What Makes Us Human?

Guest: Kiran Krishnan
The Genius of Your Genes Summit, hosted by Donna Gates
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Donna: Welcome to the Genius of Your Genes Summit. We've had so many great interviews, but this interview that we're going to have today with Kiran Krishnan, is really a special one because the topic… Well, first of all, he's extremely knowledgeable. He's been a microbiologist for all of his professional life and a tremendous amount of research and developing products, and he knows all about the virus realm, as well as the bacteria that are living in our gut. So we're going to have a pretty neat conversation here. And it's an important one because we have our genes and the microbes in our gut have their genes, and things are happening because of that. So, thank you so much for taking the time because I know you're busy. Thanks, Kiran, for being here today.

Kiran: Of course, it's my pleasure. Thank you for inviting me and it's an honor to be here. I was mentioning to you earlier that I love this topic. It's such an important topic, especially to connect the microbiome and our epigenetics because the microbiome plays such an unbelievably large role in our gene function as well. And we'll get into that, and I think people will be pretty surprised at what a role they play.

Donna: Yeah, me too. I'm sure. I mean, I think because of the topic that a very, very large number of people approach practitioners, of course, they would know what the microbiome is, but in case there's any people that have been living in a closet for the last five or 10 years, could you just cover some basics? Like just, what's the microbiome, why is it important? And then just run with it. Just go anywhere you want to go with this topic.

Kiran: Yeah, absolutely. So the word microbiome itself encompasses what we're talking about because the microbiome is all of the organisms, the living organisms that live in and on us, and all of their genetic elements. So compare that to the word microbiota, which is also used, the microbiota speak specifically about the ecology, the presence of certain organisms. The microbiome, that's a bigger word, also encompasses all of their genetic elements. And the reason that they encompass the genetic elements because as it turns out, our genetic elements from the microbes that live in and on us, far surpass the number of genes that we have. So one of the complications that came out of the Human Genome Project, which was launched in the early 90s, and kind of finished up somewhere in the mid to late 90s, was that we actually ended up seeing that as a human, as a species, in our chromosomes we have far fewer genes than we ever estimated there to be. We're pretty complex organisms. We're at the top of the food chain or the top of the evolutionary ladder, and yet we've got somewhere

around 22, 23,000 functional genes. And that may sound like a lot, but then you have rice plants and you have earthworms that have more functioning genes in their chromosomes than we do. So the question is, how is it that we're so sophisticated? At the start of the Human Genome Project, where they were looking at sequencing the entire human genome, the estimate was that we'd have somewhere around 130 to 200,000 active genes, because of all the complex chemistry of proteins and all that, that we can code for that we produce. But with that 22,000 or so genes that they've discovered, there's a major gap. And where does the rest of our activity come from? We don't code for enough stuff to be human. And then the Human Microbiome Project was launched back in, I think it was 2005 now, and they started sequencing the genome of all the microbes that live in and on us. And as it turns out, we've got over 150 times more bacterial DNA in our system than human DNA. We have over three and a half million bacterial genes in our system than human genes and they account for almost like 90% of metabolic function as a human. So what we thought made us human was completely wrong. We estimated the human as this collection of organ systems, connected by soft tissue and vasculars, our vascular system and our muscles and our bones, and all that. We see this human as this engineering construct, with this sophisticated brain that we have that kind of controls everything below it. But as it turns out, what makes us human are the microbes that live in and on us. That's 90% of who we are. So it's really mind boggling when you think that most of our day to day function is coded for by bacteria, viruses, even things like protozoa, amoeba and so on, but predominantly bacteria.

Donna: Well, then that makes you wonder, how are they doing that? Like, is it the way they're communicating to the gut wall? Is it the way they're communicating to our own genes? Like, what's their mechanism of action, I guess you would say that allows them to be inside of us but running so much of the show?

Kiran: Yeah, that's part of the complication, right? Because when you think about bacteria, classically, you think about something that is infectious or bad, and certain parts of the body have to completely be sterile. If there's microbes there, it's a problem, it's a disease and so on. For example, we used to think that our blood was sterile. If, you know, 15, 20 years ago, a doctor found active bacteria in your blood, they would think you're going to have an infection of bacteremia or sepsis, and it'd be a very dangerous and precarious position. But as it turns out, now for every milliliter of blood that we sample, you've got about a thousand bacteria cells in there, and humans have over five and a half thousand milliliters of blood. So we've got a lot of bacteria swimming around in our blood, in our cerebral spinal fluid, in the amniotic sac and the amniotic fluid in pregnant women, of course, in your mammary glands that pass on to the child; everywhere. Virtually everywhere in the body, we're covered with microbes, and in all of these regions, microbes do a few different things. Number one, they can actually share genetic control with us by producing things like microRNA.

So microRNA are these little functional elements of RNA that can sit at the promoter regions of DNA and in some cases RNA as well, and interfere with how a gene is being expressed. It can either inhibit a gene from being expressed, it can enhance the expression of a gene, and these are our genes. It can change the structure of the protein that's being produced by that gene, when we're talking about things like histones and histone deacetylases. So they can change the enzymes that are making proteins from our genes. So they have that kind of control mechanism. So imagine them are sitting here, they want to change what genes we are expressing, they can send out things like micro vesicles, microRNA that go and actually physically change what genes we're expressing.
So that's one way that they can do it. And again, because microbes are all over our body, they can do this in all different regions of our body, including, of course, our gut, which is where the vast majority of microbes live. And then wherever they're sending the messages, the microRNA or the little peptides and vesicles, it enters our circulatory system through our gut, it enters our lymphatic system through our gut, it enters neurons, it can go directly to our brain; it can circulate through the body and end up in different organ systems. So they've got access to every part of our body, sitting in the gut and sitting in our blood, and sitting in our cerebral spinal fluid and so on. So they're everywhere. So that's one mechanism. The other thing is, they produce...

Donna: Can I just kind of ask another question? Every single cell in the body, whether it's a brain cell or liver, or spinal, wherever it is, each cell has its own DNA. Exactly the same DNA all over but they have different functions, so they're being expressed differently. So, are you saying that the microbes, say in the...? Because I mean, there's some in the gut, there's plenty of the skin, there's some in our nasal passage everywhere, are they somewhat local? Like, the ones in the skin are doing local things or in the gut are just working in the gut? Are you saying that the ones in the gut can reach the ones in the brain and that gut brain connection?

