THE MODEL HEALTH SHOW

EPISODE 644

The Truth About Diet & The Human Microbiome

With Guest Dr. Suzanne Devkota

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SHAWN STEVENSON: Welcome to the Model Health Show. This is fitness and nutrition expert Shawn Stevenson and I'm so grateful for you tuning in to me today. We have an entire universe of organisms living within our bodies. The microbiome truly is having a moment of importance right now. Now it can get into a bit of a freaky feeling when we realize just how many microbes are living in and on our bodies. We have trillions with the T trillions of microbes that are existing on our human organism and in particular in our gut. Right now, there's a revolution taking place in understanding just how much our microbiome is affecting our health outcomes. Right now, we have solid data affirming how our microbiome influences our cardiovascular health, our brain health, our mood, our metabolism and so much more. We're just scratching the surface in our understanding and we're going to be talking about that today. But more importantly and more tangibly we're going to be looking at the things that we know for certain and how our diet is influencing our microbiome. And we have somebody who lives and breathes this subject matter.

Her lab, her world class facility is dedicated to studying how food is impacting what's happening with our microbes. And again, this association is so important between our microbes and our health outcomes. In particular she's going to touch on the fact that our microbiome is right there directly in close contact to our immune system. Which our immune system, the majority of our immune cells are located right there along our gut lining as well. It's front-line front and center for good reason throughout our evolution. We need our immune system to be right there on top of everything in case we have an intrusion coming in via something that we're eating. And this connection between what we're putting in our bodies and our health outcomes this is something that seems very obvious on the surface but in our society today we've kind of fallen asleep to this. We've been asleep at the wheel driving our human bodies around and we've been putting in all of this abnormal stuff and wondering why we're seeing these epidemics of gut related issues, gastrointestinal diseases. And we've seen this huge spike in recent years in deaths related to digestive issues and also this huge increase in autoimmune conditions that are largely being triggered by this association with our gut and the rest of our system.

And so today we're going to be breaking down how this association with these newly invented foods, and also looking at what are some of the time-tested proven foods that we should be including to have a healthy protective microbiome. Because that's one of the big takeaways as well is that this is a protective barrier from our bodies and the rest of the external world to be able to be front and center to decide who's friend or foe. Our microbes have a lot to say about this. Now what if we have microbes that are in the endangered species list because of the way that we're treating them or even going extinct. So again, we're going to talk about all that

today. Now just like our human cells our bacteria cells need key things from our food in order to run processes. And whether it's amino acids or whether it's key electrolytes and micronutrients our bacteria require these again to run processes and to thrive as well. So, we want to make sure that we're providing our bodies with the building blocks in order to do all the cool stuff that it can do to provide great health and well-being.

Now one of the most essential electrolytes for our gut health and also even for our brain health helping to maintain proper fluid balance throughout our bodies. Again, including through our gastrointestinal tract sodium is critical in literally keeping our tissues hydrated. Again, in particular for our brain and this brain gut connection which we're going to touch on a little bit today is of the utmost importance. But for your brain which is about upwards of 80% water to maintain its water density we require sodium. If we are deficient in sodium your brain literally can't hold on to water properly and we get a dehydrated brain that according to the journal neurology even short-term dehydration can reduce our brain volume. It can make our brain shrink. That is not good news. What does that translate to? Well even a 2% drop in our body's baseline hydration level and this is according to research cited in medicine and science and sports and exercise. Just a 2% drop in that baseline level can lead to impairment in our cognition. In particular motor coordination, executive function and I'm laughing because we start stumbling around, we're not getting around too well just because of dehydration in our brain being able to operate our body in space and to perform.

Also, executive function like map recognition, grammatical reasoning, proofreading, mental math, putting one and one together to make two and not seven. All right basic stuff. Now of course this might go to an extreme where we're having these cognitive declines, but we're looking for this fancy pants nootropic, or this newly invented concoction of whatever when in reality the primary thing for a cognitive function is water. Now being that sodium and water have this intimate connection and symbiosis. Again, sodium being required to maintain proper water balance throughout our bodies. The problem is and this is according to the FDA over 70% of the sodium in the average American's diet is through the consumption of processed foods. All right this is where most folks are getting their sodium from and it's a very, very low quality highly refined version of that thing that we're looking for. So, when we pull out all of that consumption of processed foods and we shift over we start to eat more real whole foods we could actually become deficient in sodium. This is not good. Researchers at Harvard have indicated that being deficient in this key electrolyte can actually increase the incidence of developing things like insulin resistance.

Again, we need sodium, but we need it to be high quality from real whole foods number one and number two to make sure we're getting our nutritional basis covered. We want to make sure that we're getting it from an electrolyte source that doesn't come along with another leading culprit because when we think about electrolytes they tend to come along with a lot

of sugar, a lot of sugar, artificial colors, artificial this artificial that. We need high quality electrolytes because in this conversation today talking about the microbiome this study was published in advances in nutrition uncovered that there are even more issues with sugar in our microbiome in particular, they noted that there's a clear pro-inflammatory impact that sugar can create in our gut. All right we need our electrolytes we don't need the sugar. This is why I'm a huge fan of element. Go to drinklmnt.com/model and get the very best electrolytes with no sugar, no artificial craziness, none of that stuff just the highest quality electrolytes that you're going to find.

And most importantly this is why dozens of professional teams are actually utilizing Element now and getting away from that crap that was packaged up as this electrolyte source that people were doing previously the Gatorade the Powerade, we're not doing that stuff anymore. They've upgraded and they have all of these fantastic data points on the optimal ratios of sodium, magnesium, potassium and again they've got the data to back it up and right now you're going to get access to a free gift with every purchase of Element, so again go to drinklmnt.com/model. Take advantage of their incredible electrolyte formulas and also you get a free gift with every purchase. You're going to get a sample pack to try out every single one of their electrolyte blends. Head over there check them out drinklmnt.com/model and let's get to the apple podcast review of the week.

ITUNES REVIEW: Another five-star review titled, 'Setting the Standard for Health Information' by Cpix. “Shawn Stevenson is doing the lord's work. He's bringing us the information when the people we expect to serve us, don't. He speaks truth with the resources to back it up. He invites professionals on to share their knowledge which can contradict one episode to the next but that's the beauty of this podcast! It gives you the information you need to do your own research and make your own decisions to improve your health. I can't wait for what's still to come. Keep going Mr. Stevenson! The world needs you!”

SHAWN STEVENSON: Wow, thank you so much for leaving that review over on apple podcast. It really did hit my heart. I truly do appreciate that, and that's what this is all about is to bring in multiple perspectives to be inclusive, but also having the same thread of being true to basic tenets of what our genes expect of us. That's a top priority. And there is no exception today with our special guest because she's going to knock your socks off with her knowledge. Our guest today has been appointed as a director of the Cedars-Sinai Microbiome Research Institute, and also an assistant professor in the Cedars-Sinai Division of Gastroenterology as well as associate professor at Cedars-Sinai Biomedical Sciences. And I'm talking about Dr. Suzanne Devkota. She's been specifically investigating the role of diet in shaping the outcomes of our microbiome. One of her areas of research looked at the effects of dietary fat on host microbiome interactions, and the outcomes of inflammatory bowel diseases which led to some of the first mechanistic insights into why "modern diseases" such as IBD and diabetes and food

allergies have rapidly increased in the last few decades. Now, again this conversation is incredibly insightful looking at so many different dimensions of our microbial health and our overall health outcomes but again in particular her field of expertise is looking at how food is affecting our microbiome.

Let's jump into this conversation with the amazing Dr. Suzanne Devkota. First of all welcome to the show.

DR. SUZANNE DEVKOTA: Thank you.

SHAWN STEVENSON: Thank you for coming to hang out with us.

