Episode 141 Transcript

00:00:00:03 - 00:00:08:03
Kiran Krishnan, PhD
Get outside. The role of transient microbes from the natural environment on the health and function of the skin cannot be overstated.

00:00:08:08 - 00:00:33:17
Dr. Jaclyn Smeaton
Welcome to the DUTCH podcast, where we dive deep into the science of hormones, wellness and personalized health care. I'm Doctor Jaclyn Smeaton, chief medical officer at DUTCH. Join us every Tuesday as we bring you expert insights, cutting edge research, and practical tips to help you take control of your health from the inside out. Whether you're a health care professional or simply looking to optimize your own well-being, we've got you covered.

00:00:33:19 - 00:00:57:04
Dr. Jaclyn Smeaton
The contents of this podcast are for educational and informational purposes only. This information is not to be interpreted or mistaken for medical advice. Consult your health care provider for medical advice, diagnosis and treatment. Welcome back everyone. I'm so excited you're here for joining us at the DUTCH podcast live at a forum. I'm Doctor Jaclyn Smeaton, chief medical officer at the DUTCH Test, and I hope you've been with me all day.

00:00:57:05 - 00:01:17:14
Dr. Jaclyn Smeaton
We're trying to give you a little bit of a taste of all the fun, amazing, brilliant guests that we've had at a forum here. Today's guest. This afternoon's guest is no different. Kiran Krishnan. Really? Someone who's made a lot of impactful changes to our industry, really got us thinking a lot about the microbiome, which we know is something that's so critically important.

00:01:17:20 - 00:01:44:13
Dr. Jaclyn Smeaton
And we're going to be talking today about the skin microbiome, which is something that is really, really making a huge change even in the conventional space around, you know, toothpaste and skincare lines. And we're starting to actually think about products being disruptive or supportive to microbiome. So let me just introduce our

guest. Kiran is a research microbiologist and really an innovator in functional medicine industry with over 15 years in microbiome science.

00:01:44:13 - 00:02:08:00
Dr. Jaclyn Smeaton
He's the cofounder of Microbiome Labs, which is now huge. They must be really smooth, pretty mad, and a pioneer of spore based probiotic therapeutics, which I think a lot of you probably are using in your practices. Now you have multiple patents, a lot of published studies, and really, you've really dedicated your life to this global education of the gut microbiome and that complexity of the microbiome with things like immune science.

00:02:08:04 - 00:02:13:09
Dr. Jaclyn Smeaton
And you've made it so easy to access and to learn. So thank you for all the work you've done.

00:02:13:11 - 00:02:24:02
Kiran Krishnan, PhD
Oh. Thank you. It's my pleasure. And I'm really excited to be here. Thank you for having me. And it's fun to do it live because we've done we've had a conversation before, but we've had to do it online, so this is great.

00:02:24:02 - 00:02:34:22
Dr. Jaclyn Smeaton
Yeah, this is great. And, so I want to start by just talking about the skin microbiome. Yeah. What would you give especially clinicians as a primer as to why they should care about the skin microbiome?

00:02:35:00 - 00:03:09:07
Kiran Krishnan, PhD
You know, I, I became really interested in it because I'm obsessed with barriers. Right. 15 years ago. So I became obsessed with the gut barrier and understanding leaky gut and inTestinal permeability and the clinical impact that it has on patients, where when you start digging into what you come to find out is that maintenance of the barrier in the gut, for example, is is highly determinist, determined by the types of microbes that exist in the gut, and when that becomes dysfunctional, when the microbes and the the ecosystem of the microbes becomes dysfunctional, you get barrier dysfunction.

00:03:09:07 - 00:03:28:10
Kiran Krishnan, PhD
And then that becomes very clinically relevant in disease pathology. So then that starts the the wheels turning and thinking, okay, what are the other barriers in the system. Right. And the skin of course is one of the largest barriers. And there are tons of microbes on the skin. That's 35 times more microbes than there are skin cells.

00:03:28:12 - 00:03:56:07
Kiran Krishnan, PhD
Right. And so the microbes seem to play a very important role on the function of the skin as a barrier. And of the microbes become dis biotic. There's a very clear path to how the skin barrier becomes leaky and becomes dysfunctional. And then now there's a 65 year long study which is still going on that illustrates that when the skin becomes leaky and the barrier of the skin compromises, it becomes an independent risk driver for chronic disease.

00:03:56:08 - 00:03:56:14
Kiran Krishnan, PhD
Wow.

00:03:56:14 - 00:03:57:12
Dr. Jaclyn Smeaton
That's fascinating.

00:03:57:12 - 00:04:20:15
Kiran Krishnan, PhD
Which is crazy, right? You wouldn't think that. So this is called the Baltimore Longitudinal Study of Aging. It's a 65 year long study still ongoing. That was something like 3800 subjects. It's the first and only longitudinal study of aging, which is fascinating. They took subjects who were in their early 20s and late teens, and they decided we're going to follow them for the next 80 plus years until they die.

00:04:20:19 - 00:04:39:19
Kiran Krishnan, PhD
Right. And we're going to measure all kinds of things along the way. We're going to look at all the choices that they make and how it impacts them. We're going to look at mechanisms from a cellular perspective, from a, metabolic and so on. They looked at everything on these individuals to understand what was driving risk and of morbidity

and mortality.

00:04:40:01 - 00:04:52:17
Kiran Krishnan, PhD
Right. What they found and and this is one of the most interesting conclusions, was a best predictor in all of the things that they found of morbidity and mortality was age, skin.

00:04:52:19 - 00:04:53:12
Dr. Jaclyn Smeaton
Age, skin.

00:04:53:12 - 00:05:16:04
Kiran Krishnan, PhD
Age, skin. Right. And how do you define age? Skin. Well, they're talking about fine lines, wrinkles, dryness, thinning of the skin, hyperpigmentation. Right. And so the pigment you know this dysfunction in the skin. So you get all these different colorings of the skin. So then someone like myself and maybe even you might think, well okay, that makes sense because maybe the skin is a reflection of an unhealthy insight, right?

00:05:16:08 - 00:05:31:20
Kiran Krishnan, PhD
Right. But they showed that not to be true. What they found was that the aging of the skin precedes any sort of biological markers they could pick up internally of disease process. Right. So the skin dysfunction occurs first.

00:05:31:22 - 00:05:50:03
Dr. Jaclyn Smeaton
Yeah. I mean, I think about like the implication of like smoking on skin. I mean, when you're walking around, you can tell who's a smoker and who's not. When people hit maybe 50s or 60s. Exactly. So I can see what you mean. Where there are these dramatic changes due to things like oxidative stress levels and that example. Yeah, that you're seeing those changes tell us more.

