Build Your Resilient Gut

MICROBIOME & BEYOND

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MODULE 1 - Video Transcript

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Introduction:

So module number one. We're starting with microbiome essentials. The purpose of this module is to give you a good overview and in some areas we'll go a little bit deeper on what the microbiome is, how it's structured, how it affects us, what are some of the major functions of the microbiome that we have to understand and we have to pay attention to. You have to understand this material in order to really understand the role of the microbiome and then be able to make decisions on your day-to-day basis of what to eat, what to wear, what to put on.

Is this supplement right for me? Is that supplement right for me? Is this good for my microbiome? Is that bad for my microbiome? And how does a microbiome impact my condition or the condition of a loved one that you might be working with? So this is where a lot of that foundational information will be. Again, it'll seem like a lot of information, but there'll be numerous themes that get repeated over and over again. So let's jump in here.

Lesson 1: The Human Holobiont

So remember, I've used this term before, the human holobiont, right? Since the launch of the Human Microbiome Project, we've had to redefine what the human structure is. We are now considered a holobiont. A holobiont is a superorganism. We are a walking talking rainforest. We are made up of many different microecologies with thousands of different species. And all of those species and ecologies are critical for the function and the progression of the whole, and they have to work together in order to function properly and propagate the health of the whole.

For example, if the stomach is dysbiotic, it's going to lead to the small bowel being dysbiotic, which is then going to lead to large bowel being dysbiotic. You can go even more upstream if the mouth is dysfunctional, it's going to lead to the stomach being dysfunctional, which is going to lead to the small intestine, which is going to lead to

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large intestine issues. You can have an oral microbiome disruption that leads to an increased risk for inflammatory bowel disease. That's how connected the systems are. You could have a gut dysfunction that leads to Alzheimer's or Parkinson's. You could have a skin disorder that leads to osteoporosis. And we'll connect some of those dots for you. But keep in mind, the entire system is a systems' biology machine where all of the systems matter and all of the systems are going to be connected in one way or the other.

So everything we do is important and everything we do is relevant to our overall outcomes and we have to break down the silo thinking of medicine. Modern medicine has broken up the body into about 200 distinct segments, and each doctor focuses on a segment for the entire career and their entire life. And more often than not, when they're looking at a dysfunction in a segment, they don't look at the other 199 segments. In their view, their segment is the only thing that is involved in the problem. That's where we get a lot of dysfunction in how disease pathologies are treated, especially with the microbiome, everything is connected, because the ecosystems are connected. The microbes in your lungs are talking to the microbes in your gut. The microbes in your gut are talking to the microbes in your brain. They're all talking to each other and they're all effectuating how one another functions.

So we'll elaborate more and more and more on that and we'll give you specific examples that you can talk to people about. You can absorb and understand yourself and you can utilize to effectuate better health as you go along. So this kind of information is not only

fascinating, it's one of those fun facts, but it's also a critical component to understanding how your body works, and it's a critical component in understanding how to address problems within your system. So think about the human genome, right? The human genome has about 20,000 functional genes. An earthworm has about 30,000 functional genes. So we really don't have a lot of sophistication in our own genome in order to conduct the day-to-day functions. And yet the microbiome has over 3 million functional genes. About 150 times greater genomic diversity in our microbes than in our own

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chromosomes, in our own genes. And that is an awesome fun fact that is great at parties and will blow your mind a little bit, but that also explains how you have to think about the microbiome.

Because over the last 10 years in teaching about the microbiome to practitioners and people alike, health conscious people alike, more often than not, I hear people thinking about the microbiome as a problematic microbe that's causing a given problem. They're trying to identify the bad bacteria that's doing a thing that's causing the issue that they're feeling, whether it's a digestive issue, an immune issue or something else. What is the bad bacteria? Now, that dysfunctional mindset is only propagated by gut tests that are very focused on pathogens, but what we forget is pathogens make up somewhere around 0.1% of the total microbial load. So it means that more often than not, it's not the presence of a single bacteria or one or two bacteria that's causing the problem. It's typically the absence of numerous other bacteria that's causing the problems. It's not an issue of this one bad bacteria is there doing this thing, I got to kill it. I got to intervene with this bacteria. It's really what is going on with the rest of the microbes. Why are they not effectuating their function?

