Dr. Jill

Your Functional Medicine Expert®

Jill Carnahan, MD ABIHM, ABoIM, IFMCP

#130: Dr. Jill interviews Shaina Cahill, Ph.D. on Fecal Microbiota Transplant

Text:

Dr. Jill 0:13

Okay, we're live. Welcome everybody to another episode of Dr. Jill Live. I am super excited about our topic. As you know, I love gut health and everything to do with the microbiome. And we're going to dive deep today into fecal microbiota transplant (FMT) and why it might be for more than just C. diff, which is the current indication. What else might this be for? Where's the research? Where's the status?

Dr. Jill 0:34

I've got an expert here today. Shaina is a neuroscientist with an interest in alternative medicine that utilizes the body's innate systems. I love that! She received her doctoral degree in neuroscience from the University of British Columbia. Her research studies have focused on brain development and the impact of biological sex, exercise, and aging on the brain. She has a passion for medical education and scientific communication that is accessible, accurate, and digestible. Shaina is the Director of Medical Communications and Affairs at Novel Biome and is focused on spreading educational and scientific information about the microbiome and FMT. Shaina, I'm so glad to have you here today.

Shaina Cahill, Ph.D. 1:12

Thank you so much for having me.

Dr. Jill 1:13

You're welcome. So, I always like to start with [one's] story, and especially, how did you get into this field? You're obviously a neuroscientist. The microbiome—you and I know they're totally connected. But tell us, how did you get into your study of neuroscience? And then, how did you get into microbiome research?

Shaina Cahill, Ph.D. 1:28

Yes. So I always found a way, somehow, in my academic research, to find weird niches that connected my interest in brain development and brain aging, with areas that we didn't seem to always put together. So my master's work looked at ghrelin, which is a feeding hormone, and how that actually changes as we age and how that might be tied to some of the dysfunctions in the brain and memory. So after leaving and doing my Ph.D., I went into the world of medical affairs.

Shaina Cahill, Ph.D. 1:59

Mostly, my interest there came from wanting to be able to translate my passion for science and education to how we can utilize that and allow everyday people to be able to consume these large amounts of information. That's what my focus has been on. I don't expect everybody to be able to read 100 papers, but that's my job. And then, how do we get that down to something that someone can understand and use that information? And that led me to fecal microbiota transplantation because it's an area where there's a lot of research, but that research hasn't really been connecting together as seamlessly as I think it could be. It's an area where I think we're going to see a lot more interest, as well as a lot more use for it. I felt like that was the right place to settle myself in to figure out: How can we educate people on it? And in terms of that, how do we increase the research so that it can be utilized more widely?

Dr. Jill 2:56

Brilliantly said. I love it. I remember, 20 years ago, at the beginning of one of my functional medicine practices, I'd have a college kid come in with depression or anxiety, and I'd be like, "Okay, we need to do a stool profile." As you know, back 20 years ago, this data... I'm sure you could speak this far more clearly than I, but the increase, if you start to search 'microbiome,' is exponentially exploding and shows what I've been doing for 20 years. And anyone in functional medicine knows about the microbiome, the brain, aging, and memory. So I'm sure you know, again, even more than I do about how much is really coming out. The great thing—I love this foundation because you're a researcher and I'm a scientist at heart—and what's true about our topic today is that there is so much science, and it's literally exploding. Do you want to comment on what you've seen in your career as far as how much it's really increasing in the amount of data that's coming out on the microbiome and medications and all these things?

Shaina Cahill, Ph.D. 3:48

Yes. The way that I always highlight it for people [and] the first understanding is that clinical trials are really expensive. They are not easy to run, and a lot of them fail. The growth in clinical research on the application of fecal microbiota transplants outside of C. diff in the last 10 years has gone from about 30 trials 10 years ago to about 300 trials in 2020. So that's a huge explosion of resources for understanding how this works. But to get to do a clinical trial, the amount of work that goes into both preclinical and early clinical studies is exponential. So this research is growing every day in a really interesting way that we [generally] don't see a lot of in [many other] research [programs] anymore, where we're learning about the basics at the same time we're learning how it applies to disease.