00:05:50:05 - 00:06:15:23
Kiran Krishnan, PhD
Yeah. So here's what we're actually finding out. Right. And I'm not part of these studies. I'm speaking collectively as somebody that's been following this work. That

when the skin barrier becomes compromised, antigens and so on penetrate through the skin and end up meeting the immune system in the periphery. The immune system is really poorly designed to develop any sort of tolerance when it meets antigens in the periphery.

00:06:15:23 - 00:06:43:17
Kiran Krishnan, PhD
Right. All of the tolerance factors occurs when you meet, antigens through the gut. So the mucosa through sampling with dendritic cells, through upregulation of T cells, all in the context of the gut microbiome, right. Then we can develop oral tolerance against, say, food antigens and environmental antigens. If you take those same antigens and you penetrate the skin with it and it meets the immune system in the periphery, and what you get is an aberrant response from natural killer cells.

00:06:43:17 - 00:06:57:23
Kiran Krishnan, PhD
And a sauna fills in basophils, and you end up with this amazing hypersensitivity response throughout the body to those antigens. Right. So that's one of the pathologies that seem to be occurring. Now. This is actually really well documented in kids.

00:06:57:23 - 00:06:59:00
Dr. Jaclyn Smeaton
Okay.

00:06:59:02 - 00:07:24:03
Kiran Krishnan, PhD
Atopic dermatitis which is super common in kids. Right. Which is driven by skin dysbiosis. An overgrowth typically of staph aureus on the skin and then a, a sequential, dysfunction or dismantling of the barrier system of the skin in those kids. Those kids with atopic dermatitis are eight times more likely to develop, allergies, food sensitivities and allergies.

00:07:24:05 - 00:07:42:07
Kiran Krishnan, PhD
Right. And they call it the atopic march. So what they've shown is, for example, peanut antigens, if peanut antigens enter into the skin and end up in circulation, those kids have a very high likelihood of developing severe anaphylactic and inflammatory response against peanut antigen.

00:07:42:10 - 00:07:43:06
Dr. Jaclyn Smeaton
Interesting.

00:07:43:06 - 00:08:04:17
Kiran Krishnan, PhD
Yeah. And they would they've mimicked some of these studies. They've done it on like dogs for example. Right. Shaved dogs rubbing peanut antigens on their on their sensitive skin and then looking at, immune responses internally to those antigens that are penetrating through the skin. Right. So that's a great illustration of when things are allowed to penetrate through the skin that normally shouldn't be.

00:08:04:19 - 00:08:34:03
Kiran Krishnan, PhD
It can create a profound inflammatory response. Another example of that, which is kind of freaky, it's kind of scary. They're finding that one of the independent risk factors for Alzheimer's is skin dysfunction, especially in the face and neck area. Right. Malaysia overgrowth, for example. Right. Fungal overgrowth and antigens from the fungus actually penetrating through the skin and entering into the central nervous system, eliciting an inflammatory response that damages the central nervous system.

00:08:34:09 - 00:09:01:00
Kiran Krishnan, PhD
Right. So now that's an independent response. They're they can show psoriasis, proteins in the psoriatic lesions found in the bone driving osteoporosis. Well, right. So the barrier, the skin as a barrier, which is the most important function of this largest organ in our body. When that barrier system falls apart, it drives disease risk. And that barrier system is determined.

00:09:01:01 - 00:09:04:17
Kiran Krishnan, PhD
Or the barrier function is determined by the microbes that exist on the skin.

00:09:04:17 - 00:09:20:18
Dr. Jaclyn Smeaton
Yeah. Let's pull this off the microbiome because it's so interesting. I mean, it seems like there are a lot of things that could damage skin and make it, you know, have less integrity. Right? I have so many questions. I don't even know where to start. So let's

talk a little bit about the role the microbiome plays first in protecting the skin.

00:09:20:18 - 00:09:49:04
Kiran Krishnan, PhD
Yeah. So you've got, resident microbes and transient microbes on the skin. Resident microbes are typically the microbes that are there permanently. Their numbers don't really shift a significant amount unless something catastrophic happens, right? Like you're bathed in benzoyl peroxide or something like that. Or for women going through, you know, a C-section, for example, you're basically sitting in antimicrobials for a long period of time, or people that use really strong antimicrobials as a way of cleansing themselves all the time.

00:09:49:04 - 00:10:13:11
Kiran Krishnan, PhD
Soaps that with the addition of antimicrobials. Right. Or antibiotic creams and all of that. Right. So, so those can all, create real detriment to the resident microbes. So the resident microbes exist on the skin, and then they're transient microbes that you're supposed to pick up from the environment. Those transient microbes can have a very beneficial effect on both the resident microbes and how the immune system responds to stimulus on the skin.

00:10:13:13 - 00:10:37:12
Kiran Krishnan, PhD
Right. So there is a tolerance effect of natural environmental bacteria when they jump onto the skin, in conjunction with the resident microbes, they train the immune system in the dermis and the epidermis to not respond to certain stimuli. Just like in the gut microbiome, can train the immune system not to respond to food antigens. All that are coming in there is this immune tutoring that seems to occur on the skin.

00:10:37:16 - 00:11:01:12
Kiran Krishnan, PhD
Right. So so that's one aspect of the barrier function. It's it's priming and training the immune system not to overreact to things. The second part of it is the actual structural elements of the skin, right. So the expression of collagen fibers, right. And then looking at the ceramide layer, which is a mortar that sticks all the skin cells together, that creates this hydrophobic layer.

00:11:01:12 - 00:11:23:13
Kiran Krishnan, PhD

That's really, really important. And then on top of that is the maintenance of the skin. We all know, for example, that is so important to the health of the skin, right? The healthy pH of the skin is between like four, four and a half. So it's more acidic than anything. If it goes up, what tends to happen is you have high risk of fungal overgrowth and issues that that stem from that.

00:11:23:15 - 00:11:52:06
Kiran Krishnan, PhD
So then how do we maintain the pH of the skin. Right. That's such a critical feature. We have such a narrow window of what's a healthy pH. We don't have a way of maintaining that pressure. Right. We're not putting a hydrochloric acid on our skin like we do in our stomach. It's the microbes. The resident microbes take the oils that are being produced on our skin and excreted, break those oils down into fatty acids, and those fatty acids maintain the lower pH of the skin, right?