Kiran: Yeah, actually, so the ones in the gut have a special capability of reaching many different parts of the body and they do that through the circulatory... getting access to the circulatory system through the digestive tract. They also can do that through getting access through the lymphatic system. So there's something called a mesenteric lymphatic system that has direct access in the gut; that then spreads out throughout the rest of the body. They can also get access to the rest of the body through the enteric nervous system. So that's this really elaborate set of neurons that cover everywhere from your mouth to your bottom, in your digestive tract. And that enteric nervous system is connected directly to the spinal cord and then also directly to the brain, through the Vagus nerve. So they have access to all the different parts of the body from the gut. Now, the localized microbes do have local specific function. So your skin microbiome looks very different than your gut microbiome. If you're a woman, your vaginal microbiome looks very different than your gut microbiome. Your microbiome in your upper respiratory tract looks quite different. And each of

those do localized functions as well. So they produce specific compounds, they produce microRNA, they produce these excretory vesicles that all control DNA expression in those particular areas. And one interesting example of that is we've known for a while on the skin, if you get a cut, the way your skin heals that cut is by up regulating matrix metalloproteinases. So it's like these specific type of protein and enzymes that rebuild the skin structure at the site of that cut. As it turns out, now some of the latest microbiome research on the skin is showing that one of the first things that happens when you break the skin, you physically break it, is the edges of the break becomes surrounded by a specific type of bacteria. And those bacteria trigger the response of healing, up regulating that matrix metalloproteinases. So every function in the body, every time we look, seems to be tied by some microbe doing something specific.

Donna: I think another perfect example of that is the mucus that lines the gut lining, for example, and all over, really; we have mucus lining everywhere, and the nose. That set of genes, called MUC1, MUC2 and so on, and they produce that mucus, but only in the presence of the microbes. So as I understand it, from what I've read, if you have a germ free mouse that doesn't have any microbes anywhere, in their gut or anywhere, they're not going to make mucus either because those microbes stimulate those genes to work. So that's a good example of how they work.

Kiran: Yeah, absolutely. And what you brought up as an example, is really quite profound and so important because let's talk about what this mucus layer is. We always thought of our dermal layer on our outer surface, on our skin, as being the biggest barrier that we have. Well, it's not. The mucus layer inside the body, which covers every single orifice, in every square inch of the body on the inside; that has 150 times more surface area than the dermal layer itself. And it's the largest sampling site in the body, meaning everything that enters the body, whether it's through your mouth, your nose, your eyes, your ears, even through the skin, through the urogenital tract, no matter which way it enters, it's going through a mucus layer first. And the reason it does that is because the mucus acts both as a barrier, so things cannot just readily enter the circulatory system, but it also acts as a sampling site. Meaning that's where your body looks at what's coming in and decides how to respond to it. And if your mucus system is dysfunctional, meaning, let's say it's really thin, because you're not producing adequate amounts of mucus, you become much more susceptible to things triggering an inflammatory reaction in your system. So that's where a lot of things like environmental allergies come from, food sensitivities, dermatitis, and all of these reactive responses to things that people are coming in contact with because the mucus layer isn't thick enough, isn't well formed enough, and the immune response in the mucus layer is somehow disrupted. There are bacteria in the gut like akkermansia muciniphila, whose job it is, is to eat and recycle the mucus and trigger that mucin gene; that mucin 1 and mucin 2. And so just that one example alone that you brought up, is so profound because we would cease to exist if the microbes did not allow us to express our mucus genes, MUC1 and

MUC2, but we call them MUC-T genes because we wouldn't be able to defend off anything that enters our system, everything would trigger an inflammatory response, you know, it would be a difficult existence.

Donna: Well because of the epigenetic talk and it's so important here too, if you wanted to increase the mucous lining, because let's say it was kind of thin, would you tell somebody to just create a healthier microbiome down in the gut? Or are there other things you could do, like drink aloe juice or something to improve the lining of the gut? Have you looked into that pretty much?

Kiran: Hmm, that's actually a really big focus of our research because in our view...

Donna: That's nice. Glad I asked that question?

Kiran: Totally, yes, very good intuition because that's been one of the things that we've really focused on, is how do we rebuild this mucus structure? Because we know things like exposure to Roundup® over time, eating gluten for periods of time, all of that stuff destroys that mucus lining, and antibiotic use and so on. Because when you have antibiotics, you actually end up selecting for a higher level of bacteria that eat away at the mucus, without helping rebuild it. So a lot of dysfunctions can be tied back to a disrupted mucosa. Things like gastroesophageal reflux disease, depression, metabolic syndrome, all of these things have been shown to be tied to a dysfunction in that mucosa. So the components that are most responsible for regenerating the mucosa are these, number one, its amino acids. So amino acids from the diet, things like leucine, cysteine, they are an important building block of the mucus layer. So you need to make sure you're getting enough protein and certainly getting amino acids that are absorbable because they become an important part of rebuilding it. Number two, butyrate is the number one signal for goblet cells, whose job it is to produce the mucus. So butyrate is the energy source and the turn on signal for these goblet cells.

Donna: Where does butyrate come from?

Kiran: So the way you get butyrate, the most profound source of butyrate is in your colon. And it's from bacteria in your colon fermenting resistant starches and complex carbohydrates, and fermenting and converting them into short chain fatty acids. And one of those short chain fatty acids is butyrate. So then, there's also microbes who do this specifically, one of the well-known microbes that does this is akkermansia muciniphila, faecalibacterium prausnitzii. It's hard to remember all these but just think about it this way, the more resistant starches, the more complex and resistant carbohydrates you're consuming, it'll feed these kinds of bacteria and it'll help them produce the butyrate and also help them stimulate the mucus gene, in order to increase the production of mucus.

Donna: So you can make a potato salad and put it in the refrigerator and you've got resistant starch.

Kiran: Yeah, exactly and that'll also help. Yeah, that'll all help defend.

Donna: Because that's something too that people should know, is that feeding ourselves and feeding the microbes too can be very delicious. It's not like that you have to supplement or that it's a starvation thing. It can be yummy, delicious food.

Kiran: Right, absolutely.

Donna: That's really interesting about the amino acids too. But what about the person that is eating protein but they're not digesting that protein? So, what happens with undigested protein down in the gut?