DR. SUZANNE DEVKOTA: Thanks.

SHAWN STEVENSON: It's so awesome to see you. Why do we have a microbiome? What is this all about? What is its purpose?

DR. SUZANNE DEVKOTA: It's actually, it's a really good question. We have a microbiome because we evolved... So, we evolved with microbes since humans started breathing air, and we kind of realized... Now I'm making it sound like it's a... It's the evolution really, but we didn't have much of a say in this, but our bacteria in our guts and fungi and so on can actually carry out metabolic and biochemical functions that our body cannot do on its own. And that evolved over time I think out of efficiency. So, for example the one we think about most is there are certain fibers that we eat that our body doesn't actually have the enzymes to break down, but our microbes do, and so rather than there being redundancy and our bodies making those enzymes if our microbes have them then we can now focus on a different function and our microbes can do that for us. So, there's many examples of that.

SHAWN STEVENSON: So, like outsourcing.

DR. SUZANNE DEVKOTA: It's kind of like outsourcing, yeah. Exactly, it's like outsourcing functions to your microbiome. Also, microbes produce some essential vitamins, nutrients that our bodies can't make. They can make B vitamins that we only get from either the diet or our bugs some vitamin K's and other vitamins like that and so we really rely on them and so if you wipe them out or you don't have a complete microbiome you could potentially have some inadvertent like deficiencies nutritionally.

SHAWN STEVENSON: Wow, so remarkable and this is just scratching the surface.

DR. SUZANNE DEVKOTA: Yeah.

SHAWN STEVENSON: Because essentially, it's providing us with things that if we don't have them, we can't do certain processes or do them efficiently if we're lacking on this particular diversity. What about short-chain fatty acids?

DR. SUZANNE DEVKOTA: Yes, our microbes make short-chain fatty acids abundantly, but they don't just make them without you giving them a substrate to metabolize. So, fiber from the diet is the primary thing microbes use to make short-chain fatty acids, butyrate, acetate, propionate. And we now know those short-chain fatty acids are really important for gut health, specifically gut health. We don't fully know how much of those short chain fatty acids seep out into the bloodstream and go to the brain and other parts of the body, but we know your gut epithelium, your gut barrier actually to keep that healthy and intact short-chain fatty acids actually help support that. So that's why when we recommend fiber it's really for gut health, so that your microbes can make the short-chain fatty acids and promote a healthy gut barrier.

SHAWN STEVENSON: Right, so we know obviously again gut health which affects everything about us but also, we have some correlations with some other things as well whether it's things going on with our brain, with our metabolic health overall, it's a lot of cool stuff. And this is the thing and I'm so grateful to have you on because you were actually in this world. You were in them guts looking at what's going on and how food specifically is impacting our microbiome. So what led you to studying this and becoming really obsessed with this particular part of science?

DR. SUZANNE DEVKOTA: Yeah, I mean like many other scientists' story is it's accident it's serendipity. A lot of the paths are not just straightforward. I didn't plan this coming out of the womb that this is what I would do. The field didn't exist when I was born, but I always had an interest in nutrition fundamentally, and I have... My undergrad was in biology, but I did a master's in nutritional sciences at Illinois, and that really got me interested in how the body as irrespective of the bugs metabolizes at the molecular level the foods that we eat. And I was in a lab, I was in Don Lehman's lab, and we were really interested in high protein low carb diets. And but the biochemistry of it and it was really new to me, and I was studying insulin signaling pathways, and I really loved complex pathways. And I decided I wanted to go further so I did a PhD in nutrition and metabolism, and that was in like 2007-2008. And just at that time the microbiome field was kind of emerging as something we needed to really pay attention to, and the tools to study it were becoming accessible.

And so, I was... Started grad school did a rotation in a lab where it was a GI gastroenterology lab. I didn't want to do GI research. I want to do diabetes research actually, but I had to fill in a rotation spot, and I said, Okay, I have a nutrition background, let's ask a super simple question. How do dietary fats affect your gut microbiome and not just quantity high fat versus low fat

but saturated, polyunsaturated, monounsaturated break it down, right? Does the source of the fat really make a difference? Really, really, really simple question and we did it in mice, and we found that there was a profound shift in the microbiome when the animals consume saturated fats compared to the other fats, didn't matter how much of the fat but they were consuming saturated fat. And it promoted a bloom of these bacteria that were potentially pro-inflammatory, so that sort of rocked my world and made me really think that these bacteria and nutrition there's a link there related to health and disease and I really kind of wanted to dive into that, so I didn't know what I was going to see but that really convinced me.

SHAWN STEVENSON: That's so cool, and then obviously to take it a thousand steps forward and to open your lab like what drove you to do that?

DR. SUZANNE DEVKOTA: Yeah, I always knew I wanted to have a lab. I wanted to be in academia doing research, and I had all these ideas in my head that I wanted to explore and when you're in graduate school and then a postdoc you're in someone else's lab. And so, you have to do research that's within the theme of that person's, but you eventually start to develop your own ideas and you're just like bursting at the seams. And you're like I got to get my own lab so I can ask my own questions, and that was really the driver because I had so many questions I wanted to ask and hopefully answer.

SHAWN STEVENSON: That's so remarkable. So basically, you don't like being told what to do. Let's just be honest.

DR. SUZANNE DEVKOTA: Who does? I mean, yeah.

SHAWN STEVENSON: I mean, some people do. They like you know... But I love that because again you're bursting at the seams as you said with things that you want to study or experiment with or ask questions but being that you didn't have your own lab you kind of had the politicization of the thing.

DR. SUZANNE DEVKOTA: Yeah, yeah. There's... Yeah.

SHAWN STEVENSON: And so, you opening your lab it's been pretty remarkable the information and just you know our mutual friend, Gabrielle Lyon has just been sharing so many cool things that you've been up to, and I want to talk about some of these things. But I think primarily if you could, and I know this is a super complex question I'm going to ask you, but obviously the microbiome is having a huge moment and it's kind of serendipitous even your timing of getting into the field, right? It's so remarkable because this is the big thing.

DR. SUZANNE DEVKOTA: Yeah.

SHAWN STEVENSON: What makes up a healthy microbiome?

DR. SUZANNE DEVKOTA: Yeah, that is the question that all of us in the field want to know and it's such an important question because many of us are studying microbiomes and disease, but you can't understand disease without understanding healthy. What we do know unequivocally, I don't think anyone would argue with this is that every person, every organism's microbiome is different from one another... It's like a fingerprint, and we see all the studies... If you look at all of these big sequencing studies, the first conclusion that comes out is inter-individual variation. Once you normalize for that you can start to look for the other treatment effects. So, what is healthy for you might not be healthy for me and vice versa. So, there's this interplay of your body's chemistry, your biochemistry, there's a little bit of genetics that determines your biochemistry.

And where in the world were you born? What parents were you... What families were you born into? What foods were you weaned onto? What water supply are you drinking? What air are you breathing? All of that stuff determines your microbiome. It's not nature versus nurture. It really is, it's nurture, it's your environment primarily that determines it, and everyone's environment is slightly different. So that's a very unsatisfying answer, but there are some things that we know that are kind of core conclusions that we would all point to as being healthy. Number one is a diverse microbiome so having many different types of bacteria in your gut. It's your bacteria, they carry out essential functions. There's redundancy in those functions, so the more diverse bacteria you have the more redundancy is built in. So, if you accidentally knock one of them out the functions can still proceed. If you have low diversity, you knock out that function, and it can no longer be carried out.

So, diversity is really important, and so when we say diversity that's why. And that's really the primary thing that we know. You want a lot of different bugs in your GI tract, so then when you think about okay what can I do to maintain that it's kind of common sense, antibiotics, right? Wipe out your gut bacteria so obviously chronic antibiotic use isn't going to be good for a healthy microbiome, things like that. You can sort of extrapolate how to maintain health in your microbiome.