00:11:52:06 - 00:12:08:15
Kiran Krishnan, PhD
So the pH of the skin, the immune response on the skin, the structural elements like the collagen fibers in the last ten fibers, the ceramide layer, which creates a hydrophobic, lipid barrier on the skin. All of those components are dependent on microbes on the skin.

00:12:08:17 - 00:12:33:05
Dr. Jaclyn Smeaton
Well, it seems like we do a lot of damage to our skin just like the activities of daily life. And I think about I think they're starting to shift away now culturally. But I think about the obsession with hand sanitization. Oh, yeah. Can you talk a little bit about that? Because it seems like the hands one, they show aging very early because even for people who are using sun protection, we don't think of our hands, but they're constantly exposed.

00:12:33:07 - 00:12:50:20
Dr. Jaclyn Smeaton
They're also probably exposed to the most microbes and any part on our body. And then they're also exposed to probably the most antimicrobials, like leaving susceptibility to damage. Have you seen data or do you have opinions on that? Although the hand sanitizers and the impact that may be having.

00:12:50:22 - 00:13:00:08

Kiran Krishnan, PhD
Yeah, absolutely. So you know, one of the one of the wins in this whole, space was the removal of triclosan from a lot of the.

00:13:00:10 - 00:13:01:17
Dr. Jaclyn Smeaton
Which was an endocrine disruptors.

00:13:01:17 - 00:13:22:17
Kiran Krishnan, PhD
Well, exactly. Right. And and it's a, it's such a broad spectrum antimicrobial. And, and it has a double whammy. And a lot of antimicrobials, including all the alcohol based sanitizers have a double whammy because not only do they virtually sterilize your skin microbiome. Right. So they're knocking down the microbes 9,095%. So it's like a one log reduction. We call that right.

00:13:22:17 - 00:13:46:04
Kiran Krishnan, PhD
So it's 90% plus. On top of that they dry out the skin as well. Right. Which is then a the like the next step that usually occurs in barrier dysfunction is like the dysbiosis from changing the microbial environment. And then the dysbiosis will often lead to drying out of the skin because the dysbiosis causes the ceramide layer to break apart because the microbes are needed for the share.

00:13:46:04 - 00:14:05:16
Kiran Krishnan, PhD
My layer and the Sarah my layer is what keeps the evaporative, the evaporation of moisture away from your skin because it's a hydrophobic layer, it doesn't allow moisture to come out. Right. And so but when that Sarah, my layer is broken up, you get a lot of evaporation and the skin becomes dry. That starts to create the penetration or the barrier dysfunction.

00:14:05:21 - 00:14:07:13
Kiran Krishnan, PhD
Alcohol does that in one step.

00:14:07:13 - 00:14:11:19
Dr. Jaclyn Smeaton
I was going to say alcohol doesn't seem like it'd be any better for that. Sarah. My layer.

00:14:11:20 - 00:14:22:14
Kiran Krishnan, PhD
No, it's not. And in fact, you know, anything beyond a gentle soak for cleansing of your hands or any part of your body is way excessive.

00:14:22:16 - 00:14:30:01
Dr. Jaclyn Smeaton
Yeah. And I see now a lot of soaps even are like they talk about maintaining pH or maintaining microbiome. Should we be looking for things like that to use.

00:14:30:02 - 00:14:45:20
Kiran Krishnan, PhD
We should to a certain degree. Now most of them from what I've seen, don't actually have any studies in place to show that it is friendly to the microbiome. Okay. Right. Real old fashioned soap that just made from fats, surfactants. Right? They're perfectly fine.

00:14:45:21 - 00:14:46:07
Dr. Jaclyn Smeaton
The old.

00:14:46:10 - 00:15:05:15
Kiran Krishnan, PhD
Well, the old school. Right. Well, it was called time ago. Yeah. And I mean, I like I use, for example, and some people who are very skincare conscious cringe that I use like a just a good old bar soap on both my face and my body and all that. Right. And it's like a very minimalistic bar soap that basically has like four ingredients in it.

00:15:05:17 - 00:15:06:21
Kiran Krishnan, PhD
But that's really all you need.

00:15:06:21 - 00:15:09:22
Dr. Jaclyn Smeaton
You need the light guy, you know, all the kind of traditional means.

00:15:09:22 - 00:15:10:18
Kiran Krishnan, PhD

That's exactly right.

00:15:10:18 - 00:15:11:19
Dr. Jaclyn Smeaton
That's great.

00:15:11:21 - 00:15:25:23
Kiran Krishnan, PhD
That's really all you need. And you don't want any fragrances in it either. Right. Because one of the things that, that the studies are starting to show is that most fragrance compounds are volatile compounds and those volatile compounds have strong antimicrobial effect.

00:15:26:00 - 00:15:42:10
Dr. Jaclyn Smeaton
So one of the things I think about is like with oral microbiome, there is such interesting information because it seems as though like micro microbes themselves, or they can actually enter the bloodstream, transport to other areas cause problems. Is that similar with the skin that.

00:15:42:10 - 00:15:43:11
Kiran Krishnan, PhD
That's exactly right. Yeah.

00:15:43:16 - 00:16:02:04
Dr. Jaclyn Smeaton
Can you describe that? Because I think it's hard to comprehend. Yeah. That a microbe could enter the bloodstream because of the size of what you'd expect it to be. Right. That how it can migrate to other areas or cause other dysfunction, the immune like cytokine driven reactions, those all make sense. Yeah. But actual like migration of microbes or microbial proteins.

00:16:02:07 - 00:16:04:09
Dr. Jaclyn Smeaton
Yeah. It's harder to wrap your head around that.

00:16:04:11 - 00:16:27:18
Kiran Krishnan, PhD
Yeah. And it makes sense. Because, you know, we we get very comfortable with the

idea of our barriers functioning as barriers. Right. But what we don't understand is that little by little, microscopic changes to the barrier can, can create a channels in which microbes can penetrate through. So a good example of that, we have of course, the stratum corneum is just the topmost layer of our skin.

00:16:27:18 - 00:16:49:12
Kiran Krishnan, PhD
A lot of dead skin cells. Then we have the epidermis which has multiple layers, and then the dermis of course. And now the epidermis and the dermis both have capillary beds right. Hence amazing reactivity. You rub your skin a little bit, it gets red. Those capillary beds are actually loaded with, immune cells as well. Right. A lot of the redness is the granulation of cells in there.