Kiran: Yeah, so that becomes a big problem. Now, if you have that combination, if you have a combination of a thin mucous lining and undigested protein, now you're setting yourself up for autoimmune reactivity. Because one of the things that seems to be very clear is that undigested proteins and peptides from food are cross reactive to tissues in our own body. And so if those proteins because of a thin mucus layer, are allowed to leak through the lining and become present to our immune cells, then our immune cells can develop cross reactivity to our own tissues. There's all of this data out there that shows that dairy proteins, of course, gluten peptide, certain types of soy proteins, these undigested proteins and peptides will become cross reactive to tissue and drive autoimmune disease. And then on top of that, you're not feeding or providing the amino acids, the free amino acids, to the building blocks for the mucus layer anyway. So you get both. You also see undigested proteins being cross reactive in kids on the spectrum and that purification and that cross reactivity is a major issue on kids who are on the autism spectrum. And so those become a double whammy, because not only are you not providing the building blocks to rebuild a mucus layer, but the undigested proteins are causing an immune reaction as well.

Donna: Well, is it okay for people to take amino acids as a supplement because that's a really hot supplement right now?

Kiran: Yeah, absolutely. L-forms of amino acids are the most important, of course. L-forms are the ones that your body can utilize and that's an important one to take. We use amino acids in a number of our products, certainly in our mucus rebuilding product, because there's studies that show when you add these amino acids, it rebuilds the mucus layer by 95%. So it's a simple thing to do. Amino acids are quite important. And the problem is a lot of people just don't completely digest their protein, right?

Donna: That's quite a good point.

Kiran: The way it's supposed to work, is we're supposed to eat chicken or egg or vegetables, or wherever your protein source comes from. You're supposed to chew it and masticate it in your mouth, and then the hydrochloric acid in your stomach starts breaking it down. And then you're supposed to have adequate pancreatic and other enzymes to break down the proteins into amino acids. But most people's bodies fail in that process somewhere and we get a lot of undigested proteins moving into the system. So supplementing, in that regard, can be very important.

Donna: And can you give us the name of the product that people should buy?

Kiran: Yeah, so actually, the one we designed is a product called MegaMucosa, in fact, and the whole idea there is it's got the right polyphenol mix, and we can talk about why polyphenols are important as well. Amino acids and in particular, the amino acids that are the building blocks of the mucus structure. And then it's got an IgG, an immunoglobulin, which helps kind of neutralize toxins and all that in the gut lining that negate the rebuilding. Because one of the things that the gut struggles with is it's always trying to rebuild the lining and the mucosal structure, which has a huge impact in your overall gene expression and the types of microbes that live there. But all of that stuff gets thwarted when you have a lot of inflammation going on in the gut. And inflammation can be driven by mold exposure and food borne toxins, and all of these things that come into the system. So that immunoglobulin sops all that up and kind of helps neutralize it. So those three things together play a really great role in rebuilding the whole mucus lining.

Donna: So if someone has variants in the MUC1 and MUC2 genes, especially from what I can tell from the research that MUC2 is particularly... is the one that produces the most mucus...if you already have variants there and you're already genetically not doing a really good job of producing mucus, all of these things that you're saying and using the MegaMucosa; that sounds like it's a really must for someone when you see that variant there.

Kiran: Absolutely. And people with any kind of sensitivities, whether its food or environmental, and so on, because a lot those sensitivities are driven by this issue of having too thin of a mucous lining and your body and your immune system is not getting the adequate opportunity to sample things that are entering your body. And then create an adaptive immune response to it, or it's not creating an inflammatory response to everything. So those are the types of people we work with a lot as well autoimmune, and then certainly if you have a genetic dysfunction in your mucin 2 gene, that's a really important time to utilize something like this.

Donna: Well, how would a person use it? Do they take it with each meal, in between meals, or what's the recommended protocol for that?

Kiran: So we made it a simple powder. So it's a scoop of powder, you mix in with a jug of water. I actually have mine here I've been drinking throughout the day. So I mix it in, you shake it up and then you just kind of sip it throughout the day, and you get a good constant, steady stream of the polyphenols, the amino acids, the immunoglobulins that go and kind of continuously protect the gut. Because of all of the systems in the body that get exposed to the outside world, the gut is under assault all the time. Because we're constantly putting things and complex things into our system, whether it's a drink or food, or just inadvertent exposure, just by putting our hands and all that near our mouths. Our gut is constantly going through some sort of exposure. So getting that protection and that constant nutrient source is really important.

Donna: If it's too sweet for somebody or have you decided to...? I mean, can you put lemon juice in it? Or is there any anything that you can add to it that would sort of make it... put it in a big bottle of water and then sip it throughout the day, but something you can add to it, so it didn't taste so sweet?

Kiran: That's a good question. Most of the time, we actually have two things that people have done. One is they've made popsicles out of it and that seems to reduce it because you're mixing it with a good amount of water, and then you can eat it every day. And it kind of acts like a treat almost, for those that have a little bit of a sweet tooth and want some sort of treat after a meal. We have people that have put it in seaweed jello. But the thing that I tend to do, because for me, it's also a little sweet...and the reason why it's sweet is because amino acids tend to be very bitter, when they're by themselves. So it has a really stringent bitter taste and to sort of mask that, you kind of go a little bit higher in the sweetness. But what I tend to do is just do the half a scoop in a bottle of water, shake it up, and I drink it throughout the day, and then I do another half a scoop later on in the day. And that seems to be just right for me.

Donna: Well, I think that's a fantastic tip for kids because I'm always concerned about little kids and the beginning of their life, getting that inner ecosystem in place. So for several years, you really, as a parent, actually teachers and everybody else should be thinking about this, we need to get this really critical inner ecosystem healthy. So this really critical microbiome into place early in life. And so what a cool treat, I mean to give your child a... even if they won't eat a whole popsicle because they're little, a little bitty child, you can put just two ice cube trays and give them that as a snack. So that's very cool. I'm glad you said that. Well, let's get into... just to show people some examples of the genes that some of the microbes might have. Like, what about the bacillus? What kind of genes...? If you looked at their genes, what are you seeing their genes are doing?

