picking up from our environment, and those are the kinds of organisms that we are working with right now, the environmental microbes that babies are supposed to pick up after birth. And like you said, around two and a half years after birth, the baby's kind of established his or her adult-like microbiome. And so that first couple of years is paramount in terms of the development of the microbiome. And things that perturb the microbiome in those first couple of years, end up having lifelong consequences--like antibiotic use early on, and being born via C-section, because C-section babies don't pass through the birth canal, so don't come in contact with mom's fecal products and end up having higher levels of streptococcus and other skin bacteria rather than the good gut bacteria.

22:44 KK: Also babies who are not breast fed, who are formula fed instead, end up with different types of microbes in the gut and those can all dramatically increase the risk of the

baby for allergies, asthma, metabolic syndrome, and so on. So that's basically where we end up getting our microbiome and then it becomes shaped for the next seven years. The microbiome's fitness and shape is dictated by what we're exposed to.

23:11 CS: It's fascinating. I love how you mention the elegance of nature and it's for people to really embrace the birthing process. I know that we all respect modern medicine in a crisis and when necessary but I think when we're looking at the increased rates of allergy, asthma, neurological illness, and our young kiddos are quite sick now. We have to look at how do we set moms and babies up for success to go through this process with a lot of support so that the baby gets everything nature intended. And so, that's just fascinating to me.

23:50 CS: And it brings this whole concept, not to take us off track too much, but we live in a world where we treat a lot of Lyme disease and persistent infections, and we look at parasites and fungi and viruses, and of course there's a place for strategies to decrease that burden. I always share with my patients, "We're not meant to be sterile, we're more bugs than human cells and there's just this really intimate relationship that our bodies have with these micro-organisms that we need to embrace." And so I think this illustrates this beautifully.

24:29 CS: We have to obviously do what we can to set up a child for the best microbiome possibly, given the circumstances. And then, unfortunately, what we're always racking our brain about and trying to understand is, "Why are people so sick these days?" Let's say we do everything nature intended, but we're coming up against a lot more environmental insults, I think nowadays than probably we've had in the past. Every generation I'm sure has its challenges but what we're dealing with right now, we're living in this kind of synergistic soup of toxicity that is really impacting our microbiome. What has your research shown you? What are the things that you're seeing to be the most disruptive to our microbiome?

25:22 KK: That's a really important point because we forget that we live in this kind of osmosis-type of setting with the environment, right? We are constantly putting things out

into the environment from our own bodies, and then we are constantly absorbing things from the environment into our bodies. And in the way humans evolved, we evolved to require that constant osmosis with the environment to perpetuate our health, wellness, and functionality. But then we've taken ourselves and put ourselves in this really toxic world and now, instead of bringing in all of the really natural beneficial things from nature, we're bringing in chemicals and compounds that are really disruptive to our body.

26:10 KK: So the things that we know that are the most disruptive to our microbiome, which then has been shown to be very disruptive to our health and in fact, propagates and initiates chronic illness are, of course, antibiotic use. Now, antibiotics are a mixed bag because antibiotics will save lives and they are very necessary in certain instances. However, even the CDC estimates that around 50% of antibiotic prescriptions are unnecessary. They're given for viral infections, they're given for fungal infections. So people need to be very careful about when, if and when they use antibiotics, and then of course they need to take very specific steps to try to recover their body from antibiotics. Studies show that after a seven day course of Clindamycin it can take the body up to two years to recover.

27:06 CS: Wow.

27:06 KK: Just from a seven day course, one dose of amoxicillin or Cipro will knock down your microbiome by 99.9% and it'll bounce back shortly after. But what comes back in what proportion has a significant impact. Now, those are acute things that you might have of course antibiotics here and there, the bigger impacts are actually the long-term chronic exposures. One of the most important ones for people to pay attention to is glyphosate, which is Roundup the active ingredient in Roundup, which is also used on most agricultural products in the US. People use it all around their homes, studies have shown that with babies... Newborn babies, they're finding this Roundup in the cord blood in newborn babies. It's that pervasive, it's found in organic and non-organic foods, it's in baby food.

28:02 KK: And the problem with the glyphosate is that it selectively kills good bacteria. It's

the worst kind of antibiotic, your regular antibiotics that you get for an infection actually kill all bacteria almost the same and then hopefully, the good ones bounce back. Glyphosate specifically kills good bacteria and selects for things like Clostridia, Salmonella, Klebsiella, all of these really problematic pathogenic organisms. So it's kind of the worst of both worlds and our exposure to it is chronic.