00:16:49:14 - 00:17:10:22
Kiran Krishnan, PhD
And so just friction can create mass also de granulation in your skin. So it shows you how close the circulation and the capillary beds. And immune cells are even to the surface of the skin. Right. So if you start compromising the surface of the skin so you're exfoliating too much, for example, or you're using stripping agents or acids.

00:17:10:22 - 00:17:39:01
Kiran Krishnan, PhD
And a lot of people do this, right. They're stripping their skin. They're exfoliating almost every day or every other day, or your barrier's is dysfunctional in one way or the other. It's not. It's just a few cells down before you get to a capillary bed. Now, one of the one of the things that tends to occur when you have a area of your skin where the barrier is compromised, you get small molecular toxins that penetrate through and continuously irritate that area.

00:17:39:02 - 00:17:39:20
Dr. Jaclyn Smeaton
Causes more damage.

00:17:39:20 - 00:17:59:13
Kiran Krishnan, PhD
Causes more damage. Right. So the inflammatory response in itself causes more damage. One of the area, one of the ways in which it causes damage, which we don't talk about enough, is the damage that it causes to those micro vessels. Right. Inflammation causes endothelial disruption to the micro vessels, which actually

makes the micro vessels porous, more.

00:17:59:13 - 00:18:00:00
Dr. Jaclyn Smeaton
Permeable.

00:18:00:00 - 00:18:26:03
Kiran Krishnan, PhD
More permeable. And those microbes can actually enter those micro vessels make its way into circulation. Now it's in the superhighway, right. So it can make its way throughout the body from that, from that spot. And you can you can see this is the studies that have actually shown this. You can find skin based proteins, microbes, microbial components in areas that are distal to, to the site of, of action, like in the bone, in the brain and so on.

00:18:26:03 - 00:18:33:23
Kiran Krishnan, PhD
Right. So it's really fascinating. We do make a lot of assumptions that are barriers acting as a barrier, but often it's not.

00:18:33:23 - 00:18:50:04
Dr. Jaclyn Smeaton
You have me thinking about that a little more like thinking about barrier integrity. And you know, of course these things all make sense. But when you think about the risk that it poses when you don't keep the outside outside. Yeah. Right inside, you know, they are mounting more and more when we look at all of the different microbiome.

00:18:50:04 - 00:18:50:10
Kiran Krishnan, PhD
That's.

00:18:50:10 - 00:18:51:21
Dr. Jaclyn Smeaton
Right in in the body.

00:18:51:21 - 00:19:13:05
Kiran Krishnan, PhD
Yeah, absolutely. And then the immune system becomes confused. Right. It's it it's having to deal with things that it normally doesn't deal with in areas it normally

doesn't deal with. And the immune system's default mode is like, let's just go haywire, right? It as a last ditch effort to protect the system. It basically deals with everything as if septicemia is coming along, right?

00:19:13:05 - 00:19:32:22
Kiran Krishnan, PhD
So it's like, just goes nuts. And we've heard about this during Covid, about the cytokine storm and all that that can be induced in all of these areas where barrier function becomes compromised. So we we forget, we think about our skin more often as like how we show up in the world, right? Our veneer, this is what we look like.

00:19:32:22 - 00:19:51:03
Kiran Krishnan, PhD
And, and if our skin is not looking as healthy as it should or as good as it as we'd want it to, cosmetically, there's a lot of things you can do to make it look better, right? There's, there's, injections and and Botox and this, that and the other, you know, masks that we can wear as, as makeup and things like that.

00:19:51:05 - 00:20:11:23
Kiran Krishnan, PhD
And, and our, our thoughts on skin have been always on the, appearance of the visual. The visual. But we can fake what the visual looks like. What we cannot fake is whether or not the skin is healthy. So part of my goal, with some of my new things that I'm focusing on, is how do you make skin look better?

00:20:11:23 - 00:20:13:14
Kiran Krishnan, PhD
By making it healthier.

00:20:13:16 - 00:20:31:07
Dr. Jaclyn Smeaton
That make sense? It's that inside out approach. Yeah. Are there things this is I'm like kind of jumping ahead. But I'm so curious about this. Are there things that are trending right now in skincare, whether it's red light therapy or other things that could actually be backfiring because it's harming the microbiome?

00:20:31:09 - 00:20:40:07
Kiran Krishnan, PhD
That's a good question. I so when I look at the world of esthetics and med spots, it

does make me nervous when they do a lot of microneedling.

00:20:40:07 - 00:20:53:21
Dr. Jaclyn Smeaton
It seems like there's junctions where you think about microneedling and the impact of like those actually go down to the capillary bed. The entire point is to make the skin penetrable. Yeah. So whatever serum that you're going to put on right. I mean, so absolutely, that seems like it could be problematic.

00:20:54:01 - 00:21:11:21
Kiran Krishnan, PhD
And all the injections. Right. All of that a barrier breaking. I had a great conversation with the, with the plastic surgeon who's, who's starting to come around with the idea of like, I don't know what the things I'm doing are actually good for the skin because overall, I'm breaking the barrier consistently. Right. And in an unusual way.

00:21:11:23 - 00:21:36:05
Kiran Krishnan, PhD
So and all of the stripping. Right. So the, of the skin, the the overt expression, the acid, exactly. All of that, like the idea is that, you know, if we strip the layer of the skin, we'll get new skin coming about. Right, like we're a snake shedding. It's it's, it's skin. And the new skin is showing up, but we're also stripping so much functional, so many functional elements of the skin when we do that.

00:21:36:07 - 00:21:39:14
Kiran Krishnan, PhD
And whether or not it comes back healthier is a little bit of a crapshoot.

00:21:39:16 - 00:22:00:01
Dr. Jaclyn Smeaton
It probably depends upon the environment. Yeah, that the person is in, but it does seem very risky. I think about the laser treatments that end up with, like severe redness and inflammation and that, you know, that barrier is so disrupted, it's almost like scabbing. Yeah. You know, that's that's the I mean, it's something that so many people are doing and they love the result of it.

00:22:00:02 - 00:22:06:20
Dr. Jaclyn Smeaton
Yeah. But it does seem like it's pushing the reset button. Yeah. And if you didn't do the

pre-work you might be in trouble.

00:22:07:01 - 00:22:31:20
Kiran Krishnan, PhD
Absolutely. And I think, you know, more often than not as a society we we give in to short term benefit, and kind of ignore what the long term issues may be. Why do you take even in the world of diet, you take the carnivore kind of diet and the keto kind of diet. It's like, yes, a short term relief, from the issues of intolerance of certain types of categories of foods.