Kiran: So some of the things that are really important are genes that produce post-biotics and post-biotics, especially that impact our genetic expression, right? So let's look at one of the examples, we just talked about butyrate. The bacillus also produces butyrate. They have genes that will convert resistant starches and carbohydrates into butyrate. But one of the things that butyrate does in our system is it turns on the cyclic AMP gene in our system. What does that do? Well, once you eat food...so imagine this, you're eating food, you get the resistant starches that go down into the gut, the bacillus and some of the other bacteria in the gut that have this gene, they will convert that resistant starch into short chain fatty acids. The short chain fatty acid, in particular butyrate, will enter into the fat cells and will trigger the cyclic AMP gene, and that's our gene that it's triggering. That AMP gene actually then signals to the rest of the body to burn fat for fuel. So they're kicking on our fat burning metabolism for us and it's one of the most potent ways of turning on fat burning, is through this activation of cyclic AMP. They also activate, through compounds that they make, like short chain fatty acids, something called peptide YY and GLP-1. That's also found in our digestive tract. What those things do is they signal to your cells to take in sugar that's in the blood and metabolize it into energy. So it helps with insulin response and it helps with glucose sensitivity as well. In fact, the drug, Metformin, that is the most widely used drug right now for diabetes and blood sugar control, the way it works... and they discovered this two years ago, the way it works is by increasing butyrate production in the microbiome.

Donna: Wow, that's interesting. I do know that Metformin is being taken by some people that don't have blood sugar issues, just because it helps them live much longer.

Kiran: Right, exactly and it all comes from the butyrate.

Donna: They just take it for like anti-aging. Wow. That's amazing. Well, I hope people heard what you said because that was a real pearl for people that are doing keto. And they have to burn... they're relying on their fat being burned for energy. What you just said is amazing. And then also the part about sugar, because some people are getting their energy from carbs. I personally do a combination of both, like if I don't get some carbs, complex carbs, like potato salad, for example, I'm working on my microbiome all the time too. But I actually don't sleep very well, so I just do a keto all the time. Even though I still have plenty... throughout the weeks, I'm getting excellent fats, and I'm relying on that for energy, but I strictly have to have those carbs in the night. So this is really great information that you're sharing here and thank you for that.

Kiran: Yeah. And it's important if you're doing keto, especially if you're going to try to do keto for longer period of time, you still have to get those resistant starches in and those complex carbohydrates, at some point, because those are the key things that feed those really important bacteria. The akkermansia muciniphila and the faecalibacterium, all of these bacteria, and the bacillus as

well, who turn on these genes that help you burn fat, bring down inflammation across the body, feed the brain, feed the liver, all of these other organs, with these important postbiotics. Another post-biotic that's really important are called urolithins. Urolithins are actually polyphenols that have been converted by bacteria in your gut into this compound called urolithin, which then actually becomes a really important epigenetic compound for us. It becomes hard for us to express our genes without urolithins in place.
In particular, urolithin A is a really important one. It's a really important compound that actually controls a lot of our own gene expression associated with anti-aging, associated with bringing down risks for things like cancers and systemic inflammatory response. And the only way you can get it is by your microbiome taking polyphenols and converting it to urolithins. You're not going to find urolithins in your diet. Again, that's something we depend on our microbiome to provide for us, to turn on our genes.

Donna: Wow; that explains... Élie Mechnikov, over a hundred something years ago, noticed that people that were eating fermented foods, because that's what they had back then, they didn't have probiotic supplements yet and things like the MegaMucosa, but he just noticed that they lived longer. And he lived really to be quite old, he was in his 70s when he died, which is very old for that period.
So you just explained one reason that's happening, like eating fermented foods and the bacteria and everything are producing the urolithins, and that's contributing. That's really amazing because I've always looked through the science to explain why having these good, healthy bacteria in our gut helps us live longer. So that's really great.

Kiran: Yeah, and too, ties to diet then, that's part of what makes the Mediterranean diet so healthy for a lot of people is the Mediterranean diet includes a lot of polyphenols. And these polyphenols get converted to these really important compounds like urolithin. There's other phenolic acids and all that that are also converted from polyphenols, by our gut microbiome that then affect our own gene expression. The other thing is, within the Mediterranean type of diet, you also have healthy fats coming in, even omega six fatty acids.
And as it turns out, if you have a healthy microbiome, your healthy microbiome will convert the omega six into omega three, in the gut. And that omega three is going to be more anti-inflammatory than some of the omega threes that you can find in other sources. So your gut microbiome's ability to modulate the food that's coming in, and then create a new compound for you that didn't exist before, becomes extremely important for our health and longevity purposes. So yeah, just thinking about that and what they do for us and for our diet, for diet conversion, and making our diet effective is really phenomenal.

Donna: Well, you know, I've reviewed and I've talked at other times about the oxalobacter formigenes, that's the little guy that eats oxalates. And he only... that's not his only job, is eating them and he's easily destroyed and doesn't come back. Actually, that's one of the things I'm quite intrigued by, because from the

research that I've done, the oxalobacter formigenes enter our gut when we're crawling, around that age. I've often wondered, should we all spend more time on the floor crawling around, to get it back again? And maybe that's truly the thing to do.

Kiran: It's not out of the question, I think.

Donna: Yeah, why not? So he clearly has genes for degrading oxalates. And that's just an example of like, that's all he does. He's obviously got a bunch of oxalate degrading genes, but there are other bacteria that have been found to be able to degrade oxalates with their genes. Have you looked into that much?

Kiran: Yeah. In fact, the spores that we work with, the bacillus, in particular, bacillus subtilis also has the capability of breaking down oxalates. One of the roles in the microbiome that's really interesting is a role of transient microbes. So bacillus is one of those that they live in the gut, but they live in the gut temporarily. And part of their life cycle is they come in, they do a bunch of work in the gut, typically fixing things that are wrong. And then once they feel satisfied about that, they kind of leave the gut and they spend some time in the outside world and then come back in through the oral route again. When they go out to into the outside world, sometimes they can they can pick up genes or they can take genes from the gut microbes and bring it to the outside world, and help transfer it from species to species because some of these transient organisms are our universal colonizers. They can colonize the gut of another mammal, and then the human gets exposed to them. And so they have the capability of sharing some genes with other microbes in the gut and they can pick up the slack when some of those microbes aren't functioning the way that they should be. Like oxalobacter formigenes, which is very sensitive to antibiotics. We take a couple courses of those antibiotics and their levels are so low that they're not really functioning. The bacillus can come in and actually pick up the slack on that job of breaking down oxalates. Then even if you think about the oxalate breaking down component of it, oxalates come in on healthy foods in general. These are going to be things that are, in general when you think about the macromolecules, are good for us but it happens to come in with this compound that's really problematic. And if we get too much of this compound, it's going to cause kidney stones and other problems within the system. And then here is our microbiome with this defense system for us, so that we can continue to eat these foods without that side effect danger, by breaking down the oxalate for us. It's such an elegant system when we think about it, but we're not really thinking about the role of the microbes quite enough and what we need to do to continue to feed them and support them.