Shaina Cahill, Ph.D. 4:42

I find my day can be [spent] reading a study about how FMT could be used for something like multiple sclerosis, at the same time as we're learning about the basics of

[things] like, "We should always pre-treat the gut before we do FMT." So it's very interesting that these two facets are happening at the same time. It's both a blessing and a curse, because I think we're learning how it works and then we're going to have to augment how we apply it as we're doing it. I think the ability to tie into what our body can actually do already—maybe not cure everything—could really help move us forward in diseases where we're at a stagnant pace.

Dr. Jill 5:26

I love that, and I couldn't agree more. It's interesting because in my realm, of course, I'm medically trained as an MD, but then I do this functional integrative realm, where, if we take the research and the way things go in classical medicine, there's research, there's maybe an idea, and then a couple of clinical case studies. And then, of course, the research gets bigger in the randomized controlled trials. But, usually, that can take 20 or 30 years until some idea, or, [let's] say, some vitamin, has some efficacy and until it shows enough with the large trials to put it into clinical practice, right? You and I [both] know this. And what you're describing is the pace of some of these things that are so helpful with fewer potential side effects. [With] a new drug, there might be some toxicity and stuff. And I feel like sometimes those carry more potential risk and less benefit, or the benefit comes with the risk. and you have to be more careful with implementing it.

Dr. Jill 5:26

All this to say, what I've done for 20 years is take stuff that's on the cutting edge, coming out, that maybe doesn't yet have a clinical application, but I know, like, "Okay, dosing vitamin C at 2,000 [mg] a day is pretty darn safe. There are not a lot of people [that will have adverse reactions from it] except for [those with] G6PD deficiency issues who could have problems with that. So I'd say, "Okay, if there's safety and there's potential efficacy, I will often start to implement before that 30-year curve

because my patients don't have time to wait." And I think that's what you're describing here. We're in the trenches; we're doing this stuff at the cutting edge, which means we have to take what we get and try to apply it in real-time and not wait for those 30 years because we don't want our patients to wait. Does that make sense?

Shaina Cahill, Ph.D. 6:52

Yes. And at Novel Biome, we're focused on autism spectrum disorder, which is really right at the beginning. The groundbreaking trials were in 2017 and 2019—this is recent. But there are no other options. I think we've had an understanding for a very long time of how the gut ties into a lot of diseases. But we haven't really put together the importance of: "Okay, the gut is dysfunctional. What happens if we reset it?" I think that's what we're getting—this idea that FMT [can help] at the more extreme end, but it's a hard reset on your gut. We're just now getting to really understand how things that are bad for our overall health are also bad for our gut, [and] how resetting some of the things that are happening in our lives can make changes in our gut. But in some cases, a full reset is necessary. But then, when we make those changes—the cascade that happens after that! I think, from your perspective in functional medicine, you have an understanding that the whole body is connected. I think one of the issues in traditional medicine, especially 15 to 20 years ago, [was that] it was like: The brain does this; the stomach does this; the heart does this.

Dr. Jill 8:17

Silos.

Shaina Cahill, Ph.D. 8:18

Yes. But we're in a place where, like, "Oh, wait, everything is connected." So if you change one thing, you change many things. I think that's where gut health is getting more appreciation because when we look at the gut, it's not only communicating in the basics of breaking down

our food, but it's [also] creating neurotransmitters, which are what communicate for the brain, [and] it's also dictating the immune system. So these far-reaching systems are being impacted by the gut. Now that we know it, it makes sense. You're like: "Oh, it processes all of our food; it breaks down all the molecules. It's very interconnected." But it really does, it's talking everywhere.

Shaina Cahill, Ph.D. 8:59

So what happens when it does it right? When the gut is functioning properly, what else happens? And that's where we're starting to fully see how far [we've come in terms of] the number of disorders that are being researched, ranging from gastrointestinal diseases like inflammatory bowel disease or irritable bowel syndrome [and] things like Parkinson's disease, Autism Spectrum Disorder, multiple sclerosis—[even] treatments outside of cancer to mitigate some of the negative effects of cancer treatments—are all being targeted for possible diseases where FMT and gut restoration play a role.

Dr. Jill 9:38

That makes so much sense. I just finished a chapter in an integrative cardiology textbook—it's a second edition. And the chapter I wrote was on the gut and the heart and the connection with the microbiome. And people would think, "What does that have to do with it?" So pretty much any system you could talk about—there's a relationship; it all talks. So let's go a little backward. You and I know what FMT is, but maybe those listening are like, "Okay, what is this? I kind of heard about it." Let's go to the very basics. What is FMT? What does that mean? What does it encompass? I know there are several ways to do it. Let's start with the definition. And then, we can talk about the application.