00:22:31:22 - 00:22:43:20
Kiran Krishnan, PhD
But that's not a long term issue. And that has long term consequences. Right. But the short term relief always wins out in these cases. And so often with the skin that's, that's in that's exactly how people think.

00:22:43:22 - 00:23:02:12
Dr. Jaclyn Smeaton
Well, I think even especially with the skin more than most other conditions, the short term ways out skin and hair. I mean, I've never seen women in my practice more concerned about any condition than skin conditions and hair conditions. Yeah, because that's the way we are in the it's our face of the world. It's how we interact with the world.

00:23:02:12 - 00:23:13:17
Dr. Jaclyn Smeaton
So that makes a lot of sense. But at the same time, it's probably a riskier place where women may take or not just women. Women and men. Yeah. May take more risks to try to attain the results thereafter.

00:23:13:17 - 00:23:34:00
Kiran Krishnan, PhD
Yeah, absolutely. And you see that in many conditions like acne, for example, or dermatitis, you know, I did a, bunch of work in acne even when I was at Microbiome Labs. And then even now, because it's such an interesting example of a number of things that can that can, coalesce together to create a problem.

00:23:34:01 - 00:23:55:09
Kiran Krishnan, PhD

And then, of course, which we, we look at inflammatory lesions on the skin. Right. Nobody wants pimples. And no matter what age you are. But then often the solution will create more problems down the road, right? Of course, the most prevalent solution is are antibiotics, both topical and oral antibiotics, right. And long term antibiotics in many cases.

00:23:55:11 - 00:24:17:06
Kiran Krishnan, PhD
And so that is like another great illustration of like, okay, there is a mechanism in play here that is creating this inflammatory lesion. And if we kind of look at root cause drivers, we can likely reverse it, which we've been shown to do in clinical trials. But we're taking a very different approach that actually has a more harmful trajectory to the skin.

00:24:17:08 - 00:24:51:08
DUTCH Podcast
We'll be right back with more. Join us this March at DUTCH Fest in Dallas, Texas, where you become the hormone expert. If you're a registered DUTCH provider, this is your invitation to three days of advanced hormone education, clinical insights, and hands on case study based learning from March 12th through 14th. Learn directly from founder Mark Neumann, Doctor Jacqueline Smeaton and Doctor Kerry Jones as you dive into focus sessions, discover real clinical applications and explore practical Testing strategies you can use immediately.

00:24:51:10 - 00:25:11:23
DUTCH Podcast
The goal of DUTCH Fest is to learn how to interpret the DUTCH Test with speed, confidence and clarity. Spots are limited. Registered DUTCH providers secure your ticket now to your provider portal or by visiting DUTCH fest.com. Welcome back to the DUTCH podcast.

00:25:12:01 - 00:25:17:11
Dr. Jaclyn Smeaton
I'm glad you brought up acne. Are there specific microbial patterns that tend to be seen with acne?

00:25:17:13 - 00:25:40:00
Kiran Krishnan, PhD
Yeah. So we have to treat the face. And the body is almost two different organs okay.

Right. From a microbial standpoint. So the face is a highly sebaceous environment. It's very oily. There's a lot of crypts and things like that. Because of the high sebaceous environment, the face tends to have very low diversity. Right. You typically have a few different species of bacterium.

00:25:40:01 - 00:26:03:15
Kiran Krishnan, PhD
And then there's some propionic bacterium as well. And staff epidermis, the, the the rest of the body, for example, the back the arms or legs are much more dry environments and they tend to have really high diversity. You can have upwards of a thousand different species living on your arms and legs. Right? Which is amazing. And and so when you start to understand dysbiosis on these two different parts of the body, it's exactly the opposite.

00:26:03:17 - 00:26:27:14
Kiran Krishnan, PhD
So face dysbiosis is an increase in diversity. Skin dysbiosis is decrease in diversity. Right. And so talking about acne then right. So typically what happens with acne that that starts to trigger a dysbiosis is that it starts to increase risk. For developing lesions is you start to see a reduction, an increase in diversity and a reduction in the predominant microbes.

00:26:27:14 - 00:26:28:21
Dr. Jaclyn Smeaton
Which are probably the protective.

00:26:28:22 - 00:26:50:06
Kiran Krishnan, PhD
The protective microbes. Right. And that's, could you back to your magnesia? There's a number of different versions of them. There are some that are very inflammatory and can trigger common, development. And then there are some that are protective. So Q.t bactrim is kind of a confusing microbe, right? Because, you definitely have versions of it that cause acne and versions of it that prevent acne.

00:26:50:08 - 00:27:10:08
Kiran Krishnan, PhD
And then there's a couple other propionic bacterium and there's some evidence that you're cutting back them and how it reacts with staff. Epidermis is the really important determining factor in whether that bacterium becomes aberrant and starts creating

an issue. So so you've got this predominance of bacterium and staff abdominis. Then you do all these horrible things to your face.

00:27:10:08 - 00:27:38:11
Kiran Krishnan, PhD
Right. Constantly antimicrobial ING it over washing, over cleansing, swiping it, cleaning it, stripping it, all of that stuff. And and as those two microbes keep getting knocked down, knocked down, knocked down, you start to get aberrant growth of microbes from other parts of the body. You can actually transfer microbes away from your hands, for example, as you're touching your face, you're transferring microbes now to your skin, on your face, and you're seeing a diversity increasing staph epidermis going down.

00:27:38:16 - 00:28:05:13
Kiran Krishnan, PhD
And as a result, you start to see a shift in the type of Keady bacterium becoming prevalent. That type of kidney bacterium gets into the pores and can trigger an increase in sebaceous glands activity, causing more sebum production and a clogging of those pores. Now, when you trap that bacterium in that pore, you trigger a massive inflammatory response, thereby creating an inflammatory comment on right and acne is often thought of as an infection.

00:28:05:13 - 00:28:09:10
Kiran Krishnan, PhD
Erroneously. It's not. It's a pro. It's an inflammatory condition.

00:28:09:10 - 00:28:13:07
Dr. Jaclyn Smeaton
I'm glad you make that distinction. Because bacteria like you're describing, they're involved.

00:28:13:08 - 00:28:13:20
Kiran Krishnan, PhD
They're involved.

00:28:13:22 - 00:28:16:06
Dr. Jaclyn Smeaton
But it's not necessarily infectious the way we think about.

00:28:16:06 - 00:28:24:13
Kiran Krishnan, PhD
It. Right. It's not. It's a vector. Vector is triggering an inflammatory response in the body. There are components from our gut that can get involved. As I was.