28:36 KK: Other things are in personal care products. You'll find things like parabens and other preservatives, those things do enter in through the skin, they also pollute the environment, pollute the water supply and end up in your drinking water, which actually kills off bacteria in the gut. Chlorine and Fluoride in the drinking water, using chlorine-based cleaners in your household. So we have this misconception that we need to sterilize our home. And that clean smell is kind of like chemical disinfectant smell makes people think the home is clean. The companies that make those, will add some lemon scent to it, to give you a little bit more of a natural twist to it.

29:17 KK: But that sterile smell actually is the smell of illness because studies show that households that use chlorine-based cleaners and sterilize their homes have kids that have higher incidence rates of viral infections and then also things like asthma and allergies and immune dysfunctions. So that sterilization of our home is actually a really unfavorable thing.

29:41 KK: In fact, there was a study that followed mom's new born babies... Moms with newborn babies and this would be applicable to you, Christine, they followed two groups of moms, one who had the practice of, when the baby drops the pacifier on the ground, the mom would pick up the pacifier, sterilize it with a wipe and then give it back to the baby versus the moms that pick it up off the ground, clean it with their own mouth and then put it in the baby's mouth. And the study showed that the moms that clean the pacifier with their own mouth actually had babies with far less allergies and asthma than babies whose moms sterilized the pacifier with the wipe, and then put it back in the baby's mouth. So this sharing of microbes that are closest to the microbiome environment is actually a really important thing.

30:27 KK: Those are the main things; preservatives in foods, glyphosate in foods, chlorine, fluoride in the drinking water, preservatives in personal care products and toxic components in personal care products. Of course, there's a lot of xenobiotics, there's a lot of xenoestrogens, things that are endocrine disruptors, that act as antimicrobials in the system, and then of course...antibiotic use as well, which in some cases can't be avoided, but in other cases should be avoided because they're not really being prescribed for the right thing.

31:00 CS: So many great points about how we can be proactive and feel empowered. Avoidance is always the first step, and how we can make lifestyle changes to limit our body burden. We see patients who can do everything right and still have an exposure. So I try not to get really anxious or paranoid about that and just say, "We have to do what we can and be proactive and empowered, and try to implement change by choosing lifestyle choices that are going to hopefully create more of them when we see the organic movement and more green cleaning and all of that--but we're never going to live in a perfect environment right now."

31:48 CS: How do we support ourselves, and what has your research shown, especially with the Bacillus Spores--how do we really deal with these insults and how do we repair our leaky gut and our microbiome? I know that the really fun part for us is that you're researching this, as well as creating these products. And so what has your latest research shown us?

32:17 KK: What's really interesting is that a lot of this which seems really complex can be boiled down into a couple of simple things. All of the exposure that we have basically cause dysbiosis, and dysbiosis is a really general term for imbalance in your flora. Everybody's flora gets imbalanced in a slightly different way because everybody's gut microbes are unique, and you have a different distribution of microbes within your gut than I do for example, and that's the thing that makes us all unique individuals, our microbes are different and unique to us.

33:04 KK: Now, when we end up living in this modern society, we get chronic exposure to

these chemicals, and what ends up happening is you get a severe imbalance where you end up with bacteria that cause inflammation in the body, bacteria that over-activate the immune system in response to foods, in response to drinks, in response to things within the environmental system, bacteria that cause the intestinal lining to become leaky and open up essentially, and then also bacteria that cause excessive gas production, things like ammonia, that can actually affect systemic inflammation and affect our own cells by disrupting the mitochondria and the functionality of our own cells.

33:49 KK: So, you end up getting this breakdown of how the system is supposed to function purely from an imbalance of good and bad bacteria. So what our focus was is, "Okay, does this imbalance cause the types of symptomologies or the types of effects that lead to chronic illness?" And the effect that we were paying attention to in particular, was chronic low-grade inflammation in the body. And a particular type of chronic low-grade inflammation, the fancy term for it is CD14-activated inflammation.

34:24 KK: So there's a type of inflammation that occurs in the body that has been tied to cardiovascular disease, obesity, diabetes, Alzheimer's, Parkinson's, autoimmune disease, even simple things like allergies and asthma, as well as even more complex things like anxiety, depression, hypogonadism, which is low testosterone, gingivitis, acne, all of these things, they seem like very, very different conditions. Acne is a very different condition than Parkinson's, and it affects very different parts of the body, and yet they have the same origin. Both of those conditions start with a particular type of chronic inflammation that is a result of a dysbiotic flora, meaning an imbalance of good and bad bacteria.