SHAWN STEVENSON: Wow, this is fascinating. And you said with the nature versus nurture thing this brings the question you would probably have a microbiome that's more similar to your wife than say your mother?

DR. SUZANNE DEVKOTA: Totally. Yeah, absolutely. There's been studies on this, and I love to quote these studies. Cohabitation is a major driver of your microbiome composition and not so much like it'll completely shift you, but it'll make you more similar to another person. And

even if you have pets, you can exchange microbes with your pets, and it's not necessarily a bad thing it just is. And so, this might be a topic we get into later but in the early days of fecal transplants.

SHAWN STEVENSON: I just wrote fecal transplants. I just wrote it. We're lined up.

DR. SUZANNE DEVKOTA: I know. In the early days before there were stool banks where you could go and get stool. The recommendation was your donor should be a healthy person you live with because it will be more likely to engraft in your gut because it's kind of more similar. It probably is some of your original bugs, so there is something to the cohabitation and similarity, yeah.

SHAWN STEVENSON: All right. Now, since we're on fecal transplants which can sound super weird. First of all, what is it? And second of all, what are some of the benefits that we're actually seeing in science right now?

DR. SUZANNE DEVKOTA: Yeah, a fecal transplant is collecting stool from a donor and using it to a recipient either through multiple routes, either through capsules, through a nasogastric tube from the top or through an enema from the bottom, so you can colonize all the relevant parts of the gut, but it's essentially colonizing one person with another person's microbiome. I feel like it's common knowledge, but I realize that it's not and it sounds very gross to a lot of people, and it kind of is but it works for certain diseases amazingly. It's like a miracle. So, the one area... The condition in America that you can do a fecal transplant legally in a hospital is for recurrent Clostridioides difficile infection, and this is a bacteria that is actually, many of us have it naturally. It doesn't cause any problems, but when you go on broad spectrum antibiotics, and you suppress the competition and if it's in your gut it will overgrow.

And sometimes you can get rid of it with antibiotics, but sometimes you can't and it keeps coming back so it's recurrent. Recurrent C. Diff is what we call it, and it can cause colitis, like really, really bad intestinal inflammation. And there's no treatment for it in these patients who get it in the recurrent state except for fecal transplant, so the FDA has approved it for these individuals and there are stool banks such as Open Biome which is based in Boston that has donors, that will healthy donors that get screened they get screened for infectious diseases and so on, and the stool is there and a doctor can call the stool bank and request capsules. It's a lot, it's like 30 capsules you have to take, but many people prefer that over getting you know a tube stuck in them. And it works, actually, I think the studies that have been done show something in the range of 95% efficacy or antibiotics. So, it's been a miracle cure for these people. And many scientists are trying to recreate stool synthetically, and it doesn't do as good a job as the real thing. And we don't know why.

SHAWN STEVENSON: I mean for me it's a little bit obvious, of course we have this paradigm better living through science and science is obviously super important, there are certain things that are incredibly difficult, I wouldn't say impossible to replicate but for stool to be created like so many... We're talking probably millions of interactions at minimum are taking place, and these things have evolved over hundreds of thousands of years, or longer to be able to do this particular thing. And there's this intelligence. And this is really the... The point is there's this intelligence with our microbes that is just so remarkable and we're just now starting to understand some of it. With that said this intelligence and what we've evolved kind of giving us inputs because you said this at the very beginning, it's not the microbes in of themselves, it's what we're feeding them to. So, these are the prebiotics.

DR. SUZANNE DEVKOTA: Yeah, exactly.

SHAWN STEVENSON: Now with this interaction and what we've evolved eating what happens when we go to an extreme with various diets? And we know the guys, these are my friends and colleagues, we got a carnivore camp over here, we've got vegan camp all the way polar opposites on what they're constituting for their diet that they're providing their microbiome. What have you found because again you're looking at what's happening with food interactions with these various diets and us potentially leaving things out.

DR. SUZANNE DEVKOTA: Yeah, so I don't hate on any one of these diets, because just like the microbiome is like a fingerprint What diet and way of eating works for one person versus another? If you feel good on it and you're healthy and you go to the doctor, your blood... All that looks good and you're feeling good on it, that's really... And you can maintain that way of eating then that's really all that matters. So that's fine whichever these diets people choose, but they're... Going back to the concept of diversity, of your gut microbiome, the way you create diversity is by eating diverse foods. So, if you're very one-dimensional in the types of foods that you eat, if you're eating a carnivore diet you are eating a very one-dimensional diet compared to an omnivore. I mean, there's no way to argue against that, but if you're eating mostly meat, you're going to facilitate a microbiome community that is very efficient at metabolizing amino acids and proteins and breaking that down.

So, your bugs is form and function. The bugs you have are the result of what you are feeding them. It's really straightforward. It's not rocket science and so if you are an omnivore and you're eating meat and you're eating plants and you're eating whatever...

SHAWN STEVENSON: Mushrooms.

DR. SUZANNE DEVKOTA: Mushrooms, whatever, you're going to have bugs that will break down lignans, that will break down amino acids, that will break down phytochemicals, that are

not in these other diets. So, you have just more diverse bugs and so my personal feeling is the omnivore diet is the healthiest diet you can eat. Now, there's so many versions of omnivore ranging from ultra-unhealthy to very healthy so obviously there's a spectrum within that but I'm an omnivore I eat meat I eat everything pretty much, but that's a personal preference. But narrow diets beget a narrow microbiome, and it may not manifest in the moment as a problem. I know many people eat narrow diets and have normal bowel movements and things like that, but we haven't followed the long-term effects of this, and we need to. And I actually, I have been thinking about... I'd love to crowdsource people who'd be interested, put it out there. I would love to get some carnivores who want to donate stool samples and let's answer this question. Let's compare the carnivore to omnivore to vegans, and actually let's just look longitudinally at microbiomes. And I will do that study, so whoever wants to do it hit me up and let's design a cool study to really answer this once and for all.

SHAWN STEVENSON: Yeah, I love it and that's the thing is asking these questions and actually let's put together a study and let's look at it. And it seems obvious but part of the cool thing about you having your lab and being acclimated to this world even though if we might have these questions there's an issue with, again, politics and funding and all these things but we don't have to have all this infighting. We can answer these questions, but I think one of the biggest most important things that you've already shared which is we're all so unique, and there are going to be outliers on those polar opposites. And we can all have little trysts with these different things as well and experiment and find out what's best for us. But part of the problem I think is we become so idealistic and dogmatic. We find something that works for us, and we assume it's going to work for everybody else, and our microbiome, our unique microbial fingerprint would have something else to say about that. And I just kind of like to go back to what have we been doing the longest as a species, right? As far as like a completely vegan society or culture we haven't seen that before, so we're running an experiment which can manifest health potentially. We have to be open to that, and same thing we very rarely see a completely carnivore society throughout history.

We've seen a little bit more something closer to that, but even folks that are doing a more of an animal based protocol, a lot of times are still including some plant foods as well. And especially as they go over time, but this is not to say that there aren't going to be outliers because a lot of times we point to well, this person's been doing this for 40 years...

DR. SUZANNE DEVKOTA: Yeah, I know.

SHAWN STEVENSON: There's liars then the word outlier too by the way. I'm just going to throw that out there. I'm just going to throw it out there. Once you actually meet some of these people... But again, when we find something that works... I'm so grateful that you said that we can't knock that, we can't just, especially, again if you're healthy you feel good your blood

works good. Now, I want you to give yourself permission to be open in case you do run into a pitfall, and don't tie yourself to this ideal versus what's best for you. And so, I want to ask you about this because these diversity inputs what happens when we lose diversity? Can we... For example, let's just say that we jump onto an animal-based diet and we're doing that for a while and we're feeling good, but then we start to maybe develop a deficiency or whatever the case might be, can we get species back once we lose them?