00:28:24:13 - 00:28:42:15
Dr. Jaclyn Smeaton
Just about to ask, I mean, is there like this gut skin connection? I know there's providers like Julie Greenberg comes to mind for me, she's had incredible results in her dermatology practice, working on the gut microbiome and I find that so fascinating that she's she says now she can take a look at someone's skin and kind of predict which is going to see when she does GI Testing.

00:28:42:15 - 00:28:45:20
Dr. Jaclyn Smeaton
Yeah, I'd love to hear your point of view on the connection point there.

00:28:45:20 - 00:29:06:02
Kiran Krishnan, PhD
Yeah, yeah, I actually have a pattern on this on a, on a probiotic way of alleviating acne. Both, both inflammatory and non inflammatory lesions. It's actually one of the last patterns I, was able to develop at Microbiome Labs before, before I left. And so the hypothesis was simple. So there's about 52 studies that look at dietary impact on acne.

00:29:06:03 - 00:29:25:15
Kiran Krishnan, PhD
Right. What's really clear is in in most individuals who are susceptible to acne. And I think you have to have a topical susceptibility to which is that dysbiosis. Right. And then the internal part can drive and increase the risk. And then of course there are hormonal components as well, which will. Well, we could talk about but let's say they already have the topical risk.

00:29:25:15 - 00:29:44:03
Kiran Krishnan, PhD
They're seeing an increase in the diversity of the skin on the face and neck. And then they're seeing that shift and Q2 bacterium, the type of bacterium. Now you add to that stressors in the gut. So in this case they looked at gluten and dairy. And what seems clear is that foods that are high in in dysfunctional fats.

00:29:44:03 - 00:30:13:18
Kiran Krishnan, PhD
So like fast food, processed foods, gluten and dairy can drive acne in most individuals. And what they found is that foods that are that follow more of the Mediterranean diet seem to alleviate acne, right? So what that indicates to me is that foods that increase endotoxin LPs are likely causing more impact on acne. So first line that we looked at is is there a correlation or connection between leaky gut and LPs, endotoxin and acne?

00:30:13:20 - 00:30:33:14
Kiran Krishnan, PhD
And sure enough, there are at least four studies that show in individuals who are susceptible to acne if their serum levels of LPs increase above a certain threshold, you can find LPs interacting with the sebaceous glands, triggering more inflammation. Right? So LPs was a trigger that kind of broke the camel's back. That caused the formation of the common ones.

00:30:33:18 - 00:30:36:00
Kiran Krishnan, PhD
They're already susceptible. But that became a trigger.

00:30:36:00 - 00:30:46:17
Dr. Jaclyn Smeaton
So really, if you were going to break that down to simplify it, the the gut dysbiosis is leading to kind of this inflammation that's causing greater susceptibility in other microbes.

00:30:46:19 - 00:31:16:05
Kiran Krishnan, PhD
Exactly. So, so if you think about the, the skin has now structurally and, ecologically been primed for developing acne and then the gut becomes the driver of it, right. And if the gut. So in those conditions, if you're structurally and ecologically primed for acne, but your gut is perfectly healthy, you don't have endotoxin and you don't, there's another component I'll talk about if that component is is functioning, you will likely not develop lesions.

00:31:16:05 - 00:31:41:06
Kiran Krishnan, PhD
Right? You it seems like acne. You have to have both components. So the other

component of it is we were looking at short chain fatty acids and their impact on acne. What became clear is that individuals that were protected against acne were individuals that had high acetate production, and acetate is an interesting component of the short chain fatty acids because it it leaves the gut, more often than butyrate and propionate does.

00:31:41:06 - 00:32:10:02
Kiran Krishnan, PhD
Right. And you find it in the periphery, in skin. And then and what we find is that there's data that indicates that acetate can actually reduce the amount of sebum production and act as an antimicrobial inside the, the, the, the port itself. Right. So our hypothesis, which is what we, we were able to develop the patent on, was if we design a probiotic that stops LPs and increases acetate production, we should be able to significantly reduce acne lesions.

00:32:10:08 - 00:32:27:12
Kiran Krishnan, PhD
So we ended up doing two clinical trials. The second one is a much larger it was it would became the largest probiotic acne study ever. And it was a 90 day study. And we saw on average, a 75% reduction in both inflammatory non inflammatory lesions. Wow. Just with the probiotic.

00:32:27:13 - 00:32:29:20
Dr. Jaclyn Smeaton
And that's just really by altering the gut microbiome.

00:32:29:20 - 00:32:54:15
Kiran Krishnan, PhD
Just by altering the gut microbiome, we what we did in the in the placebo group, we did because everyone has a skin routine. So we kind of gave them the same skin routine. We gave them the same cleanser, the same toner, same moisturizer. So everyone use the same, topical treatment. The only difference was whether they were getting the probiotic, a placebo and a 75% reduction is on par with doxycycline or any kind of antibiotic treatment.

00:32:54:21 - 00:32:58:12
Dr. Jaclyn Smeaton
And yet and you're doing that through building, not through knocking things down.

00:32:58:14 - 00:33:19:08
Kiran Krishnan, PhD
Exactly. And so, yeah, you know, we're absolutely building we're making the skin healthier in that regard. We're making them healthier because we're reducing leaky gut, which we know impacts everything. And then we're increasing short chain fatty acid production, which improves all kinds of things as well. Right. So overall, they're becoming healthier and thereby showing on the skin with as clearer skin.

00:33:19:13 - 00:33:30:10
Dr. Jaclyn Smeaton
Can you talk a bit more about the population of patients that that's best suited for? Like I think about hormonal acne during puberty. Does it work during that time or is that hormone contribution a different mechanism layered on?

00:33:30:12 - 00:33:51:10
Kiran Krishnan, PhD
So we we've done some work on this as well. Hormonal acne is a little bit harder to deal with than people that, have non-hormonal acne. And cystic acne is also a little bit harder to manage. But nonetheless, we do see effects in both as well. Right. With hormonal acne seems to be more important on your timing of things, right?

00:33:51:10 - 00:34:04:10
Kiran Krishnan, PhD
Because it's associated with cycles. You know, we know that, you know, in a, luteal phase, we're going to see potentially an increase in acne because, estrogen is dropped, of course, and androgens are.

00:34:04:10 - 00:34:05:21
Dr. Jaclyn Smeaton
Going up, right, relatively.