So we have to change that mindset, right? So we need to stop always thinking about problems with the microbiome as the presence of bad bacteria. It's equally, if not more often, the absence of good bacteria or the absence of good bacterial function. Because remember, there's 150 times more genetic material in our bodies from microbes in humans, which means we absolutely need the microbes just for basic functionality. And so if those microbes aren't present and not expressing those genes, creating those proteins or bioactive compounds, we just can't even function and some of the loss of that basic functionality leads to disease. We'll make some of those clear through examples as well.

There are of course, more microbial cells than human cells in your body. There are thousands of species of bacteria that have been identified in your gut, in your skin, in other biomes in your body, and if you put all these microbes together in one place, it

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would weigh about three pounds. Interestingly, it's about the same weight of your brain. So in many ways it's similar to your other brain. And our microbiome plays a role in virtually everything that happens in our body, our digestion, nutrient absorption, immune regulation. Those are all basic, of course, because those are all part of the digestive tract metabolism, hormone balancing, signaling, regulation, neurotransmitter production and regulation, detoxification, and thousands upon thousands of other processes in the body.

Lesson 2- An Introduction to the Gut Microbiome

Here's some other interesting things about the microbiome to keep in mind that there are over 2000 species of identified bacteria that can be present in your microbiome. And when I say your microbiome, keep in mind we're talking about all of the microbes in your system, not just the gut. The gut has the largest portion, but there are microbes everywhere. Your skin, your skin has about one and a half trillion microbes. Your mouth has about 22% of all the microbes in your body. Your gut has a little over thirty-something percent. So we're talking about all of the microbes throughout your biome. The average person has somewhere between 300-700 species. I'll elaborate on why that is a scary number right now. Right at the end of this slide, I'll talk about that.

If you look at the microbiome and some of its functionality, it produces, for example, 90% of the body's serotonin is produced by the microbiome, and that's produced largely in the gut by cells called enterochromaffin cells. These EC cells are part of your hormonal cells in the lining of your gut, and they produce all kinds of hormones, including serotonin, which is a very important neurotransmitter hormone type of regulatory compound.

Now, I want to elaborate on this a little bit. This is where we're going to go a little bit off the slides and elaborate on it because I want to illustrate how important just this one

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functionality is. So keep in mind, throughout your intestinal lining, you have these cells called enterochromaffin cells. These are part of your neuroendocrine system. So your neuroendocrine system are hormonal cells that are within the neurological system of your body. They're lining the intestinal lining. They line within the intestinal lining itself. So every 12 cells or so, you've got this neuroendocrine cell, which is called an enterochromaffin cell. That cell produces 90% of your serotonin. You've got a number of them in your digestive tract. The way that that cell produces serotonin requires the activation by microbes in a couple different formats. Number one, stimulation of that cell, a nudging if you will, of that cell to say, "Hey, produce serotonin." That is one of the ways in which the microbes stimulate those cells to produce serotonin.

The second way is by allowing the metabolization of tryptophan by pushing tryptophan metabolism down a particular pathway that converts tryptophan into serotonin and then melatonin eventually as well. Your microbes play an important role in nudging the differentiation of the metabolization of tryptophan into serotonin. So the microbes play a dual in causing those cells to produce serotonin. Now, what is serotonin being produced in the gut for? What is it being used for? So here are some of the things it's being used for where it's absolutely critical. Number one, regulation of gut motility. The movement of your bowel is dependent on the presence of serotonin, and serotonin is an effectuator of that peristaltic activity of your bowel. If your bowels are stagnant, you are slow. You're not regularly going to the bathroom once or twice a day and you don't have well-formed stools there's likely an issue with serotonin production in the bowel.