Shaina Cahill, Ph.D. 10:08

Yes. Fecal microbiota transplantation, or FMT, is the idea of taking a healthy person's gut microbiome from their

stool. These people are highly screened; it's very selective for people who could even act as donors. I could not be a donor; I'm not healthy enough, [even though] I'm generally healthy. So we take these well-screened donors, and their stools are broken down. It's basically the parts of the gut microbiome—the bacteria, the fungi, [and] the different viruses that are in there that make up this colony—[that] are purified. Then, someone who has gut dysbiosis—we're talking about a gut that's dysfunctional and that cannot easily be changed, so something like probiotics or a change in diet is not going to reset their gut—[is] going to take FMT, which is from this donor material. That ranges from colonoscopy and retention enemas to these new ways of doing things like oral FMT capsules.

Shaina Cahill, Ph.D. 11:09

What we're seeing is that you're re-educating the gut microbiome, teaching it how to be the best version of itself. So it recolonizes the gut; the gut starts to look more like the donor gut microbiome, so you get a healthy gut. And then you see these huge secondary changes, not just in GI symptoms but across the board. For us with autism spectrum disorder, [there are] secondary changes, but as well as [with] other disorders, we see changes that aren't just gut-related.

Dr. Jill 11:39

That makes so much sense, because, again, it goes all over the neurotransmitters and all this. So practically speaking, say someone visited your clinic. What would that look like? Would it be an intake? Would it then be a visit? Would it be a follow-up? What does the process look like for the average person? And what's the timeframe for that? And then, we'll talk about indication.

Shaina Cahill, Ph.D. 11:55

Yes. The way that we approach treatment with FMT is, the first thing we always do is have a call with whoever is

interested. That breaks down what it is, what the research says, what the person is looking for, what symptoms they have, and if it would be a good fit. So that's the beginning of the journey. Our journey [and] our standard protocols focus on someone who has autism spectrum disorder. Of course, in the call, if that's not what you're looking for, we augment our process based on that. But we do have three checkpoints throughout the process with a physician's assistant. That starts with looking at what medications you're taking, what your diet looks like, [and] what symptoms you have, then creating a pretreatment to prep your gut to be able to allow for this new gut [microbiota] to come in and get cozy in there. So they'll come to our treatment center after their pretreatment, and they'll spend a week there.

Dr. Jill 12:55

And pretreatment, would you ideally do a month or three months? Or what kind of pretreatment timeframe?

Shaina Cahill, Ph.D. 12:59

Pretreatment [lasts up to] three to four weeks normally. That's normally based on some kind of antibiotics; we know antibiotics wipe out the gut microbiome. So we take advantage of something we know is negative to prep the gut so it's able to engraft new bacteria, and then they spend a week at one of our treatment centers. We have four right now: one in Mexico, one in Hungary, one in Australia, and one in Panama. That basically allows [one] to reduce the stress of getting to a treatment center. We pair with facilities that are able to do it and have like-minded physicians, and then we provide them with [the] product and a protocol. Once they go home, we do 15 weeks of treatment after that first initial week. That's normally either oral capsules or, for someone who can't swallow capsules because we work with a lot of children, we have an oral powder that they can just mix with juice and water. They do that for 15 weeks. Over that period, they meet with a physician's assistant again to check in. We [also] do different behavioral measurements and

gastrointestinal measurements to measure improvements and see what we're seeing change-wise. Right now, we're basically looking up to two years after, monitoring changes and seeing what impacts [they have].

Dr. Jill 14:21

I'm guessing—do you do stool testing? Of course, I'm assuming. Is that part of it or not?

Shaina Cahill, Ph.D. 14:25

We don't use testing unless… Often, parents will have a lot of that information. We're only working with kids with autism, so parents have a lot of information coming in—a plethora of every health aspect. But we do everything individually. It depends on where someone is in their health journey, so all of those things are dependent on that person. That's why it always starts with a call because everybody comes in at a different point. If FMT is the correct treatment option, where they start is dependent on where they'll end up.