DR. SUZANNE DEVKOTA: Yes and no. It depends on how long that reduction diversity has gone on, so an example I will give is from a study from Justin Sonnenberg at Stanford great microbiome researcher, did this beautiful study. It's in mice but it's an amazing proof of concept study that highlights this. So, he was looking at generational loss of microbes over four to five generations of mice that were born and was looking at what happens if progressively you start losing fiber in your diet and stop eating fiber. So, they had mom mice that were on a high fiber diet and then the pups were weaned onto a high fiber diet, and they had this complex diverse microbiome. Then each subsequent generation was weaned onto no fiber diets, and you could see the progressive loss of certain species of microbes, major classes that we view as important microbes today. And as the generations went on when they tried to reintroduce fiber into the diet, they could not no matter how much fiber they gave re-support those lost bugs and re-colonize those support bugs, those bugs that they lost. So, there was a point where no matter what you do your diet cannot recover what you've lost.

SHAWN STEVENSON: They go extinct.

DR. SUZANNE DEVKOTA: They go extinct, extinction and that was a really, that was probably the first paper that talked about extinction of microbes. And it's controversial because people always believed you could bring bugs back but it's just showing no you couldn't, and if you look at our trajectory as humans over from our hunter gatherers to our lives now there has been almost certainly extinction events in our microbiome. And you can look into some cultures around the world there have been studies of the Hadza, which people have read a lot about the Hadza in Africa. You look at Inuits in Alaska and in New Guinea and native populations, and they have fundamentally different microbiomes than we have. They're much more diverse and so we as a westernized society, industrialized society, I guess have lost some of these organisms and we likely won't get them back. Probiotics are not really the solution because they are a very narrow spectrum of bugs and they may not be the ones we've actually lost, and so in the short term if you decide to go carnivore for a year and then you go back, yeah, you could probably recover anything you've lost. Generationally, you can actually have extinction events.

SHAWN STEVENSON: Wow and you just mentioned these different populations with incredibly diverse and different microbiomes, the Hadza, Inuit. But they tend to experience far less

chronic diseases that we see today in our modern society which also speaks to when we see this loss in diversity or even a certain cascade of bacteria, can we see correlations with certain health issues like obesity for example based on our bacteria makeup.

DR. SUZANNE DEVKOTA: Yeah, it's difficult to deconvolute that from other lifestyle factors. I'm not a microbiome researcher that believes that microbiome is the end-all and be-all to all the chronic diseases we're experiencing today. I do think it's a factor and an important factor to some and not others. I think metabolic diseases there is almost certainly a role for the microbiome. Will it trump overeating, I don't know that that's the case. I think controlling portion sizes and exercise and all that will still always be the primary solution for treating obesity, but could it be that... There's always those stories of I'm doing everything right and I'm still not losing weight, or I'm still having to take metformin or whatever. And it's likely there are underlying issues potentially related to your microbiome that could be involved there, and those are the kinds of things we're trying to understand, but if you look at these societies as you mentioned that don't have these chronic diseases.

There are also other things at play such as communal living hygiene eating from the earth the style of eating that can all play into preventing chronic diseases, but all those things affect the microbiome in actually a beneficial way. Your microbiome is it becomes more diverse by being exposed to your environment, by being exposed to other people as we talked about, by being exposed to natural foods eating with the seasons that sort of thing. We know those things to be true. So, it's all connected, and your microbiome is a part of it.

SHAWN STEVENSON: Yeah, yeah. Even exercise and movement affect our microbiome. There's new research on that too, and what I'm really hearing you say is like there isn't necessarily a chicken or egg scenario here. We know that they feed into each other it's not that the microbiome issues or the thriving nature of it is causing these other things and this is not necessarily causing they all are associated in relationship, and this is, but again that's so obvious. Everything is going to affect that fingerprint, and even your fingerprint today is it going to be the same tomorrow?

DR. SUZANNE DEVKOTA: Right, probably. Yeah, probably but you have... Your microbiome can change dramatically in a 24-hour cycle, but it tends to bounce back. And we've done studies with intermittent fasting, and we've seen with at the like 16-hour time point of fasting your microbiome diversity plummets. But as soon as you start eating again it goes right back up, so you have some dynamic shifts day to day, but if you looked at someone's lifespan from... Your microbiomes kind of stabilized around puberty 14, 15, 16 that age all the way to adulthood. It's pretty darn stable, and you have to have chronic antibiotic, use things like that major events to really... You know GI surgery to really cause a dramatic shift, but traveling, jet lag, trying out

different diets for a short period, moving into a new place... Those are kind of blips in the big picture. But if you do those things chronically you can alter the overall community.

SHAWN STEVENSON: Right, we've got a quick break coming up. We'll be right back. Recently scientists have discovered that the human gut is a mass of neural tissue filled with 30 types of neurotransmitters just like our brains. Because of the massive amount of brain-like tissue found in the gut it has rightfully earned the title of being "the second brain". Technically known as the enteric nervous system. This second brain consists of around 100 million neurons. Now, here's where it gets really interesting. Researchers at UCLA discovered that the trillions of bacteria in your gut are continuously communicating with your enteric nervous system aka your second brain. And researchers from Caltech reported that certain bacteria in the gut play an important role in the production of hormones that are crucial for our mental health, body composition and even our sleep quality. With the impact of processed foods, stress, and environmental toxins the health of our microbiome can be severely disrupted.

In addition to a healthy real food diet there are wonderful sources of nutrition that can improve the health of our microbiome like few things can. A recent study published in the peer-reviewed journal: Nature Communications, uncovered that a unique compound called theabrownin found in a traditional fermented tea called pu'er has some remarkable effects on our microbiome. The researchers found that theabrownin positively alters our gut microbiota and directly reduces excessive liver cholesterol and reduces lipogenesis aka the creation of new fat. Another study published in the journal of agriculture and food chemistry found that pu'er may be able to reverse gut dysbiosis by dramatically reducing ratios of potentially harmful bacteria and increasing ratios of beneficial bacteria. This tea is truly incredible, but as with everything the quality and sourcing matters a lot. This is why I drink the fermented Pu'er tea from Pique Life.

They use a patented cold extraction technology that extracts the bioactive compounds in their teas at cold to low temperatures, and this process actually helps to increase the amount of antioxidants and phytonutrients that we are getting from our tea. And I also love that it's wild harvested, meaning that it's even more concentrated in polyphenols than any other tea source plus Pique is making sure that it's triple toxin screened for one of the highest levels of purity and right now in the industry with teas there are a lot of things going on with heavy metals toxic molds, so making sure that there's none of that in their incredible tea. They have over 20 delicious award-winning flavors, and I'm sure that you're going to find more than one that you love. Go to piquelife.com/model and use the code model at checkout and you're going to get 10% off their remarkable Pu'er tea and all of their other tea varieties. Again, go to piquelife.com/model; That's P-I-Q-U-E-L-I-F-E.com/model. Use the code model at checkout for 10% off and now back to the show.

So, mentioning surgery, what about the microbiome... Is there any changes that take place if someone has say a gastric bypass procedure which again these procedures have skyrocketed in recent years. Is there a change to the microbiome?