Donna: I was looking into trying to find the genes for the bifidus, different strains of bifidus and I kind of got stopped right away because microbiologists like yourself, they can't really say, "Oh, these bifidus have these genes. And this strain over here has these genes," because they swap with each other all the

time. And it's hard for them to like exactly know which bacteria bifida says what. So that's always amazed me. I kind of have this image in my mind of this gene swapping party going on down there.

Kiran: That's true and that's kind of part of survival within the human system. Part of what has made us so complex and allowed us to move up the rungs of the evolutionary ladder and the rungs of the food chain are the complexity in the genes that we carry. When our early, early humans, our descendants, if you will, they weren't even humans yet, when they came down from the trees, that provided a very significant advantage to us as a species because up in the trees, the exposure to ruminant animals, soil migration, and all that was much less. We stayed in certain locales for a very long period of time. When we came down from the trees and became bipedal, meaning walking upright, and we started doing longer migrations, we started picking up a lot more genetic material from the environment through bacteria. That has really allowed us the capability of being kind of omnivores and super adaptive to numerous conditions. So it's so important to appreciate that and keep that in mind. That our microbes have been picking up genes from all over the place, from other animals, from the environment, from the soil, and then coming into our system, bringing all of those capabilities into this one construct, which is the human system.

Donna: Well, now everybody knows by this time that the early man who was wandering around, constantly changing and looking for food, was picking up a lot of bacteria. And when they go and see these more primitive tribes of people, they see that they have a lot more diversity in their gut than we do today. What would you say to that? Like we're living in the modern time or we're living in apartments in cities like New York and everywhere, what does a modern person of today do to kind of make up for that?

Kiran: Yeah. And that is such an important point because we know, looking at all of the microbiome research in the last 12, 15 years, the one theme that seems to be permanent across the board, is that diversity in the gut microbiome is equivalent to health and longevity. In fact, the longevity studies couldn't be more clear, people who live well into their 90s, who have really good health outcomes, tend to have diversity in their microbiome similar to people in their 30s. So then when you look at people even in their late 60s and 70s that have a lot of chronic illnesses and all that, their diversity is terrible within the microbiome. So diversity in the microbiome dictates how long you're going to live and what risks you have for chronic illness. And diversity came from two things; number one, exposure to the outside environment, the soil, the ecosystem, animals, and so on. Number two is from diet. So our ancestors ate six to 800 different types of foods annually. Six to 800. That's an insane amount when you think about it because when you look at a typical Westerner, even one that eats really well, they might be eating 20 or 25 different types of foods. So our system evolved to harbor and encounter a very vast variety of macronutrients. But nowadays, we've really shrunken our macronutrients source to five or six basic things; that come in different varieties,

but it's the same five or six basic things. So one of the strategies for someone in the modern world is to just start increasing the diversity in your diet.
And the way I recommend people doing that, the easiest way to do it is just go to like a local ethnic grocery store. Whether it's a Middle Eastern grocery store or a Korean, an Asian grocery store, you will find roots and tubers and vegetables, and fruits there. Even meats there that you wouldn't find at your local Whole Foods and Trader Joe's, and those kind of places that you're used to.
And the recommendation is just add in one new food to your diet each week. It doesn't have to be a complex meal, you don't have to go and make a whole Chinese meal out of anything. But if you add one new food that you haven't eaten before into your diet each week, we're talking small amounts of it, and then in the next week, you keep that food but add in something new. By the end of the year, you would have more than doubled the diversity in your diet; that drives the diversity in your microbiome significantly. So that's one really powerful strategy. Number two is just getting out there more. Going out in nature, being in the woods, going on hikes, getting closer to dirt as much as you can, actually increases your diversity quite a bit.

Donna: Like I say, crawling around.

Kiran: Crawling around, going back. It's easier. And then number three, fasting. When you look at the studies, fasting, which is counterintuitive because you're thinking, "Wait, I'm not feeding my microbiome." Well as it turns out, adding in some sort of regular intermittent fasting, whether it's a 16 hour fast or a 14 hour fast, or you might go for a 24 hour fast every few days or something like that. There's many strategies around it. But fasting in general, increases the diversity in your microbiome because there's loads of microbes within your gut that only do well when there's no food present. So this gives them the chance to start bringing up their populations, as well. And then the last thing is, and we've recently published a study on this, in August of 2017, I think was in the Journal of Nutrients, I'm not sure, I believe, we've published a lot recently, so I'm confusing all the various journals. But we show this combination of prebiotic and probiotic. We use the megaspore biotic and then symbiotic, which is a mega prebiotic; that combination in a period of three weeks, increased the diversity of the microbiome by almost 40%. So it brought back a lot of species that were at such low levels they were almost undetectable. And the prebiotic contains certain oligosaccharides which are resistant forms of carbohydrates that are really important.

Donna: What is that product called?

Kiran: That's called MegaPreBiotic, and it's combined with the MegaSporeBiotic as a probiotic, prebiotic combination. And the prebiotic is a scoop. So you kind of drink it the same way you would do the MegaMucosa . Put a scoop in a bottle, drink it and sip it throughout the day. You take the spores, two caps a day with any meal of the day. Then the diversity of the microbiome

increases dramatically because remember, 90% of our metabolic activity is coded for by bacterial DNA, and we need more diverse bacteria in there to provide us all of the genes that we require, in order to function as humans. If we have low diversity, we're missing really, really critical genetic components to perform what we're supposed to perform as humans.

Donna: Good, I'm glad you said that. But I also wanted to add that the bacillus, they're so hardy. They can even be heated and baked. So around the holidays, for example, if people decide they want to make some sugar free, gluten free cookies, I'm not a big flour fan but if that's what you want to do during the holidays, I honestly put them in these mixes that I make up sometimes to bring to parties. So, just that people can see, you can make a very delicious cookie that has no sugar in it, no gluten in it, and I can give you a probiotic cookie too.

Kiran: Oh, absolutely. And then that probiotic will help you digest it, convert those carbohydrates to short chain fatty acids, do all of these wonderful things within your system. And that's their job in nature, you know, that's what they're designed to do.