What else does it do? It activates sensory and motor reflexes, which is really important for your gut to play a role in triggering motor reflexes throughout your body. Your gut can sense contents that are coming through and then creates motor reflexes so that the rest of your body can respond to the presence of their contents. In particular things like eating. So as your stomach expands, for example, you've got neurological tissue that is supposed to sense the expansion of the stomach and then send signals to the brain through the autonomic nervous system to tell the brain, "Hey, release the satiety hormone so that we don't overeat because our stomach's about to blow because we're

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eating so much." So that's another simple explanation of how some of these motor reflexes are critically important to dictate our behavior.

Now, when we overeat and we go beyond that distension, beyond that feeling of fullness, we end up with a food bolus that can actually drive more inflammation in the body. The studies are clear that high-caloric dense meals, meaning we're overeating beyond the amount of calories we need for that particular meal, leads to an increased risk of endotoxemia, meaning leaky gut. And it leads to issues like leptin resistance. It also leads to issues like [inaudible 00:19:54] which is... Or hyperlipidemia. So after the meal, having too much blood lipids having too much blood sugar, leading to leaky gut, leading to systemic inflammation, all of these things can occur just because the motor neurons in the GI tract aren't responding properly to the expansion of the stomach and the intestines from eating too much volume. Serotonin is required for that. Fluid secretion and absorption, so your bowel is supposed to regulate how much fluid you take in and how much fluid you put out.

Now, if you're chronically constipated, it could mean that your bowels are slow because of the lack of serotonin production, but it also could mean that because of the lack of serotonin production, your bowels aren't secreting or retaining enough fluid, so your stools are too hard, which makes it harder and harder to push them through, which then leads to more constipation, that feeling of fullness, and then eventually a lot of struggling when the stool does make its way to the end to get it out. And that struggling can lead to things like hemorrhoids and other lesions. It can lead to tears, micro tears, in the large bowel, which then increase susceptibility to inflammation, damage, IBD, and so on. So again, all of that can stem from not having enough serotonin being produced in the gut.

What else does it do? Well, it regulates gut inflammation. So the gut is highly susceptible to inflammation because there's tons and tons of compounds entering the gut on a daily basis, and your immune system has to try to figure out what to do with it. Serotonin plays a very important anti-inflammatory role in the bowel, both in the small

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bowel and the large bowel, so it regulates inflammation. If you're not making enough serotonin through the enterochromaffin cells as a result of having a dysbiotic microbiome, then you are much more susceptible to inflammation that may lead to things like IBD or Crohn's disease.

It regulates nausea and vomiting. So those that eat and then often feel kind of very nauseous and uneasy and a little bit queasy in their GI tract after they eat a meal, that is likely, at least in part a serotonin issue in the bowel. Metabolic function. So serotonin helps regulate various metabolic processes, including homeostasis, lipid metabolism, energy balance to dictate whether you're producing leptin or ghrelin, the hunger hormone and the satiety hormone, the activation of things like AMPK, which is a gene that you activate to get your cells to start burning fat, insulin response, all of these aspects of metabolism, serotonin in the gut is playing a role in that.

Modulation of platelet function and blood coagulation. This is so important because as you're eating food and things are scraping by in your GI tract and you've got microbes that may be dysfunctional and trying to eat their way through the mucosal lining, you can get little micro tears and micro bleeds throughout your gut, and you want those to be repaired properly, and then throughout your body, you want your platelets to be functioning properly and you want blood coagulation to be functioning properly. As it turns out, serotonin in the gut plays a role in that. Also, bone health, osteoporosis and the resorption of bone throughout your age. So most people will build bone up to the age of 30, and serotonin seems to play a role in the density regulation of the bone by activating osteoblastic cells. Osteoblastic cells are actually the cells that build bone. I know it's a misnomer because blast, you think of exploding things, but osteoblastic cells are the bone building cells that need to be and need to be stimulated in order to take calcium and build strong bones.