DR. SUZANNE DEVKOTA: Yeah, and we're actually doing research in this but before that I'll preface it by saying there was a study published looking at exactly this, I believe in science translational medicine many, many years ago, where they looked at the microbiome before and after... The gut microbiome before and after gastric bypass and they found huge changes and they found that that correlated with... You know with gastric bypass most of the metabolic issues are corrected with gastric. People get off most of their medications, but actually the field doesn't really know why because it happens so quickly even before the weight reduction occurs. And they found this coincides with changes in the microbiome is largely correlational. We are studying how bacteria interact with fat tissue directly to cause fat expansion.

And for that we are accessing patients who have had gastric bypass and we're getting their fat tissue and their gut tissue and the interesting thing there is we are isolating live bacteria from the fat tissue of these individuals, and what we have found leading up to this study in another set of patients with Crohn's disease is that bacteria leave the gut pretty often in even healthy people, but in chronic diseases they tend to more bacteria tend to leave the gut and more pathogenic bacteria tend to leave the gut. And they embed themselves in fat tissue and they can actually cause a fat tissue to expand, so this is a potential new paradigm around obesity that is independent of excess calories and lack of physical activity that relates to your gut barrier and what we might call leaky gut. It's totally a new concept and we're really diving into that, but it could be we think it goes beyond Crohn's disease, we think it is related to obesity, we think it's related to other conditions in the body where fat expands around your organs and causes downstream issues. So, it's like direct bacteria to fat cell interactions.

SHAWN STEVENSON: Wow, that is so fascinating and this reminds me some research from the Weizmann Institute, and this is paralleling the question I asked you a little bit earlier about the potential correlation with obesity, maybe insulin resistance when we have shifts in the microbiome, but not really, again, the chicken or the egg we don't really know but you're asking these questions and finding out and now we've got this interaction with bacteria and our fat cells themselves which again it makes sense. Because before you know it there's like little inklings of things like with brain biome being a potential here. So, this begs a question we've already moved from the gut microbiome to how does that impact things that are moving away from the gut like our skin for example, our skin has a microbiome but are these two in association?

DR. SUZANNE DEVKOTA: Yeah, I mean you see now the gut fill in the blank axis, the gut brain axis, the gut skin axis, the gut joint axis. Yeah, so all of those are really interesting in hot areas

right now, so yes there are defined niches in the body that microbes live in communities. The gut obviously skin the mouth, throat and the urogenital tract. Those all had their own microbiome communities, but this concept that are these communities communicating is really new. I mean people are even talking about the gut and the urogenital tract communication related to preterm birth right, and how babies are colonized. From the beginning we always thought it was you know vaginal bugs were the first bugs to colonize a baby, but now we're finding that gut bugs as well and what actually how is that happening, so it's a totally new area. In terms of more distant sites, so gut brain, gut skin what is likely happening there is the gut has the highest density of microbes in the body.

And those microbes are producing chemicals like huge amounts of chemicals divert like things like serotonin, things that we usually think that only our body makes, our bugs can also make those. And they're small and they diffuse into the bloodstream, and they circulate in the body, so they can circulate to the brain, they can circulate to the skin. So, it is very likely that there is communication through the chemicals not necessarily at these distant sites through the bugs themselves, but through the chemicals that they're making. And it's a very difficult thing to study because the tools we have it's not easy to distinguish what is a chemical made by a bacteria versus made by our bodies because they can do sometimes the same. So, the tools need to be worked on a little bit better, but absolutely these axes from the gut going to other sites is a real thing.

SHAWN STEVENSON: Wow, that's so cool. It's not like, again, like a gut bug is yelling at a skin microorganism "Hey, Ezekiel... " And having that kind of thing versus the chemicals that they're creating, again, in us for us and that, but man this is expanding to a whole other domain of... These are things that we couldn't understand not that long ago but now being able to like really zoom in and look at what's happening. Now, part of this though when we zoom in, we start to try to identify and target this is the cause of this problem, and then we tend to have potential multi-billion-dollar drug for that one little thing. And in reality, we've kind of gone to war with microbes. Since this discovery, having a strong enough microscope is like, "Oh... That's what's causing all these problems. Let's kill that stuff not realizing we're mostly made of that stuff. So, are we too clean right now as a society?

DR. SUZANNE DEVKOTA: I think so. I think especially after the last few years, yeah, absolutely we are... It's the knee-jerk reaction to microbes is you want to get rid of them. Since we were little, we were raised to think you know but you don't eat that thing off the floor, wash your hands all the time, I'm not saying you shouldn't do those things. I mean there's...

SHAWN STEVENSON: Five second rule.

DR. SUZANNE DEVKOTA: Yes, if you're in New York city subway and you're holding that pole you better wash your hands, and don't touch your eye.

SHAWN STEVENSON: What's been on that pole?

DR. SUZANNE DEVKOTA: Yeah, because you will almost certainly get pink eye. So yes, there are certain cases, just use your common sense and wash your hands. But people have taken that to the extreme especially with their kids, and kids are... There's so much to learn from how kids are... Like how their guts are colonized, and there's a lot of focus and research on babies and kids. And whenever I have a friend who has a baby, I'm like, "Come on, give me some stool." So, we can track your baby over the first few years and see if they're being colonized appropriately because we know that... You asked me why do we have a microbiome, the other important role for having a microbiome is to educate your immune system. And your gut has the highest density of immune cells in the entire body, and if you don't educate your gut appropriately very early on you can cause aberrant immune responses everywhere else.

And we see okay, why are there peanut allergies everywhere? Why are there all these things that didn't really exist when I was in school even? And in part it's because you know you don't see the effects until many, many years later, but we have transitioned into a society that is at least in the U.S, hyper clean. And I'm a big advocate as are many of my colleagues that we need having pets in the house, letting your kids play outside. Kids are on video games, they're inside all the time and it's a problem. Many of us didn't grow up that way. We were outside and just go home for dinner or whatever it is or, and that is probably the healthier way to, to live. Now, you can recreate things like that, not everyone's comfortable letting their kids just run out wild into the street. I grew up in the Midwest it was pretty like the woods are right in the backyard, but maybe live in an urban environment and that's not an option. Still like being outdoors is so important. Interaction with other kids, other people even as adults is really important. And we kind of eliminated that rightfully so for three years, but what's going to happen? What are we going to see is the effects over the next five years? And we're seeing it right now with all the respiratory infections in kids.

SHAWN STEVENSON: Yeah, it's crazy.

DR. SUZANNE DEVKOTA: Yeah.

SHAWN STEVENSON: And of course, them being the least susceptible to all of the distancing and the shutdowns and all the things... For me one of the things I was kind of trying to bring to light which is having this one size fits all approach might not be a good idea, because what are the long-term ramifications. And we're already seeing some of those psychological, but also half of my son's school was like out of school just like... And it's not the 'VID. It was you

know all these kids are being sick with something else, and they their immune systems haven't had this education. And this is really what I'm hearing too is the environment and being in nature and interacting versus being on the, the PlayStation. We're missing out on all these inputs for a microbiome and thus the training for our immune system and thus making us more susceptible potentially to all manner of things.

DR. SUZANNE DEVKOTA: Yeah, absolutely. I mean it goes beyond just childhood obesity sedentary, playing video games sedentary. There's the whole immune, the things you don't see. The gut education immune system and all that is as important as just simply metabolically and getting physical activity so yeah absolutely and kids, if we support healthy microbiomes in kids now the long-term effect on the health care system and everything will be so much less than what we're seeing today.

SHAWN STEVENSON: Can we talk about where this all started like the hygiene hypothesis. Let's talk about that a little bit.