Dr. Jill 15:00

That makes perfect sense. We know [that], at least in the United States, the FDA has approved this for C. diff [and] colitis, because there are not a lot of other options. I think that's one of the reasons. Again, you could speak to the research on that. But you and I know there are so many more likely applications. What are you seeing the research trend to?—besides what you're doing, obviously, brand new research in this realm. And I think what happens is that things that don't have a lot of other options are the ones that are first allowed to be able to do this in an experimental way. Why don't you talk through where we came from with C. diff and what other indications are now being studied?

Shaina Cahill, Ph.D. 15:32

Yes. So, in C. diff, it's mostly targeted at people who don't respond to typical treatment or have recurrent C. diff—so,

[ones] who've had multiple incidences. FMT treatment shows a 90% efficacy rate, which is huge; 90% just doesn't happen in a lot of things. But on top of that, compared to what our standard treatment is... C. diff comes about in most cases because of antibiotic treatment. Unfortunately, the first line of treatment for C. diff is antibiotic treatment.

Dr. Jill 16:04

And heavy-duty ones, because they have to [inaudible].

Shaina Cahill, Ph.D. 16:06

What they're actually seeing is that FMT seems to be a more efficacious treatment option than what we're currently doing, which is [using] antibiotics. Because of the safety profile of the FMT right now [and] how efficient it seems to be with C. diff, we're seeing growth outside of C. diff where it could be used. And of course, all of this is dependent on increased clinical research, [which] is needed. And more clinical trials are needed to get a better understanding.

Shaina Cahill, Ph.D. 16:38

But for inflammatory bowel disease, right now the studies are looking at long-term FMT treatments, which are normally loading doses similar to what we do in our protocol. So you have a couple of treatments, which are large doses, and then short periods with lower-dosed FMT over long periods. But for irritable bowel disease (IBD), it's about a 30% remission rate, which is fairly good. And we're learning that in cases with something like IBD, where it has inflamed periods and non-inflamed periods, when treatment occurs and how high inflammation is seem to impact the response.

Shaina Cahill, Ph.D. 17:22

Irritable bowel disease shows about a 50% remission rate, which is quite good and seems to be long-term. There are not a lot of studies that have looked long term, so the

ones that have shown that, the results seem to go on for longer periods. Parkinson's disease and multiple sclerosis are very early to the gate. Parkinson's disease has three or four clinical trials going on right now, and MS, I think, has two. The preclinical research is really positive, and the number of case studies there have been shows [improvement]. Both of these diseases show gastrointestinal issues, so we're seeing improvements there, but the secondary improvements and the core processes within this disease also seem to improve. For autism spectrum disorder, which, of course, is our focus, we see kids with ASD having more and more severe gastrointestinal issues than their peers. On top of that, their gut seems to be more immature, so it doesn't match what their age peers look like.

Shaina Cahill, Ph.D. 18:32

Doing FMT, we see improvements in these gastrointestinal symptoms. One study showed a 77% improvement that lasted over two years. But on top of that, which we see in a lot of disorders, autism-related behaviors also improve. So the study that I'm talking about is from Dr. James Adams's group at Arizona State. Initially, they showed a 23% improvement in autism-related behaviors, and two years later, when they looked [again], it was actually a 47% improvement. So over time, as the gut changes more, it integrates. You see a whole shift to a more normal gut microbiome, [and] we're seeing changes in these behaviors. We're seeing that in a lot of neurological diseases.

Shaina Cahill, Ph.D. 19:22

Obesity and metabolic disorders are other areas that have been hotly looked at. This research is kind of all over the place. There are two facets to what has happened. Pre-clinically, and what we've seen in some studies is basically taking a lean healthy non-obese gut microbiome and putting it in someone who is obese, most of the changes there seem to be a shift in the gut microbiome, which is good in how it's metabolizing things [and] insulin

sensitivity seems to change. But one of the areas that has been really interesting is autologous fecal microbiota transplantation, which is actually using your own gut microbiome [by] storing it and then using it later.