00:34:06:02 - 00:34:39:05
Kiran Krishnan, PhD
Relatively. And as a result, of course, you see the characteristic around around the, the jawline and so on. So then the question is, well, why is that? Well, androgens tend to stimulate more sebum production. Right. And that you create more inflammation. So then like okay, if you're if you determine that and that's where a DUTCH Test comes in, you know, really beneficial because you can then correlate your, your, you know, your expression of acne lesions and, and the, the development of lesions to

your cycle and what's actually happening, you can figure out a is it driven by an androgenic response?

00:34:39:07 - 00:35:00:03
Kiran Krishnan, PhD
B is it androgenic? And a cortisol response, because we know stress also can induce it, right. So you can look at the cortisol pattern as well. And so you can align your acne issue with patterns. Yeah. And as a result of that you can be more proactive. Right. So if you're going into your phase right, you want to be much more sound on your diet.

00:35:00:05 - 00:35:01:06
Dr. Jaclyn Smeaton
So sleep more.

00:35:01:06 - 00:35:22:00
Kiran Krishnan, PhD
Sleep more right. You want to you want to increase fiber intake. You want to get more short chain fatty acids going. You want more acetate going up. You want, like less dairy, less gluten. You want to be really clean about those things. The studies on acne and diet showed that polyphenol intake in the diet has a massive improvement on acne lesions.

00:35:22:04 - 00:35:42:06
Kiran Krishnan, PhD
So you want to increase your fruits and vegetables and all that as you're going into luteal phase, right? If that's what you've mapped it out. Or if it's just purely a cortisol response. Right, right. Then because some people will have stress related acne which can occur, but stress creates an, leaky gut. And that's probably the main mechanism in which it's causing acne.

00:35:42:07 - 00:36:02:05
Dr. Jaclyn Smeaton
Right? Yeah. It's interesting cause women tend to have more. We actually have more androgen receptors in the skin cells around our jawline and neck as well in some women. So it's really, I think thank you for bringing up the DUTCH chest. We love talking about the podcast, but it is really nice because it seems like it layers in with this microbial approach because you will have, particularly if women make a lot of DHT.

00:36:02:06 - 00:36:15:10

Dr. Jaclyn Smeaton
Yeah, you know, they are metabolizing their Testosterone and DHEA down those alpha pathways which produce much stronger androgen metabolites. Yeah, they could be at that extra risk of making more sebum, causing more problems. Like thinking about it all connects well.

00:36:15:11 - 00:36:34:10
Kiran Krishnan, PhD
And I you know, we talked to I, I have a skin serum product, which is a spore based skin serum that seems to really help with acne. And and when we find resistance in its ability to help, one of my recommendations to the clinicians that are using it is I do a DUTCH Test and figure out the pattern.

00:36:34:12 - 00:36:41:18
Kiran Krishnan, PhD
Right, because there may be a pattern to this that you're not seeing. And you want to understand that. Right? Because then it's a different, slightly different approach that you would take.

00:36:41:21 - 00:37:01:17
Dr. Jaclyn Smeaton
So we've talked about aging skin. We've talked about acne. I want to talk a little bit about inflammatory skin conditions, because that seems like the other category where you get a lot of barrier disruption. You mentioned psoriasis. We've talked a little about like atopic dermatitis. Yeah. Can you speak a little bit to those conditions. And it's hard to lump them all together right now because they're a little different.

00:37:01:19 - 00:37:05:19
Dr. Jaclyn Smeaton
But talk a little bit about that and how a microbiome based approach might help.

00:37:05:21 - 00:37:26:05
Kiran Krishnan, PhD
Yeah. So we've actually done a lot of work on atopic dermatitis. And for a couple reasons. Number one is that, the existing treatments for it are not great, right? Steroid creams are really the go to. And then we started two studies now on pediatric atopic dermatitis in particular because of that, atopic march that I talked about.

00:37:26:05 - 00:37:45:15

Kiran Krishnan, PhD
Right. So imagine a kid who was, say, 7 or 8 years old and has, you know, bilateral atopic dermatitis. They have lesions on both arms and legs and so on. It's really irritating and difficult for the child at this age. But the but the bigger impact is that that's going to create lifelong sensitivities because of the atopic march.

00:37:45:17 - 00:38:22:02
Kiran Krishnan, PhD
And they're just not managed well. Right. The first line, actors in this are the pediatricians, and I've talked to dermatologists about it, and they're like, pediatricians do not know how to handle skin issues, but there are very few dermatologists that also deal with, with, pediatric dermatitis. Right. So, so we started looking at this and go, okay, there's clearly a microbiome role here because with atopic dermatitis especially, it's really clear that an overgrowth of staph aureus is is a is a determining factor of whether or not an individual should develop a lesion in that area.

00:38:22:04 - 00:38:42:12
Kiran Krishnan, PhD
Right. But they have areas of their skin where they're not developing lesions. Right. So I started this in the crudest way, starting with starting this and having people do autologous transfers. All right. So I'm saying okay, you've got on this hand here, you've got a dermatitis lesion. This hand seems fine. So the microbiome on this hand must be okay.

00:38:42:16 - 00:38:59:08
Kiran Krishnan, PhD
This thing for whatever reason you've got too much staph aureus. So I said clean this area really well where you've got the lesion, assuming the skin's not overtly broken and all that, but clean it with a nice, gentle soap and then take a cotton swab with what? That's wet with a little bit of, know, like olive oil or something.

00:38:59:10 - 00:39:02:12
Kiran Krishnan, PhD
Scrub the healthy area and transfer it to the good area. Right.

00:39:02:12 - 00:39:03:22
Dr. Jaclyn Smeaton
It's easier than a fecal transplant.

00:39:03:23 - 00:39:30:23
Kiran Krishnan, PhD
It is. It is, and certainly easier fecal transfer from somebody else. Right. And so, so just do that like a, like a few cases just to see if that even makes any difference. And, and we were seeing some really profound results from that. Right. It's a little bit more difficult for people to do on a regular basis, but just that autologous transfer where we're changing the microbial environment here started to see a significant improvement here.

00:39:31:04 - 00:39:51:13
Kiran Krishnan, PhD
So to me, that became clear that, okay, that the microbial trigger is so important. Right, right. So then we developed that serum which is a spore based serum. We've done the spores in the gut. We know the spores are really good at competitive exclusion. So we said can you can they do it on the skin as well. So we started treating these lesions with with the spore based serum.

00:39:51:18 - 00:40:07:01
Kiran Krishnan, PhD
And we're finding amazing results so far. Right. So so now we know that if we can shift the microbiome on the skin and at least in the category of atopic dermatitis, those type of inflammatory conditions, we can likely, you know, subdue that response.