35:13 KK: That is why even though we are living in this modern age of science and medicine, and we have a lot of tools and resources, these diseases continue to increase in prevalence, because we're not tapping into the root cause of the root cause, which is the dysbiotic flora that leads to leakiness in the gut, that leakiness in the gut leads to the types of chronic inflammation that sets the body up for these types of diseases. And so that's what we are focusing on--our idea was, "Can we introduce bacteria that seem to have a protective role in the microbiome and then, will those bacteria protect the host from this leakiness and then the subsequent inflammation?"

35:58 KK: When we published our paper in August of 2017, we showed the very first probiotic, or any, really, any nutritional compound that's been shown to be able to prevent the leakiness in the gut and stop the inflammation that occurs as a result of the leakiness. So that was a really profound thing, in fact The Journal allowed us to publish it as something called a frontier paper, because they've never seen results that have shown anything that can reduce the leakiness of the gut. That was quite significant. So we were very happy and excited and proud to do that.

36:36 KK: But that becomes a fundamental thing that people need to do, is they need to start to work on increasing the diversity of the gut, removing themselves from toxins and things that we know perturb the gut, and then utilizing probiotics and other nutritional ingredients that help resolve the leakiness, that will resolve the chronic inflammation which is what these chronic diseases kind of swim in, that's the pool that they breed in.

37:06 CS: I find myself seeing the same things too. It's like when you have a patient, very different patients, and very complex patients, we can boil down to really some common denominators that can really fix a lot of things when we look at the root cause. I think this is really empowering, given what we're up against, to show this dramatic of an effect from the spores. I'm excited, I think we're only just getting started.

37:58 CS: With everything that we've talked about, we've seen this increased sensitivity in a lot of patients, and an increased lack of tolerance, if you will, to treatment, and that can be a whole spectrum of how that presents, but there's a lot of information coming out about Mast Cell Activation Syndrome, and these histamine responses, and just this really over-active immune system. I know that you've shared some connections between the spores and histamine in the gut, and I think that is just so valuable. So if you don't mind walking us through that.

38:34 KK: Yeah, so the job of our immune system is to react to the environment around us. The innate part of the immune system which is the first line of defense has no choice but to sample things that are coming in through the diet, sample things that are coming in

through our nasal passages, the things we breathe in, the things we drink in, everything has a signature to it, and then our immune system has to react to it. Now when our immune system reacts at first, it does react in an inflammatory manner, and that's fine, that's actually a normal aspect of the immune system and it is protective in many ways. That inflammatory reaction can protect against infections, for example, that may be coming in.

39:21 KK: However, the problem lies in that our systems are not able to move from the initial inflammatory response towards the adaptive response where our immune system learns what to attack and what not to attack. And that's where things really start to break down. As it turns out, a lot of that learning of the immune system where it sees a particular antigen, let's say pollen or ragweed or a soy protein or something that may be coming in from the diet, and it learns not to attack and initiate an inflammatory response against that, that process is called immune tolerance, that tolerance is dictated by the presence of bacteria in the gut.

40:06 KK: So there are several different types of bacteria. Like certain strains of Clostridia actually can increase tolerance believe it or not, but Akkermansia muciniphila is a type of bacteria that lives in the gut that actually initiates the ability of the immune system to create this tolerance. The spores activate the type of immune response that allows for the tolerance. And a lot of that is dictated by something called your T reg cells. So these are your regulatory T cells. The job of the regulatory T cells is to survey all of these immune responses that are going on and then figure out which responses are required and which responses should be minimized or even prevented and stopped because they're not favorable or they're not required and so that activation of the T reg system is controlled in large part by having a diverse healthy microbiome.

41:00 KK: One of the consequences of living in the toxic world that we live in is that our microbiome gets decimated so we lose that learning aspect of our immune system. And so the only part of the immune system that seems to work really well is that initial line of defense, which is the innate immune system. The innate immune system uses several tools to try to defend the body. One of those tools is mast cells that activate and release

histamine. Another one of those tools are natural killer cells. Natural killer cells, not only will kill any invading virus or bacteria, but they are non-specific in a way, so they end up killing tissue around where the virus and bacteria is as well. Then you've got the IgE response which is more of the allergenic response. Those are all the first line of defense responses.