Donna: Well, I did want to put in a couple of... just because I think it's so important that people eat fermented foods, fermented cabbage and fermented... I call them cultured vegetables because sauerkraut is usually just cabbage. But I have a lot of wonderful recipes where we added them to different types of vegetables. And they're delicious, absolutely delicious. But what I love about them is that whether...let's say you're using cabbage, kale, fennel, garlic, ginger, just a lot of different... I never put too many in one recipe, like maybe I'll use an onion or something, garlic, ginger. But the thing is, is wherever those plants grew, each individual one of them had their own ecosystem on them. And then when you ferment them, you're bringing them into the kitchen and slicing them, and packing them in a jar and letting them sit for a week or so. And it's like this world of diversity that you're bringing into a jar and then you're eating it. The power of nature that you really... the diversity, man can't actually quite compete with that. But we can come close and we can do great things like you're talking about. So we should do both really, but that is one of the reasons why after all these years, fermented vegetables have become, to me, a must. Unless you have a really big problem with CBOE, then you can't have them initially but you do want to... and I'd like your opinion on this, but this is what I think. Is that you want to address the CBOE, get rid of that problematic bacteria that's in the wrong place in the small intestine, but then make sure you work on your microbiome and get things working again. Are those people going to have constant relapses? And that's what happens with people with CBOE, they relapse. Any thoughts about that? Because I'm interviewing Shivan, who is an expert in the CBOE, for one of the talks and I know she would appreciate, many people have CBOE, and many people would appreciate your wisdom in that area.

Kiran: Yeah, absolutely. So in fact, I've done a couple interviews on her program, her CBOE programs that she puts on out there. Because CBOE to me is a troubling thing in our modern society, because our treatments for it are really not that successful. Most people have continuous relapse of CBOE. A lot of it is because we are heavily focused on the symptom associated with CBOE, right? The symptom being the bloating and distension of the gut. So everything is focused on, how do we bring down the bloating? And so we're hitting it with the antibacterials. We're hitting it with antimicrobials, and we're not really thinking about the root cause of the bloating. There are a couple of problems that are occurring in CBOE. Number one is, bacteria is being allowed to overgrow in a part of the gut where you're supposed to have fairly low levels of bacteria. Number two, the digestive tract is not moving well enough, so the word for that is stasis. So stasis plays a significant role in CBOE because things are allowed to stay stagnant in one place in your small intestine, and then putrefy and get fermented by the over growing bacteria. So, my question was, what are the two mechanisms that we have or what are the mechanisms, not just two, in our body to prevent the overgrowth of bacteria in the small intestine? And then what's the mechanism that we have to turn on the bowels and keep things moving? So let's go with the antimicrobial side of it. We actually have really, really powerful antimicrobials in the small intestine, who exist in a large part, to keep the levels of bacteria down. The first part is HCl that comes in from the stomach. If we have low levels of HCl, we're going to have a higher pH in the very proximal part of the small intestine; you're going to start seeing bacterial overgrowth in that region. The second and probably the most important is bile. So bile is a very strong antimicrobial and in fact, bile, when combined with fatty acids in the diet, become really strong surfactants. And bile goes through and sweeps through your small intestine every time you eat, and clears the microbes from their keeping really low microbial levels, because bile is a very strong anti-microbial. Now bile can get recycled and used in one meal, up to 25 times. So that bile is being released by the gallbladder, yeah, going through the small intestine, cleaning everything out, keeping the microbial loads low. And then it gets reabsorbed at the end of the small intestine, through the portal vein, goes back in the liver, gets cleaned up and jazzed up, and then sent back out and secreted back through the gallbladder. So imagine this anti-microbial flush moving through your system, cleaning the system out every time you eat. So that keeps bacteria levels low. Now bile does another thing, it turns on something called the FXR gene in the end of your small intestine. The FXR receptor, which then triggers the FXR gene causes our intestinal lining, our intestinal epithelial cells, to secrete antimicrobial compounds into the small intestine. Specifically to go in and kill bacteria, to prevent overgrowth in the small intestine. So we've got these really important defense mechanisms that are in place to prevent CBOE from ever happening. But what's going on with the bile? Well, for the most part people have dysfunctional microbiomes. And as it turns out, the gallbladder in itself has its own microbiome. And antibiotic use and so on can create this function of the gallbladder microbiome, which basically stops the secretion of bile into the small intestine. So the secretory mechanism in the gallbladder is affected by dysbiosis.

So that's one of the problems. The number two is the liver itself, right? So the liver is undergoing lots of toxicity, because of poor diet and lifestyle choices. The liver's job is to make bile and secrete it out. If the liver is undergoing stress, the amount of bile it's making, lowers dramatically. So that of course then lowers the amount of bile that's going through our system. So that's a big part of the problem. So to me, CBOE should include as a primary part, something for the gallbladder to improve the secretion of bile. And number two, something for the liver to support the liver in its metabolic function, to produce adequate amounts of bile. So that's one part.

Donna: I'll just throw in a little extra tip in here too. Traditionally, milk thistle and there are there are herbs for secreting bile... increasing bile flow. We actually have a product called LivAmend that does that and it's amazing because it also stimulates peristaltic movement. So people that are constipated, they take two or three with each meal, then soon, in a week or so time, they're not constipated anymore. So that's really interesting to me. Are there any microbes... can we bring any microbes into the story, the bile story, and the liver story?

Kiran: Sure, yeah. So with the microbes that we work with, the spores that are really important because the second part of the issue with CBOE, the peristaltic movement and the migrating motor complex, that's the movement part of the gut; that's also dysfunctional in a very significant way. Now, in digging into the research, what I found is one of the main things that stops the movement of the bowel is LPS, lipopolysaccharide. LPS is an endotoxin that's made in the gut, if it's allowed to leak through the gut lining and enter the circulation, one of the places it goes is it goes into the vagal efferent nerve. That's where the central nervous system connects to the vagal nerve. And that will stop these signals from the brain down to the gut to move the bowel.

Donna: That's so important. Just say it one more time because that is so, so important, what you just said. No one knows this.

Kiran: Yeah, the movement of the bowel is dependent on a signal from your brain, and it comes down through the vagal nerve. And then the vagal efferent nerve is the part of the nerve that connects your brain to that vagal nerve, which controls gut motility. So what happens now is when your gut is leaky, because you're got dysbiosis and you've been exposed to Roundup® and antibiotics and all this stuff that's messing up your gut...

Donna: And even stress.