Shaina Cahill, Ph.D. 20:09

With metabolic disorders, when somebody is at their leanest, their healthiest—they store their gut microbiome and use that to restore their gut later on—[then] we see improvements in insulin sensitivity. It seems to hold off weight gain—not that it solves all things, but it does seem to shift how quickly that happens, but at first—that's really [in its] early days. The whole concept of banking your gut microbiome is growing in popularity. I think it is something long-term that more and more people are doing, because [it is ideal] at your healthiest, at your youngest, when your gut looks its best. [Imagine that] one time you take antibiotics and you get C. diff, or you start to age and your gut deteriorates really quickly. Having that stored allows you to have this health capsule ready. As we learn more about what the gut can do, how important will that be to have?

Shaina Cahill, Ph.D. 21:14

I guess the last one I'll mention is in terms of cancers and what they're doing. Some of the treatments related to cancer treatment are quite invasive, especially when you're looking at stem cell treatments and what has to be done to the body for the body to be able to handle a stem cell treatment. [What's] interesting [is that] they're doing fecal microbiota transplants after they do this treatment, and that's actually helping with graft versus host, and it's also helping with some of those secondary symptoms. So it's helping maintain health on top of these other treatments that are happening. So I think that's another interesting area that's being looked at, like: "Okay, so maybe it's not the gut microbiome that's playing the role in cancer, but we're doing all these other things and damaging the gut. If we restore that, can it take some of these secondary symptoms away?"

Dr. Jill 22:06

Fascinating. I have so many questions as you're talking. First of all, I don't know if you know my history, but at 25 years old, during medical school, I had breast cancer. I had three-drug chemo, and then, six months later, I got Crohn's disease. I had the genetics, and there's no doubt in my mind that some of the chemotherapy drugs created more permeability. Had I known [about] or been able to do something like this, I probably would have staved off… Who knows, right? But it's interesting because it's very relevant to me personally. All my passion and work for the microbiome have been [about] restoring—for the last 20 years—what happened with the chemo and the Crohn's, and I no longer have Crohn's because of what I've done. But I bet something like this could take it to the next level. Had I known 20 years ago, this would have been so amazing. My theory is that one of the cyclophosphamide's mechanisms is creating intestinal permeability. It probably created a more impermeable gut while I also had a gene, NOD2, for Crohn's, and then, through crossover into the immune system, it triggered… Anyway, the rest is history. But it's so fascinating. So, a couple of questions. The donors—are you homogenizing the donors together? Or does each patient get a different donor?

Shaina Cahill, Ph.D. 23:11

Here's an example: You get two bottles of pills; those will normally be from two different donors. Then we tell patients to actually mix between the donors during the day. So it's not a mix within one pill. But we do encourage them to use more than one donor. That's because we're still learning about what's important in each donor. We [also] know that the donor microbiome plays a huge role in engraftment in those outcomes, and so by using multiple donors, you increase the likelihood, the variability, and what's going into the gut to make a new gut microbiome.

Dr. Jill 23:51

Fascinating. Are you testing for keystone [species] like Akkermansia, [Faecalibacterium] prausnitzii, and Roseburia? Those are the ones that really—

Shaina Cahill, Ph.D. 23:57

The number of questions these donors get asked! We look at both their and their family's health histories and anything that could possibly be impacted by the gut microbiome, so that's everything from cancer to obesity in your family to any kind of neurological condition. If it is a disorder, most likely they will be negated. All of our donors have never had antibiotics in their lives, which is really hard to find.

Dr. Jill 24:26

Wow! How do you find these people? I was going to say, as I always joked years ago when teaching about FMT, before we had options like what your clinic does, I would say: "For me, I don't know where I'd find a good donor except for maybe Papua New Guinea."

Shaina Cahill, Ph.D. 24:39

Yes, and it is hard to find. In the published resources, you're looking at about three, and some of them go six months without antibiotics. But, how long does it take the gut to go back to 100%? And what are the impacts of having to be restored? We go to the extreme, and we know that without [donors] taking [antibiotics], you're getting the healthiest gut. All of our donors are vaginally born because you know that that plays a role. And they report on their diets, so they have to have a wide variety. We tell everybody, "Try to eat 50 different foods a week because what you eat feeds your gut. The variety in which you eat is the variety in which your gut exists. And they report on their physical activity, which is all things we know impacts it.