00:40:07:06 - 00:40:34:01
Dr. Jaclyn Smeaton
I'm glad to hear this because I think this is an area that's been a struggle to treat even with integrative medicine. I mean, when I learned in naturopathic school, everything was like, it's a food allergy, it's a food allergy. But the data has not played out that food allergies are a consistent role in atopic German kids. And in fact, the data doesn't really suggest that it has any kind of meaningful incidence that's higher in kids with a topic derm compared to a control population.

00:40:34:01 - 00:40:42:12
Dr. Jaclyn Smeaton
So it's great to hear about other mechanisms that we may be able to think about just for these children and to prevent them from having to do these drastic elimination diet.

00:40:42:12 - 00:40:50:18

Kiran Krishnan, PhD
Totally. Yeah, absolutely. And in fact, if there is a connection with food allergies, it's the food allergies result from the atopic dermatitis, not the cause of it.

00:40:50:19 - 00:40:51:18
Dr. Jaclyn Smeaton
Right?

00:40:51:20 - 00:41:11:23
Kiran Krishnan, PhD
It's so it's the presence of microbes on the skin that are triggering aberrant immune responses. And then if you pair that with a dysfunctional gut that tends to to to create this like massive NF kappa B type of response to every trigger, then you get this perfect storm of a negative trigger and then the gut that also responds overtly to that trigger.

00:41:12:01 - 00:41:24:23
Dr. Jaclyn Smeaton
Well, I'm sure everyone that's listening is now wondering, well, this is amazing. What do I do about it? So yeah. Can you tell me what foundational strategies clinicians should start with with their patients when it comes to preserving skin barrier function?

00:41:25:04 - 00:41:47:17
Kiran Krishnan, PhD
Yeah. You know, there's some surprisingly simple things to do. Right. So number one I would say start a process is trying to clean up most of the personal care products. Right. If you're if you've got if your patients got products with a bunch of parabens and phthalates and all of that stuff in it, benzoate and all that, all of those preservatives, and I'll try to clean those up because those are all strong antimicrobials that are going to be killing off any beneficial bacteria in your skin.

00:41:47:23 - 00:42:09:17
Kiran Krishnan, PhD
So let's reduce the killing. Right. So that's step one. Number two, replace those of course, with as clean of products as you can. It doesn't have to be overwhelming. Start with something simple. I started for example with my moisturizer like what is the cleanest moisturizer I can find that works for my skin? Then I went on to like deodorant and went on to soaps and so on.

00:42:09:19 - 00:42:15:18
Kiran Krishnan, PhD
Number two, if it's if it's somebody that uses makeup, make sure they're removing the makeup the moment they get home.

00:42:15:18 - 00:42:23:02
Dr. Jaclyn Smeaton
I'm so honestly, like really bad about that, like anyone listening to the podcast cares, but I'm like one of those people that's so tired. I want to get home. I just hit the pillow.

00:42:23:03 - 00:42:40:11
Kiran Krishnan, PhD
Yeah, exactly right. You want to remove that makeup? You want to reset the skin microbiome? You don't need to harshly. I mean, there's things you need to do to remove the makeup, but beyond that, you want to clean and moisturize the skin, right? And number three, you want to use, at least once a day. More skin mimetic moisturizers.

00:42:40:17 - 00:43:02:21
Kiran Krishnan, PhD
What that means are these are these are anhydrous moisturizers that don't have water in it, okay. Moisturizers that are predominantly things like squalane or linoleic acid that mimic the oils on the skin that are really moisturizing and also protect the microbes on the skin. Okay. Right. Another thing you can do is, at least a few times a week, if possible, go with stripped skin.

00:43:02:21 - 00:43:28:20
Kiran Krishnan, PhD
And when I say stripped, I mean no product on it. Yeah, right. Except for moisturizer. Get outside the role of transient microbes from the natural environment on the health and function of the skin cannot be overstated, right? People pay thousands of dollars to the mud baths and things like that. Right? And soak themselves in tubs. All you have to do is actually go out for a walk with no makeup on and no anything on with this clean skin and interact with nature, right?

00:43:28:20 - 00:43:51:07
Kiran Krishnan, PhD
Just the microbes in the in the air alone. Settling on your skin can have a very

modulatory effect. Right. And then using serums like we have the serum, with the, with the spores in it, that can be helpful as well for a lot of people. And then finally cleaning up the gut. Right. The gut is going to play a role in driving proinflammatory responses on the skin.

00:43:51:12 - 00:43:59:13
Kiran Krishnan, PhD
So if your gut is leaky and you have low, short chain fatty acids, that's going to have a negative effect on the skin. So fixing the gut also helps, quite a bit.

00:43:59:16 - 00:44:14:23
Dr. Jaclyn Smeaton
I love that, especially if we didn't get a chance to talk about it. But I've always been fascinated by the data showing that health is better in people who grew up on farms versus in cities. And I think about skin health as well. And I love that recommendation to kind of get out in nature and don't be afraid to get your hands dirty.

00:44:14:23 - 00:44:22:22
Dr. Jaclyn Smeaton
Yeah, right. Because it actually is protective. And it makes a lot of sense that you're getting that, you know, now that you've explained that skin microbiome, how it would have such a positive effect.

00:44:22:22 - 00:44:38:00
Kiran Krishnan, PhD
Yeah. You know, if people are going out for walks, try to go out for walks without any of the things on the skin that we normally would have, right? Our makeups and this, that and the other. Of course, if it's super sunny, you're going to need some sunscreen on there. But, but nonetheless, try to go out with as clean skin as you can.

00:44:38:02 - 00:44:44:02
Dr. Jaclyn Smeaton
Great. If people want to learn more about this, can you share where they can best find more info from you and your education and the products?

00:44:44:05 - 00:45:03:03
Kiran Krishnan, PhD
Yeah, so a couple of places. So I put a lot of education on the skin microbiome. On my, on my page called Self-care Civi carry. That's the Instagram handle. And in fact, sieve

also has a microbe, a skin microbiome like free course that we have on YouTube. Right. So people can just follow that as well.

00:45:03:06 - 00:45:09:15
Kiran Krishnan, PhD
And then of course, my personal, Instagram, where I share a lot of this, as well as Karen biome key and bio of me.

00:45:09:19 - 00:45:13:10
Dr. Jaclyn Smeaton
Wonderful. It's been great to have you on again. Thank you so much for joining me today.

00:45:13:10 - 00:45:16:00
Kiran Krishnan, PhD
It's my pleasure.

00:45:16:01 - 00:45:28:17
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