Kiran: Even stress. Yes, stress is a major driver of leakiness in the gut and of course, poor diet and lifestyle choices. When that endotoxin that's produced in your intestines... and it's always there, it's always produced; we cannot get away from it, that's why it's called an endotoxin, versus an exotoxin that comes in from outside. When that endotoxin is allowed to leak through, it gets into the

circulatory system, it migrates up and it lodges itself in that vagal efferent nerve, stopping the signal from the brain to the gut to move, essentially stopping bowel movement. Both the peristaltic movement, which is the part of the digestive movement, that you can feel as the as the gut is moving food down the system. And another important movement called the migrating motor complex, which is an electrical sweeping of the gut to clean it out. Both of those are stopped and here's the thing, the studies show that when the vagal efferent nerve is blocked by LPS, even using prokinetics that are known to stimulate the bowel, does not work because the signal from the master control center, the brain, is completely shut off. So it becomes extremely important for CBOE people to think about healing that leakiness in the gut because that's part of the thing that's driving the stasis, which causes the ability for the gut to overgrow bacteria and not sweep it out, and allows things to start putrefying and fermenting in the small bowel.
So those two things, the bile flow and the movement of the bile are so important and not really addressed in CBOE. Most CBOE patients are being treated with antibiotics and antimicrobials all the time. And then think about this, if you are CBOE, because of the symptoms of bloating and distension, you completely cut down your diet of fermentable carbohydrates. You basically stop eating them, you're basically eating fat and protein. And because the fermentable carbohydrates are no longer in your system, then the colonic bacteria that required them aren't being fed. And the colonic bacteria are the ones that produced the butyrate and the propionate, and the acetate, which rebuild the gut lining. So your gut is just becoming more and more leaky over time.

Donna: And inflamed and that's the irritable bowel disease.

Kiran: And here's the thing; that leakiness in the gut drives non-alcoholic fatty liver disease as well. So now your liver is becoming more toxic and producing less bile and this loop continues to go on and on.

Donna: So what's the solution?

Kiran: So, like you said, the product that you have that helps bile flow, that's going to be really important for CBOE. I couldn't encourage people with CBOE more, to try a product that increases bile flow and increases peristaltic activity. And then you have to address the issue of leaky gut. For us, we use the MegaSpore. We've published one study, we've got a second study going on right now with the same clinical outcome of leakiness in gut. And we've shown that we can stop that LPS from migrating from the gut into the circulatory system, because we have to stop that LPS from getting into the vagal efferent nerve.

Donna: But you can't stop the LPS, the lipopolysaccharides from being produced, no matter what, like the bacillus and other good bacteria, they can't... Can they keep it down though to a minimum, don't they? Having really good bacteria in the gut, by keeping that under control or are the good bacteria producing it also?

Kiran: No, well, some of the bacteria that produce it are a good bacteria. So they're not... LPS is not produced only by pathogens. It's produced by a lot of your commensal bacteria that are friendly and doing good things for you. It's just a component of the bacterial cell wall that is important for bacteria, but when the bacteria die, and that releases the LPS, and if your gut is leaky, the LPS is allowed to leak through and into the system.
So what the bacillus does, the way we saw, how we were able to reduce LPS migration by over 60% in just 30 days, was because it's sealing up those tight junctions. The bacillus, when it gets into the gut, actually increases the expression of tight junction proteins. That's another epigenetic component to it. And they've done a number of these studies on animals. We've done some of these studies as well. We found that when the bacillus is present in the gut lining, whether in the small or large intestine, it increases the expression of our tight junction proteins that seal up the gut and don't let that LPS leak through.

Donna: Oh, that's so important and you just... I do want to point out that people are afraid to take any probiotics when they have CBOE. There's been some myth out there that you have to avoid them completely. Bacillus and I find, even bifidus are fine. It's the lactic acid producing. So then my fermented vegetables can't be at that time. You know, the battle cry for functional medicine is first fix the gut, but also get to the root cause.

Kiran: Absolutely, yeah.

Donna: Probably is the root cause. So, gosh, that's so important. Thank you very, very much for that.

Kiran: Yeah, absolutely.

Donna: I knew when I called you that this was going to be a very special interview.

Kiran: We were going to have fun, we knew it.

Donna: And fun, lots and lots of fun. Well, you know, I've been a fan of yours for years.

Kiran: Thank you so much.

Donna: And we have your microbes in our protein shake too. And I always just get amazing feedback from people about how much it's helped them too.

Kiran: That's amazing.

Donna: So I love working with you and following you, and you guys are

always introducing new things or anybody interested in the gut should be following you, bottom line.

Kiran: Thank you so much. We've been doing a lot of research. We're so focused on research. We've completed and published now, five trials but we have nine other trials in peer review right now. Meaning it's going through the journals and they're peer reviewing it. And then aside from that, we've got another seven or eight trials that are ongoing. So all in all, we've got somewhere around 22 trials that we've initiated and are running. We're very big on the research side because we feel a real compelling need to add to the understanding of all of this stuff, so that people can find solutions, right? At the end of the day, if you work on the gut, it's such a powerful tool at curbing chronic illness, but we really need to understand it more and find the best tools for it. And that's part of what we do.

Donna: Yeah, that's great. And do you mind telling us about some of the trials? Like, what are you looking for?

Kiran: Sure, yeah, we've done all kinds of things like metabolic trials and skin trials. Like, example of one trial that just completed, it was actually at the beginning of this year, was a skin trial where we're looking at the ability of a probiotic to bring down inflammation in the skin, including inflammatory lesions and acne lesions. And we saw the probiotic being able to bring those down in a significant way, in 30 days, by about 40%. Just taking the probiotic orally. We're doing a gum disease study showing that when you ingest a probiotic, and it's stopping the leaky gut and the inflammation; that it changes the characteristics of the natures of your gum, bringing down the severity of gingivitis. We're doing a body composition and metabolic study where we're showing that in 90 days, without any sort of diet and exercise, which is part of the control system, we always recommend people to eat right and exercise, but this one we wanted to see, can we change the way people's bodies respond to food and will that have a compositional change in the body? And with just two of the spores, the subtilis and the coagulants, and then a little bit of a xylo-oligosaccharide, which is a prebiotic, the combination of the three reduces visceral body fat in 90 days, by almost 38%. And the visceral fat is the most dangerous fat, right? That's the fat around the organs. That's harder to reduce. And that's by dexa-analysis. We completed a study showing bringing down of triglycerides in a significant way in the 90 day period. And then we did actually a couple of really fun dog studies because what we wanted to prove was that dogs, our fur babies, our pets, also had significant leaky gut, and that leaky gut was a big driver of chronic illness in dogs. And sure enough, we found that dogs have significant leaky gut, it drives chronic systemic inflammation, just the same as in humans. And we created a spore based dog probiotic that was able to bring down that leaky gut in a very significant way. So those are some of the fun things that we get to study and we work with lots of universities on some of these trials. And then there's a lot more

we're doing, autoimmune stuff. We're doing stuff in cancer. We're doing studies in diabetes and so on, sugar control and whatnot.