DR. SUZANNE DEVKOTA: The origins of it, I mean, have been infectious diseases research has been studied for a long time and the definition of the hygiene hypothesis has different forms, and maybe I'd have a very liberal definition of the hygiene hypothesis whereas in some definitions it's strictly related to like antibiotic usage, and so the topic has been discussed for a while but there's this figure I use a lot in my talks from the new England journal of medicine where it shows the early 1900s you can see an increase in like just staggering rise in deaths from infectious diseases. That's what most people were dying from in the early part of the 1900s, then you go from 1950 onwards and you see a dramatic drop in those, but a dramatic increase in chronic diseases. And so, this has been one of the things that has been pointed to as an explanation has been our over modern medicine which is great, and that's important but the chronic disease part is the improper education of our immune system through over sanitization.

And so, there is probably something to it. It's probably multifactorial, but it's a concept that's been studied for quite a while. I have colleagues who've written a couple books on this, and they're compelling if you want to like really dive into it and learn more you can check those out. It is a really interesting theory.

SHAWN STEVENSON: Yeah, it seems like the obvious thing would be to have a little balance with this. Like you said, if you're on the pole in the subway that might be a good time, or if you're out at a gala, like I was yesterday shaking a bunch of hands and that kind of thing, and then you want to go dip your fingers in some guacamole, maybe you wash your hands. But I've seen this where walking into a classroom for example they've got the Purell...

DR. SUZANNE DEVKOTA: Yeah, the Purell, yeah.

SHAWN STEVENSON: Pump right there as you walk in and like doing this five times a day, sometimes people are doing it more. Is that a good idea? Like what is it doing potentially to our skin microbiomes?

DR. SUZANNE DEVKOTA: Yeah, I mean there have been studies now, so all the hand sanitizers that you see today are alcohol based. So, they just cause your hands to get really, really dry and they will kill whatever kind of bugs are on there. There have been studies now kind of looking at hand sanitizer use and effects on, on your microbiome sort of skin, and actually gut microbiome as well. And they're seeing some effect... No, I don't like to mention them as much 'cause it's very associative and I don't like some of these association studies, because they're still... The relationship is a little bit tenuous, but you almost certainly are affecting your skin microbiome by chronic sanitizing use. But that's really your hands. Most people aren't wiping it on their whole body.

SHAWN STEVENSON: There's some people that do.

DR. SUZANNE DEVKOTA: I don't know, maybe. But you now also see these products that are microbiome like body cleansers and so I think people are starting to realize that, hey, maybe the over cleaning isn't necessarily good, and we need to try to support either the barrier of your skin, or try to repopulate them in some way. I don't necessarily believe the probiotic skin products are right but protecting your skin natural environment is important. Sanitizers before were really problematic because they had bactericidal chemicals in them that actually would kill bugs or prevent colonization of potential bugs. And the FDA actually made companies eliminate those because the companies couldn't prove that having that in the product was actually better than just alcohol alone. And so, the FDA said there's potential more detrimental side effects to having those in there than keeping them, so all the companies had to get rid of them.

So now the hand sanitizers are just alcohol and that's okay, but I wouldn't use it in excess. Actually, soap and water is really the best way to go for cleaning your hands, if you have access to that choose soap and water don't take a alcohol-based hand sanitizer.

SHAWN STEVENSON: This gets me thinking so this is external and again we can't see it and I think that's part of the issue too, but we have this protective barrier that's evolved. Again, we don't really understand the intelligence that's there, and we could just kind of tear it down as we're doing this habitually really. Again, there's a spot case for you to use some, but ideally again soap and water, but internally this got me thinking about that as well with oh, man I was just looking at the environmental working group and some of this stuff on pesticides and

herbicides and this whole stuff, and there's so many that are like caught up in red tape. There's one like chlorpyrifos is found to like disrupt the microbial genes in some kind of abnormal way that's leading to higher incidence of like birth defects and it's so crazy and it's... The data's there enough to be like let's pause on this, and it's been going on for quite some time, but because these companies... Again, it's about growing the food and getting rid of those pests, but what are we made of? Those same microorganisms that you're trying to kill these little bugs, what about our bugs?

DR. SUZANNE DEVKOTA: Yeah, yeah, the environmental toxins is a really fascinating area. Things like glyphosate, common pesticides, there's been research on their effects on the microbiome. And definitely reducing gut microbiome diversity. One thing that... Apart from the microbiome chemical pesticides and other things like that are found in paint and so on are called endocrine disruptors. And they've been studied for a long time for their effect on creating like insulin resistance because these chemicals actually get stored in fat. Your fat sops up all this stuff and so the more fat you have the more you'll store in your body. And there are things that they're insidious. They're kind of whether it was BPA at one time and plastics, things we don't really know that are in our food supply or otherwise. And they get stored in fat tissue and so then what happens when you lose weight? Do you release all that into your body? What is the side effect of that? But they actually interact.

They have chemical structures that can mimic hormones. They can interfere with sort of our metabolism of certain sterols, and we don't know, and that's independent of the microbiome there are not a lot of people in the microbiome field studying the interaction of those with the microbiome and there probably should be. A lot of people are studying the role of food additives that are intentionally put into the food supply to make food taste better, and so on. But the environmental toxins is a really important field I think more people need to look into from a microbiome gut health perspective.

SHAWN STEVENSON: Yeah, I think all of these things are stacking conditions against us just in, again, the last few decades is where we've seen this rampant increase in chronic disease, but like you said infectious diseases went down for a bit but even a few of those are like on the rise. And I was looking at a study that was looking at a snapshot like the mid '80s and seeing ironically and even the research was just like surprisingly we are seeing an increase in infectious diseases. And potentially we're going to have both at epidemic proportions here because of the overall disruption of our terrain. I think it's intimately connected. And earlier you mentioned probiotics and obviously this is a huge market, and that's the thing marketers... Do your thing. When I see a commercial like on Network TV for probiotic then I know, okay like but is this of efficacy? And I think we can miss the point because we superficially believe that this whatever 10 billion units of whatever is something that your body needs, and/or that it's going to even populate.

It could just be an expensive jar of whatever versus you mentioned the poop pills. All right, I think that the efficacy there is different because there's intelligence there, and more of a resonance maybe with the human body versus whatever they're doing to make these probiotics. Let's talk about that.

DR. SUZANNE DEVKOTA: Yeah, as I said I mean people have tried to recapitulate what is in stool you know to create healthy microbial communities and it doesn't work. So, I'm not saying everyone should be going out doing fecal transplants like at home if you're otherwise healthy so like really don't do it at home, just don't do it at home. But a probiotic is that concept, it's a synthetic community that has been created in hopes that it will colonize your gut and do something good. I commend people for recognizing that gut health is important for overall health and wanting to do something about it, so people are always like, "All this whole time was I doing nothing?" And they don't not do nothing, right? They just don't do what you think they're... And you're spending a lot of money doing what diet likely can do for you, the foods that you're eating versus spending 100 bucks on your probiotic. Now, what I will say is probiotic technology and research has come such a long way from where it was just five years ago 10 years ago.

So, there's going to be new generations... Or probiotics are already in development that are going to make a difference, and I think companies are trying to do good in this space. But the existing formulations what they really are just different combinations of the same old bugs that we keep seeing, and there has been a lot of regulation around how they're labeled on a bottle, what needs to be shown. Before it was a wild west. You didn't know what was alive in that pill, a lot of them were dead, a lot of them were not ever like verified, they'll say a number but they was never actually tested at manufacturing that it was 10 billion or 20 billion, it's just put in there. And it became a multi-billion-dollar industry with very little regulation, and so now that's all coming to a head and the labeling is becoming a lot better. People want to know, Okay, if I want to take a probiotic, what should I look for? And I say, "Okay, listen I'm not going to convince you one way or another, but if you choose to take a probiotic what should you look for?