41:50 KK: We're missing the tutoring or the learning aspect of the immune system that is controlled by healthy bacteria in the gut that tell the immune system, "Okay, don't react to that stuff anymore. It's not dangerous," or "react in this way, which is actually more effective, which is through the antibody route with B cells." So that's the part that's really important.

42:12 KK: In fact, a really well-informed allergist will tell you to get dirty a little bit more if you're really trying to fix your allergies. I had a friend, we affectionately call her child, "The Bubble Boy" because he essentially had to live in a bubble because he was allergic to everything, even stainless steel would give him a reaction on his skin. And in part, it was because he was C-sectioned. He ended up having a couple rounds of antibiotics when he was first born and mom was incredibly paranoid and sterilized everything around him.

42:50 KK: When we would go to a restaurant, she would actually pull out a chlorine wipe and wipe down the table and chairs and all that stuff around him, that ended up having devastating consequences to his immune system and he became severely allergic to everything. One fine day the allergist that they were working with said, "You know what? The best thing you can do is take his pacifier, throw it in the dirt, throw it by the garbage and then put it back in his mouth."

43:14 CS: [chuckle] I love it. Yes.

43:15 KK: Right? And that was baffling to her. But that was something I was trying to explain to her too, and I'm glad the allergist finally revealed that to her and that's really what we need. We need these bacteria, that train our immune system to control the immune responses that are unfavorable.

43:35 CS: Absolutely, and I think that's just such a great point in that the key to health is not restrict, restrict, live in a bubble...I always share with my patients too, health is resilience. We're meant to interact and participate in our environment and we shouldn't fear it, but embrace it and so I think that's a really good illustration of that point for sure.

44:00 KK: Yes. Let me give you another point of that, that's actually quite fascinating. Not only do we share and pick up health from one another but of course, we can pick a disease confirmation from one another as well. So there was a fascinating study that I saw. I don't know if it's published yet, but I got an opportunity to see the presentation at one of the conferences I go to. And it was a researcher I think at Johns Hopkins that was doing a study on the impact of antibiotics on the microbiome of subjects. But he was going one step beyond. So what he was doing, is he would find individuals that are going through a course of antibiotics, he would study their microbiomes, and then he would study their microbiomes for six months after the course of antibiotics had stopped. And what he found was that the disturbance within the microbiome, that he measured from the antibiotics was still present six months later.

44:52 KK: But the crazy part of the study was that he also followed the microbiomes of those living with that individual in the same household, and he found that the people who were living with that individual who weren't taking the antibiotics, also saw the same disruption in their microbiome and was still present for six months.

45:11 CS: Wow.

45:12 KK: Right? So that shows us how intimately connected we are, especially in this microbial world. So imagine that you can live with somebody who's taking a course of antibiotics and that course of antibiotics is disrupting their microbiome, thereby creating this cascade of issues starting with leaky gut and inflammation and you are not taking the antibiotic but being in the same household, your gut becomes perturbed in the same way.

45:39 CS: Yes, wow. That's mind-blowing.

45:41 KK: It's fascinating. And it's because we share microbes, and we share microbes every day, whether we know it or not. We excrete microbes every time, for example, you go to the bathroom and you go and you defecate into the toilet, you've of course released a lot of your gut microbes in the toilet, then you flush the toilet, the toilet creates enough of aerosolization of liquid, you can actually measure it, if you put a black light on it, it actually creates an aerosol of bacteria from your fecal matter into the air, then our air duct systems are designed to suck in the air from the house and put it through the air conditioning system and push it back out. So, we are sucking in fecal matter, spreading it back out into our environment, that stuff settles down on virtually everything we touch, it gets back into our system.

46:34 KK: There's a bird that flies by your chimney, the bacteria from the bird actually falls off the bird and drops into the chimney system, enters the home. So we know there's a significant amount of interaction between microbes not only on our body but from everyone else's body that we interact with. There's studies that showed that households that have more individuals living in it actually tend to have overall healthier individuals, versus households that have one or two individuals. So the more microbes we have to share, the better things are. We share the good and we also share the bad in the case of the antibiotics.

47:13 CS: That's fascinating, and the questions that I always get that I think we can look at both sides of the scenario, especially around when people are dealing with chronic infections and Lyme disease and chronic parasitic infections and all of this, they worry about being intimate with their family and their partners. At the end of the day, we have to take that into consideration of course but it's like, how do we strengthen all of the family's immune system and not necessarily fear these encounters, but how do we look at it from this other perspective? That's fascinating Kiran, I had no idea, that blows my mind.