Donna: What about the microbes in the sinuses. You said they're different than the gut, of course. But what about treating those? Are you looking at the sinuses? That is such a huge problem and it gets bad and it blocks people's hearing. What about the sinus area?

Kiran: Personally, I used to have a lot of those issues in college and a little after college I used to get four or five sinus infections a year. What I found through the research is that when you look at individuals that have chronic rhinosinusitis, they tend to have lower diversity of bacteria in their sinus cavities and upper respiratory tract, than people that have very healthy sinuses and never get infections. So it's counterintuitive that more bacteria in this area actually reduces your risk for infection. And when you really think about the mechanisms, it makes sense because the microbes that are normal in this region, protect you from all kinds of things because a lot of the sinus infections can be driven by fungus, and can be driven by viruses. And these are the things that we always think about it as bacteria. And one of the things that we do that actually has a negative effect. Is we do too many of those neti pot rinses and all that. You want to be careful of that because one of the things that you're sloughing off is that mucus layer. So when we do the neti pot rinse, and we see the thick stuff coming out, that's actually the mucus layer with microbes that are trying to protect the system. And also, all of our immunoglobulins are in there too. And then another thing that we do, which actually my mom used to tell me all the time, and she's a medical doctor, and then I finally looked in the research and sure enough, she's right, is blowing our nose. So I used to think, years ago that if I'm rinsing my sinuses, I wanted to blow it as hard as possible to get all this stuff out. That was the thinking in the mind. But as it turns out, the harder you blow your nose, the more back pressure there is and the deeper you blow infected mucus into your sinuses. So if you have an infection or the startings of an infection, the harder you blow your nose, the deeper the infection is going to go into your sinuses. And so studies have shown that it actually increases the risk and frequency of sinus infections. And doing too many of the nasal rinses, four or five a week, will actually increase the frequency of sinus infections.

Donna: So if somebody's nose is runny, do you just sort of tap it or something?

Kiran: Exactly. Just a very gentle blowing. Usually the best way is to just close one nostril and very gently blow out the other and do the same the other way. I've completely restricted from any sort of hard blowing of the nose, where it makes that trumpeting noise and where sometimes your ears pop too. You don't want to have that effect at all, and then I've completely eliminated the sinus rinses out of my system. And fortunately, knock on wood, I haven't had an actual sinus infection in probably four years, when I was getting them three or four times a year, each year.

Donna: I have an interview with Susanne Bennett and we talk about kimchi. Her ancestors are Korean. She wrote a little book, a really nice book actually, on kimchi. But she suggested to take a Q tip and put it down in the juice and just swab that area, to do that. For the bacillus, that's not a normal place for them to live, right?

Kiran: You know, it is. Yeah, I've been wondering about this because we have a lot of docs that will have their patients snort a little bit of the bacillus in there, to get it in their system. And it seems to help a lot bring down the inflammation in the sinus cavities. And then I started digging into the research to see, is it normal for bacillus to get into the upper respiratory tract? And as it turns out, desert dust that moves from the Sahara desert and other deserts, major deserts on the globe, across North Africa, across Europe, and the Middle East, contains really high levels of spores. So people are breathing this in all the time and the spores are settling into the upper respiratory tract, and then bringing on anti-inflammatory response in these areas. So it's not a crazy thing to think that getting them in there can actually have a benefit.

Donna: Wow, great, so many tips here. This summit has really, honestly been mind blowing. I think people are going to be shocked when they start listening and get all this information. It's so useful. I have one more thing, I was just looking at my notes, because there's a gene, I think a very, very important gene to know about, called FUG2. And it's about making B12 but it's also about, like I'm a blood type A, so I'm secreting my sugar, my A sugar, into my gut lining, into my mouth saliva, breast milk if I'm breastfeeding, or skin, you know, on your sweat. And where else? The tears of the eyes. If you're a non-secretor and you've got variants in those genes, you're not secreting your blood sugar, O or AB, whatever it is, into those places to feed the bacteria. And what I realized of particularly bifidus, I realized that this is profound, actually. Because when we're born and the inner ecosystem is being established in the beginning of our life, how critical that is, those people, the mother wouldn't have these sugars in her milk. The child, the baby is not feeding the bacteria and all through its life it's not feeding the bacteria. So these are the people that are really more crippled, in a sense. Do you have any words of wisdom for the FUG2 gene?

Kiran: Sure, yeah. Yeah, the FUG2, with the non-secretor status is a more difficult condition to have to deal with because of that lack of carbohydrate in all of these mucosal tissues and excretory tissues that are important. For moms with the FUG2 snip and if you're a nonsecretor, breastfeeding with the baby is going to be really important because your breast milk will still contain numerous oligosaccharides, over 200 different types of oligosaccharides that will then act as a prebiotic to feed the baby's microbiome and help build a mucosa, and all of these other secretory components. Like your tears and your saliva and all of the secretory IgA, all the immunoglobulins that protect, in all these excretory components of the body. And with these individuals, they especially need things

like resistant starches and oligosaccharides, and fermented compounds because those then provide the energetics, they provide the carbohydrates and all that; that are required that they don't naturally secrete to feed all of the microbes in their system. So those individuals will probably need higher amounts of oligosaccharides, resistant starches, fermented fruits and vegetables, to really help support their inner ecology.

Donna: Great, I just wanted to cover that gene because it's one of my pet genes. I think it's so important to get the word out there. It's not supposed to be that common. They say about 20% of the population, but people that tend to come to people like us, practitioners, you know, it's a very large population of them. They're the ones having the gut problems and then having many other problems because they have gut problems. So anyway. Well, thank you so much Kiran, it's just an amazing amount of information. I hope people purchase this Summit and listen to this about five or six or seven times and take notes because it's just priceless information. And you know, what you can do to feel better than you've ever felt in your whole life. So thank you. Thank you very much.

Kiran: My pleasure. I'm honored to be here. Thank you so much for having me. And then thank you for doing this. Because to me, the future of healthcare is people being empowered with information to really advocate for themselves. So we can't just count on our doctors to take care of us. We need to take care of ourselves and the people around us. So this kind of information is really powerful. So I'm always happy to have an opportunity to talk about this stuff. So thank you for doing that and bringing me on.

Donna: Well, thank you very much.