You obviously having a lot of CFUs, and you'll see on the label, you know 50 billion plus. And I try to explain, you have 100 trillion at least bacteria in your gut. That's a lot of zeros, and your 10 billion... 10 billion to 100 trillion is like a drop in the Pacific Ocean. And you're hoping that makes a difference, it ain't going to happen. So, you want as many billions CFUs as possible. Then you want as many diverse kinds of bugs in that probiotic as possible as well, and ideally the probiotic has a prebiotic in it. So, some fiber source something to support those bugs and ideally an encapsulated version that can make it past the stomach acid and colonize appropriately, hopefully. You won't never know if it colonizes actually, but you hope. So those

three things would be things that I really would look for if you choose to take a probiotic and hope, hope for the best.

SHAWN STEVENSON: And hope for the best.

DR. SUZANNE DEVKOTA: Yeah.

SHAWN STEVENSON: This gets me back to thinking again what have we done the longest which is eating a diversity of foods, community interaction environment all of these inputs are going to strengthen support a healthy microbiome. And working at a university for so long, I work with people from all over the world. And I got into this place where I started asking each person from a different culture about cultured foods, and without fail whether they were from Ethiopia or from Korea, there's a cultured food that is like a staple in their traditional diet. Not that they're necessarily eating that way anymore, not that they're here at this university in America, but every culture had some kind of a cultured food. Is there any potential benefit there with fermented foods?

DR. SUZANNE DEVKOTA: It is a great point. Every culture does have some fermentation process that is a staple or was a staple at one point, and from an anthropological standpoint is pretty fascinating. And there's fermentations in an excellent preservative, can keep things for a long time. So, there are reasons for that how it developed in part for those purposes, but fermented foods are going through a huge renaissance right now. And during the pandemic people were fermenting everything, pickling everything, creating... I mean it was a thing to do being... Sourdough bread is a fermented food to a degree, and you couldn't find yeast during the pandemic either. So, there is definitely a movement in fermented foods which I support wholly. I think fermented foods are an excellent, excellent food source to support the gut microbiome. But why I think they're an important food source is not because they have live bugs in them which most of them still do have live cultures in them, it's because that it's kind of a living food and in the process... I talked about that the gut bacteria making all these metabolites all these chemicals that go to the rest of the body.

Well, your fermented food is laden with those chemicals, because the bugs are in there fermenting, doing their fermented things. And if you were to do a mass spec analysis of the liquid fraction of kombucha it would be thousands of chemicals in it. And we've actually done this analysis with... Actually, UCLA did it as part of a project that I was involved in. And so, to see what is in a bottle, kombucha blew my mind and convinced me that these fermented products are potentially... They all have you know... It's unregulated we don't know what the concentrations are. Every food is made wildly, some batch-to-batch variation things like that, but what is the postbiotics is what we call them, the chemicals produced by the bugs have major bioactive effects that we have only scratched the surface of. So fermented foods,

awesome, take them. There's really no downside to taking fermented foods unless you have some functional GI issues sometimes. If you have IBS, you might be sensitive to fermented foods but otherwise eat them pick your favorite fermented food in your cuisine and just go for it.

SHAWN STEVENSON: That is a paradigm shifter right there. It's not necessarily just the probiotics is what we're focusing on, it's what they're making, these postbiotics, which goes back to what you started. The things they're making in us for us and what we can get from these fermented foods and beverages. And also with the fermented food, or a vegetable for example, we're getting a prebiotic kind of substrate as well that could potentially be helpful for other microbes that are not in that food.

DR. SUZANNE DEVKOTA: Yeah, you're getting the whole thing, yeah.

SHAWN STEVENSON: That's pretty cool. All right speaking of cool what do you have going on right now? What are you interested in? What are you studying at your lab? What are some of the things that you're really excited about right now?

DR. SUZANNE DEVKOTA: Yeah, that's such a big question because there's... It's hard for me to... Because we have so many different diverse projects going on in the lab, and they're all exciting to me at least. So, we have studies that we initiate in our lab and then we have studies that our colleagues will initiate that we're collaborators on. And some I'll share a little bit of both of those, so some projects that we initiate in the lab that are really personally interesting to me from a diet standpoint is going back to this concept of bugs can make all these chemicals, right? Can we leverage our microbiome to make chemicals that we want? And make chemicals we can use when we're not able to get them from the diet, and so we're really at this particular moment focused on amino acids, essential amino acids, which your body doesn't make. You have to get it from the diet. But what if you are in a place whether it's socioeconomically, or you're in part of a world where you don't have access to meat or high-quality protein vegetables things like that, and so you have a deficiency.

And this is especially prevalent in under sort of developed parts of the world where babies have Kwashiorkor which is sort of that distended belly look; It's a protein malnutrition. So there has been really compelling work in the microbiome field like from Jeff Gordon showing that he's created kind of a formulation, a gut microbiome supportive for diet to give these children that actually has less calories than the existing food, but it's more gets them to gain weight faster, because it supports the microbiome and makes them healthier faster. But the mechanism was not fully known. We have found that by feeding different fibers and supporting the gut microbiome you can actually coax the bugs into producing certain amino acids that the host can use. So, if you take that proof of concept into states where you really

you know parts of the world and so on like I mentioned, you could do it cheap and you could do it effectively. And so, protein malnutrition is just one area.

There are other areas where you could be essential fatty acids, it could be things that just our body needs that we rely on diet for, but diet may not be available or sufficient. So, let's use our microbes to make those things for us. So, we're really interested in that concept. Another area is this concept about fat cells bugs and fat cell interactions. So how could our bacteria actually be directly interacting with fat cells in a way that is causing fat expansion and be one of the underlying factors of obesity maybe, so that's one thing we're looking at that is pretty exciting to us. So those are studies we've initiated that we're kind of doubling down on right now at the moment.

SHAWN STEVENSON: That's so cool. So, you mentioned obviously the importance with these amino acids and obviously you're a protein machine. Pretty much when we're looking at each other we're seeing proteins, some minerals sprinkled in there, but it's so important not just for structure but for running processes. Obviously, our mutual friend Dr. Gabrielle Lyon, protein queen. She's really pushing that awareness into popular culture, but we don't often associate... Even what you talked about in the beginning, fiber we get that with the microbiome but what about protein? Is there any evidence here of like this being a necessity?

DR. SUZANNE DEVKOTA: Protein microbiome interactions is probably one of the most understudied dietary components, oddly enough, because there's such an interest in it. And we know that... And this is often pointed to as a detrimental aspect of protein which is why I think we need more research, but microbes can ferment amino acids in the colon. And it can cause byproducts that can lead to inflammation. What we don't fully understand is how much you have to consume, what the concentration has to be to have that effect, but we know microbes can ferment proteins and create chemicals that maybe would cause inflammation. But microbes need amino acids to carry out their function, so at the same time they need these amino acids. And if they don't get them from the diet, they will forage your gut mucus for them. And that's what happens when you fast that gut bugs will forage on your body if you don't feed them, and so you need to give them a full repertoire of foods so that they don't do that to you. That much we know, but in terms of how much of the protein component of the diet is needed to support gut health, we actually don't know. I suspect as I say a diverse diet is important that includes proteins, but I can't point to many studies that have really looked at that direct relationship.

SHAWN STEVENSON: Yeah, and again you just said the most important thing which is the obvious thing it's required to run processes for ourselves and for our microbes which we're starting to but we don't really respect our microbes like we should. And huge revelations like even the genes that our microbes are carrying, all this genetic information and how their

genes interact as an epigenetic influence for our genes, and like these things literally determine our health outcomes expression of so much. But if we're not providing the building blocks to run processes... Our bodies are amazing, and this is part of the reason I believe we're seeing all these epidemics of chronic diseases. These are adaptations. If we talk about type 2 diabetes for example, this is a condition, but we tend to think that this is like an end-all be-all scenario, but our bodies are adapting to run under unideal circumstances.