48:00 KK: Yes, it's crazy. That also brings up how important it is that we interact with each other when we see each other. In many cultures in the world like in Europe and all that when they see each other they kiss each other on the cheek and that's a far more intimate

connection among people which if you break it down, scientifically has some scientific benefit because we're exchanging microbes. So I always say... I'm a big hugger, when I see people I want to give them a hug because that's actually a really good and important way of exchanging microbes with one another. So the more close we are with our fellow humans and even other animals like a dog...

48:43 KK: Study show that households with dogs as inside/outside pets have kids with lower incidence rates of asthma and allergies because the dogs go out, they bring in microbes from all over the environment, they bring it back in. If you're smart enough to let your dogs sleep in your bed with you, they will inoculate your bed with all kinds of bacteria which is actually good for your system. And again, the vast majority of bacteria, over 99.99% or more of bacteria ever discovered are either benign or beneficial, that's very, very few that are actually harmful, but we focus so much on those that are harmful. The best way to protect ourselves from those that are harmful are to support the 99.99% of the good ones.

49:26 CS: I love that. Focus on the positive, right? [laughter]

49:29 KK: Yes, absolutely.

49:30 CS: I'm sure that has an effect on our microbiome too though. The whole emotional, mental component as well. There's so many ways your research can go, right? Well Kiran, I probably could ask you a thousand more questions.

49:46 KK: Which means, we should probably do this again.

49:48 CS: I know. I think you gave us so much information to digest today and I think this is just fascinating research. And again, we're so excited because we're seeing this clinical benefit in our patients. A lot of our patients who have never noticed how they feel with a probiotic product, they feel like they definitely can feel the bacillus spores changing their gut and changing their response. I mean, these are powerful products too, and some patients who are really sensitive have to start even at half a capsule, we start slowly as

they introduce this information, essentially, into their gut microbiome. It's just been a real joy for us to see this be an effective strategy in our treatment protocols.

50:39 KK: Absolutely, and thank you so much for getting it out to people. Again, none of this would mean anything if we didn't have practices like yours that are progressive, innovative, and looking for the best things and getting the product out to people. I'm excited to announce that we have 11 clinical trials going right now. I just got word that four of them are almost done and we should have the papers written up by the end of this year, so we'll have a lot more stuff coming out.

51:12 KK: We are going to be doing the first human microbiome glyphosate study to see over time how glyphosate actually perturbs the microbiome. And then, of course, can we rescue it with certain therapies and bring it back to normal? That's one of the exciting things we're doing because it seems to be really difficult to get away from glyphosate even if we make the right choices. And we're doing studies right now on the same probiotic. Imagine that we're doing studies on acne, on periodontal disease.

51:40 CS: Oh, great.

51:41 KK: On rheumatoid arthritis and weight management. So these are all very different conditions, but they all seem to be impacted beneficially when you get the right bacteria into your system. So again, thank you for the opportunity to do this and thank you for the continued opportunity to work with you guys on the clinical side as well.

52:00 CS: Well, we appreciate it. It's a team effort, right? And it's just wonderful to be able to work with researchers who are looking at the real issues that we feel that our patients are facing. These sound like some really amazing clinical studies that we'll get to learn more about soon. Kiran, where can people find more about you and your work and your products?

52:23 KK: Go onto www.microbiomelabs.com. We have a blog attached to it that has a lot of interviews and webinars on various topics, associated with chronic health. Also via

YouTube, search my name, Kiran with "microbiome" and you'll find hundreds of videos that people have uploaded for me on there that are podcasts and webinars and interviews, a variety of sources. There's lots of info out there so if you start searching online you'll never find an end to it, but hopefully, there's a lot of good information as well. I welcome people to go and do the searches.

53:13 CS: Absolutely, you've put out some amazing information and lectures and so I hope people go down the rabbit hole with us. I so appreciate your time today, and I'll definitely invite you back. I feel like once we learn more about your research, I'd love to have you back for us to get an update and continue this learning curve.

53:34 KK: Absolutely, I look forward to it.

53:37 CS: Thank you, Kiran.

53:40 CS: Thank you for listening to The Spectrum of Health podcast, I hope you enjoyed our conversation today with Kiran Krishnan. If you want to learn more about his product, MegaSpore Biotic, we have a link in the show notes. And if you enjoyed this interview, I'd really appreciate a review on iTunes and we really appreciate your time listening today.