Shaina Cahill, Ph.D. 25:31

The variety of questions we ask and the length of time it takes to fill one of these out is really long. But as well, [something] standard—50% to 80% of people don't meet the requirements of the initial screening. Our screening is higher than that. Very few donors make it through, and then on top of that, their blood and stool are screened. So even if you make it past the initial health screening, on top of that, your blood and stool are screened. All the aspects we can control, we control for. The donor can transfer things, so everything that could be transferred, we tried to negate as much as possible.

Dr. Jill 26:09

That's amazing because that's always been my thing with FMT. This is amazing. But the donor is what makes a difference, and you guys are clearly doing your research and doing your work on that. Fascinating stuff. So, tell me about the clinic you work with. And if people do want to get a hold of you guys, how would they do that? And you said that, mainly with autism, there are definitely a few other indications. But that's really where you're focused.

Shaina Cahill, Ph.D. 26:36

Yes, our focus is mostly on kids with autism spectrum disorder, as well as adults. But we do treat people with a variety of other conditions. Anyone that reaches out to us, we'll always work with them to see if it is a good fit [for them]. Because our process starts with a call, that's all booked on our website. There's no cost—you're not guaranteeing anything. It's mostly just because we want everyone to be informed, and we want to be transparent about what we do know, what it can do, and what it can't do. So you can go to our website, which is www.novelbiome.com. And you can go there and then book a call with us. Our website ranges from everything from the history of where fecal microbiota transplants happened, which was about 1700 years ago, to our blog, which walks you through: How is it done? Why do some people use frozen stools, [while others] use fresh? So, everything that we can think of that has been a question,

we try to provide information on. You can book a call and talk with someone on our team and ask all of the questions you have, and we'll have questions for you to try to make the best pairing. And if we're not the right pairing, [we'll] try to guide you to what the best next option is.

Dr. Jill 27:55

Oh, my gosh! It's amazing that you're doing this. I love it; I love hearing more. One thing you mentioned that I think is realistic [in terms of] expectations is that this doesn't change overnight necessarily, right? It can be months or even years [before] you really see the maximum benefit, and that makes perfect sense to me. But what would you say [in terms of] when you really start to notice changes—what kind of timeframe might patients expect if they did this?

Shaina Cahill, Ph.D. 28:17

Yes. In terms of C. diff and even what we see, gastrointestinal symptoms can improve quite quickly. We've had patients that have been treated for C. diff, and they said within 24 to 48 hours they saw huge improvements. And because the loading doses are quite high, especially in terms of C. diff—it's battling back the bacteria that's negative and allowing the host to build new bacteria—on average we see gastrointestinal improvements somewhere around five weeks; we see huge GI improvements. Then, within eight weeks, we start to see behavioral changes, so it is a longer-term course. What we're finding with FMT is, as you kind of indicated, that over time, you can continue to see changes. So far, two years seems to be the longest anyone has looked. But the improvements are continuous.

Shaina Cahill, Ph.D. 29:12

When we talk to parents, they say the same thing: That there are the first improvements. Those continuously guide where things are going to go. And because of this,

diet changes—that also has other impacts as well. And then general quality-of-life improvements for both families and the children themselves also have an impact. So it's a holistic change where the gut microbiome plays a big role, causing changes, but [also] because of those, other changes happen.

Dr. Jill 29:46

It's that holistic [approach]; you're treating the whole… And I assume you give them [dietary recommendations]—"Here's the ideal diet you should be eating to make it work"—because that's part of [it].

Shaina Cahill, Ph.D. 29:53

Yes. We provide support throughout and answer questions like: "What are the best foods?" "These things have changed, so what kind of foods do we do next?

Dr. Jill 30:07

Do you find that the FMT changes their cravings too? Does it change what they want to eat?

Shaina Cahill, Ph.D. 30:11

Yes. We see augmentation in their food aversions. With kids with ASD, that's a big one. We try to be realistic. In the first couple of weeks, [we're like], "Here are ways to start integrating more foods." And, as more foods get integrated and the gut is fed, we see how they take on new foods [and how it] becomes a more positive experience. We've been working with a lot of parents, and we try to learn from them as well, because if you've ever met a parent or a family that has a child with autism, they are so well-informed. They're more informed than I am most days, and they're very willing to discuss what works and what doesn't work. And so, in working with them, we are always trying to tweak what the information we provide is as well because it's a huge life change [and] a huge family change. So it's: What are the best ways to tackle that, best feed this new microbiome, and also

support [it]?—because life happens, kids get sick. So [we evaluate]: How do we work with them when those struggles happen?