It's just changing the way that it's functioning to keep us alive, but we see it as like this is a problem this thing has happened to me when it's really biological feedback. True enough we can get to a place where some of these out picturings are, they don't seem to have a cause, but something I've been trying to push in the culture recently is like even if we don't know the cause it doesn't mean there isn't one. Causality is like this is a basic tenet, but when we don't know a thing, we'll just be like oh, this is... It "just happens". And I also believe that our bodies... Generally, we are moving towards... Like we're just kind of... We've evolved to have a state of health, but now we can believe that our bodies are essentially out to get us in a f**king peanut. It's like a time bomb. I was just with my friend last night I had no idea they were doing this...

This is my first time going to a gala. This is not where I don't come from these kinds of circumstances, so it's just very interesting they got the different courses they're bringing out all the things and there's a soup. It was wonderful soup, it's sweet potato and hot leek soup, and it was fantastic; It was great. And they sprinkle on some pepitas some pumpkin seeds, but my friend his wife right before they were about to sprinkle the pumpkin seeds, she's like, "No, no, no, no, don't put the pumpkins in." And she was like does it have pumpkin seeds in the mixture, and I'm just like what is going on. I've known them for years and we've eaten together so much, and he's like you have a bad allergy to pumpkin seeds. And I'm just like what, I had no idea. And he's like I didn't used to have it, but something happened.

DR. SUZANNE DEVKOTA: Yeah, interesting.

SHAWN STEVENSON: But we're seeing this more and more and more we're having these unusual food allergies a lot of times funny enough to nuts and seeds. Is there anything to that?

DR. SUZANNE DEVKOTA: I wish I had an answer for you. I don't, but I think adult development of allergies is really interesting because allergies will tend to manifest pretty young. If you have them, they'll manifest pretty young. You all see cases where people will develop an allergy and then lose that allergy overtime as well.

SHAWN STEVENSON: Yeah, that's me.

DR. SUZANNE DEVKOTA: Yeah, I had an egg allergy at one point, and then I no longer did. And you can sometimes induce allergies by eating too much of a food and then your body's like, no mas. And then you got to give it a break and then you can eat it again. Lactose intolerance is a classic adult developed food allergy but like with lactose intolerance you can re-titrate dairy back in slowly and get the enzyme working again. It requires a very strict protocol, but you can do it. So, it's not so much like in kids where it's very black... And it tends to be pretty black and white those allergies. The adult allergies tend to be a little gray right it's like sometimes this food but it's like the categories are a little not well defined.

SHAWN STEVENSON: And also, it can turn on and turn off and come back potentially...

DR. SUZANNE DEVKOTA: Yeah, and so why is that? I really don't know why that is. Is there a microbial cause? Maybe, maybe not. It could be something just is triggering an immune response. Some people also will get allergies that don't manifest as puffy redness that you require an EpiPen, it's not like that kind of allergy.

SHAWN STEVENSON: I found out he has a EpiPen. I had no idea, all this time we spent together.

DR. SUZANNE DEVKOTA: Yeah, I have no explanation for those situations. It's usually multi factorial.

SHAWN STEVENSON: Yeah, facts. Absolutely, but I think the underlying thing here is, is it normal or natural for us to be allergic to our environment and things in the environment so suddenly. The rates have gone up so quickly. There's something is awry here, and you know this as well and I love it because you're just like you know we do we're leaning towards it, but you're always bringing it back to what is provable right now, but we do know our microbiome influences pretty much everything about us. And we have the ability to influence our microbiome as well with the decisions that we make. So are there any last things, any recommendations that we can do either maybe things to avoid, or things to add in or focus on so we can start to really cultivate a healthy microbiome.

DR. SUZANNE DEVKOTA: Yeah, I mean the first thing I would say is I will always harp on antibiotic usage and say only take them if you have an infection verifiable bacterial infection. And I kind of believed that it was commonly accepted but I realized that it still isn't. I think people feel comfort in having their stockpile of antibiotics at home that they'll just take as soon as they're feeling... And they'll self-diagnose and... Don't self-diagnose, get a verified culture, make sure it's a bacterial infection. Some things are viral infections, antibiotics won't do anything for them and you're just going to create resistance, and what I'll say is we don't have any new antibiotics left. And so, everyone's taking all the antibiotics that we have and when we have resistance to all of them, we're going to have COVID on a massive scale with

bacteria. And that my prediction was always that bacteria is what's going to end human civilization is because we have no way to fight them.

And that will happen through just chronically using antibiotics for every small thing. You go to the dentist have a root canal, they give you prophylactic antibiotics, don't. I always ask, "Do I have to take it?" "And they say you don't have to take it." I say, "Oh, I'm not going to take it." But ask the question, Do I have to take this antibiotic before you take it, and if it's equivocal don't do it. But obviously there are times to take it and obviously you take it when that's necessary, but that for me like that is the biggest thing just be skeptical about antibiotics when they're prescribed to you and ask the question. The other thing is now if we're talking about health, as I talked about earlier, a diverse diet, eat a diverse diet that is really important. It's okay to experiment with your diet and find things that you want to try for body composition or metabolic things but I really for gut health and gut microbiome support specifically eat a diverse diet. Fiber is really important, start introducing fermented foods into your diet. Those things have been proven to have a beneficial effect and that's a good place to start.

SHAWN STEVENSON: Awesome, this is so cool. And I'm just excited to hear what's coming out of the research you're doing right now. I'm especially interested in the interaction with bacteria and our fat cells. We could be cracking a serious code here and you mentioned earlier potential study somebody wants to come in and start to contribute to a carnivore versus a vegan that kind of thing, where can people follow you where can people get more information where can people reach out?

DR. SUZANNE DEVKOTA: So, I'm on Instagram. On Instagram I try to post just latest science articles that I think are cool and try to interpret them for the public, microbiome related usually. Follow me on Instagram you can send me a message on Instagram I would love to get a cohort of like 25 carnivores 25 vegans and people... If you really document your diet, I want really solid food records and maybe doing a crossover if anyone's interested in doing a crossover would be super cool DM me let's get it going.

SHAWN STEVENSON: What is your handle?

DR. SUZANNE DEVKOTA: Suzanne Devkota. And you can follow me on Twitter that's also I post science stuff, but Instagram is really where I do more of my longer content.

SHAWN STEVENSON: Awesome. Well, thank you so much for coming to hang out with us. This has been just so cool.

DR. SUZANNE DEVKOTA: Yeah, thank you.

SHAWN STEVENSON: And thank you for the work that you're doing, and of course like not being the person who's getting told what to do, right? And you have a couple of older siblings, so I know it's a little rebellion out here for you to open your own lab which is really awesome because it's benefiting all of us, so thank you.

DR. SUZANNE DEVKOTA: Thank you.

SHAWN STEVENSON: Awesome. Dr. Suzanne Devkota everybody. Thank you so much for tuning into the show today. I hope you got a lot of value out of this. Please share this out with your friends and family. On social media you can tag me I'm @shawnmodel and tag Dr. Devkota as well. And let her know what you thought about this episode, but most importantly we got to get this education into more people's hands because this intimate connection with this invisible world and our health outcomes is something that is always with us whether we understand it or not, but also this is something that we can do something about. We can do something to improve it to support it and to overall of course to support our health outcomes, so the microbiome this information, the science on this is just going to continue to expand but learning from people like Dr. Devkota who's been in this field at the forefront of it and in her lab and doing this research it is such a gift, and it's something that we didn't have access to just a few short decades ago.

And so, to have this information right at our fingertips is so powerful, so again please share this out with your friends and family on social media or send directly from the podcast app that you're listening on. We've got some incredible master classes and incredible world-class guests coming your way very, very soon, so make sure to stay tuned. Take care, have an amazing day and I'll talk with you soon.

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