Serotonin plays a role in activating the expression of osteoblastic cells. The cells that remove bone are called osteoclastic cells, so that's a difference between the two. And serotonin can also slow down the resorption of bone by osteoclastic cells. So your bone

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health is dependent in part by the serotonin being produced in the gut. It also regulates the gut microbiota. What's pretty clear is that serotonin in the bowel plays a role in modulating the population of gut bacteria. There's some microbes that do well with an increased level of serotonin and then other microbes that are inhibited by an increased level of serotonin in the gut. So I elaborated on all of these, and I promise you I'm not going to do that kind of elaboration with every single bullet point here, but the reason I elaborated on those 10 functions of serotonin in the bowel, and many of them you would never think have anything to do with serotonin in your bowel, like bone function, coagulation, energy metabolism, motility, hydration, the absorption, and the secretion of fluid in the bowel.

All of those things are dependent on serotonin in the bowel, and serotonin in the bowel can only be produced by the stimulation of enterochromaffin cells by certain types of bacteria in the gut microbiome, in particular in spore-based bacteria in the gut microbiome. And the precursor to serotonin is tryptophan, and a lot of tryptophan is actually produced by the microbes as opposed to tryptophan that's coming in from the diet. So microbes actually break down amino acids and released more tryptophan, or they can synthesize tryptophan, which is a precursor to serotonin.

Now, I elaborate on that, all of that, again, I don't expect you to remember the details, but I want to emphasize the point that imagine one mechanism in your microbiome is off. All of those things I described can go off within your system. You may be sitting there with having chronic constipation, bowels are not moving, you're chronically dehydrated, you might bleed, you may be having issues with energy balance, your metabolism is off, you're gaining weight, your mood is of course off, so you've got all these things going on. All of that could be due to lower serotonin production in the gut because you're missing a few microbes that stimulate that serotonin production.

That's how profound changes in the microbiome can be to your overall functionality, and that's the point I want to keep putting across. You need the microbes to function, and so it's not always the presence of some bad microbe causing a problem because you

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could be constipated, your bowels not moving, food is not digesting well, you feel queasy every time you eat. In your mind, and in many practitioners minds, they might go, "Oh my God, you might have a lot of bad bacteria. There might be pathogens in there that we need to now identify and kill." And then they'll go and do a gut test and many gut tests using PCR unusually amplify the presence of pathogens, and they go, "Aha. It's because of these pathogens that you feel queasy and your bowels aren't moving, and your system doesn't agree with food, and you feel anxious, all of these things. So we got to kill these pathogens." All the while that's actually going to do more harm. Because what you're really missing is diversity, missing functional microbes that aren't at high enough levels to stimulate the enterochromaffin cells.

Hopefully that point is coming across, and I think that's what I really want you to keep absorbing through this course, because that's going to be the thing that allows you to really understand the role of the microbiome and then how to go about managing it on your day to-day basis. Now, the microbiome aids in digestion, 30 to 40% of the food you eat, the nutrient absorption from the food, the vitamin synthesis, the release of nutrients from the food, and of course the bioconversion of nutrients that aren't already present in the food, that have to be converted by the microbiome for us to utilize, know urolithins are a great example of that.

Those are all dependent on the microbiome. The microbiome produces over a thousand bioactive compounds, and the number goes into the tens of thousands if we start including all the proteins that the microbiome produces. The microbiome, of course, produces short chain fatty acids like butyrate, propionate, acetate, which we will talk about a little bit more as we go along, but they are such important regulators of everything in your body. There are dozens of chronic diseases that you can end up having, or others can of course end up having, your friends and family, just by lack of butyrate production. Diabetes, for example, cardiovascular disease, inflammatory bowel conditions, IBD, Crohn's, colitis, micro colitis, chronic diarrhea, chronic constipation, obesity. All of these things can show up as a result of not producing

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enough butyrate. That show up as a result of not producing enough butyrate. That one functionality that we depend on the microbes for can lead to so many dysfunctions in the body that it shows up as a numerous chronic conditions, and then they can pile on one another, right? If you have obesity, you can end up with type 2 diabetes. If you have type 2 diabetes then you can end up with cardiovascular disease. If you have cardiovascular disease and type 2 diabetes, you can end up with dementia. All of those stemming from just the inadequate production of butyrate, right? That's how important some of these functionalities can be, and we can't hack every one of these things. We have to start looking at the themes that we need to incorporate in order to make sure all of these things are functioning properly. And I promise you, we'll be addressing what those themes are.