Dr. Jill 31:25

I love that. And maybe not a Celiac-patient situation, but some of the other food intolerances, I'm assuming that could change as well because all of a sudden you restore [the gut microbiome]. Do you see that, where patients get less reactive to certain foods?

Shaina Cahill, Ph.D. 31:40

I wouldn't know off hand because it really is dependent [on several factors]. We have some people come to us with no restrictive diets, [whereas with] others, there is no gluten, there is no dairy, there is no corn. So, it really depends, and it also [depends on] where they are in their journey. I find [that for certain] people, diet tends to be one of the first things we change. When you think about having a dysfunctional gut that's not able to process or work the way it's supposed to, foods that are hard on the gut [and hard] to process are the first ones we take out. But we know that as the gut changes, their diets can change. But it doesn't mean all their allergies or intolerances will go away, and that will depend on why the food was removed as well.

Dr. Jill 32:22

Got it. Amazing, amazing information—such a great resource. I knew I'd enjoy this, but it was so good. One last thing I'm sure people are wondering—obviously this kind of thing is not FDA-approved as is, so this is part of what we need to do to advance research—but what kind of cost can people expect for the full treatment for a patient?

Shaina Cahill, Ph.D. 32:42

Yes. For our ASD protocol, which is 16 weeks plus 1 week, we have some measurements that are not done by

parents [but] by a clinician, as well as meeting with a physician's assistant—so it's a quite extensive package that's specific for people with a child or themselves with ASD; the cost is associated with what someone's coming to us for—but our ASD protocol is for $14,000, and that includes everything and then support afterward as well.

Dr. Jill 33:20

Again, that makes sense. This is incredibly intensive. I'm assuming that, as a physician, I could refer to you or have patients contact you or any doctors—because we've got a lot of doctors who listen too. So if they're listening, they do functional medicine, and they want... So ASD is your primary thing right now. Hopefully, this will expand. I'm going to help you get the word out because I think it's a great resource. Any last final takeaways? If someone is listening, maybe they have a child who has autism, and they've tried a lot of things; [do you have] any last little pearls for us?

Shaina Cahill, Ph.D. 33:47

Yes. [By] looking at where the research is going and the support for how impactful gut change is in disorders, we think that gut plays a huge role, and gut behavior seems to go together. When we talk to parents, they [sometimes] say that when gut symptoms are high, behavior is high. And this isn't just specific to ASD. I have friends like this, they'll call themselves 'gut people.' Like, "My gut determines everything in my life." Well, what if you could teach your gut to allow you to have more freedom, less of your behavioral swings, or better moods? That's what FMT is allowing: The chance to learn how to be more normal or more functional, allowing you to augment things going forward because your gut is able to do and communicate the way it is supposed to. You can't undersell the importance of your gut because if you just take a simple idea [that if] you have a bad day, you eat bad food, you feel bad, which causes you to have a bad day, which causes you to eat bad food, well, that's all connected because you had a bad day, stress is up, and

your mood is down, well, you crave food that is not going to feed the gut the way it needs to, which perpetuates this momentum going forward. So we know 'you are what you eat' is becoming more of a true statement than we ever thought, and I think understanding gut health and how that could play a role in your everyday life is invaluable.

Dr. Jill 35:36

I couldn't agree more. Shaina, thank you so much. And your expertise—it's super valuable. I know a lot of people have already gotten help, and I already had some comments. So thanks again for your time today.

Shaina Cahill, Ph.D. 33:47

No problem. And if you want to learn more, we have a YouTube channel where every week I try to cover some topic that I find interesting. That kind of brings in more [information] about FMT or about the gut. We're always willing for people to give us topics they'd like to hear about as well, because this body of research, as you've said, is growing every day, so we're trying to summarize it because I find it [to be] a lot. I can't imagine somebody else trying to do it when it's not their full-time job.

Dr. Jill 36:19

Exactly, there's so much there. Thanks again. Thanks for distilling it for us, and then be sure and send me a link to your YouTube channel. I will include that wherever you're listening live to this as well.

Shaina Cahill, Ph.D. 36:29

Perfect, thank you so much!

Dr. Jill 36:30

Thank you so much, Shaina!