Now, of course, a microbiome also regulates and trains our immune system, right? I'll elaborate on that in the upcoming slides, but that's a very, very critical part of how our system functions. We require our immune system and our immune system can often be a foe instead of the friend that it's supposed to be. When it is a foe and when it's not doing the job it's supposed to do, i.e. defending us and/or not attacking us, that's almost always the issue with the microbiome.

Lesson 3- What's Happening to Our Microbiome?

Here's the thing that really keeps me up at night, and I think many of you have heard me say this before, and that is, what is happening to our microbiome? There is a mass extinction going on with our microbiome, right? Remember this number at the top, bullet point 3 to 700 species, which is the average between individuals, and this is individuals in the developed worlds, right?

If we look at our closest ancestors, the tribes that are still living a fairly hunter-gatherer type of existence, a foraging type of existence, they live with the land, so they're the best examples of what our ancestors were like just a few hundred years ago. They

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tend to have upwards of 2000 unique species in their microbiome even today, right? If you look at the Hadza tribe of Tanzania. There are around 1500 to 2000 species in their microbiome. If you look at some of the Papua, New Guinea tribes, there are 1500 to 1700 species in the microbiome. The average North American from almost 10,000 microbiome tests that I'd run, the whole genome sequencing tests that I'd run when we were at Microbiome labs, the average we saw was around 200. Just keep that in mind. Our ancestors just a few generations ago had upwards of a thousand, 1500, even 2000 species of microbes in their systems.

And remember, microbes afford the vast majority of genomic capability in individuals. We have lost so many of those species permanently. We're seeing now around 200, 250 species, right? We've lost 30, 40, 50% of our microbiome diversity. In some cases, it's upwards of eight or 10 times less diversity that we're seeing today, and that is one of the scariest things. Because as we lose more diversity, we lose more functionality. All of those things I talked about, the serotonin function, the production of short-chain fatty acids, how important just those two things are to overall functionality. Imagine that the next generation had one species only that could stimulate serotonin production in the gut and then one course of antibiotic, and that species is knocked down so low that they can't stimulate serotonin production in the gut anymore. All of those 10 things, the mechanisms I talked about, goes out of whack right off the bat.

Their bowels don't move anymore. They can't regulate fluid absorption, they can't coagulate blood properly. The bones are weak. All of that from the loss of those species. When you look at the Hadza tribe in Tanzania, they probably have 50 species in their gut that can stimulate serotonin production. We might have today two or three, and we're trying to fight and hang on to those two or three species. This is the part that's really important for us to keep in mind because it is our duty to support, grow, and diversify this microbiome to pass it on to the next generation. If we're not doing that, if we're not being good stewards of this amazing ecosystem that has been given to us through countless generations of human suffering and nomadic travel throughout the world and all that stuff where they've gathered all of these microbes and all of those

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microbes have been eventually passed on to us, we've lost many of those along the way.

It becomes our duty to preserve the microbiome that we do have. So we have all of these amazing programs and all that out there to preserve the planet and the rainforest and the oceans and the rivers. Those are all really wonderful important things. But our own ecosystem is decimated. And we're not doing enough to preserve our own ecosystem, and I can assure you that well before the polluted oceans and the polluted atmosphere and the diminished rainforest kills us, our own systems are going to kill us because of our diminished ecosystem and rainforest. So that is a very, very important lesson. That is actually one of the first points that stuck to me when I started working on the microbiome that has made me so passionate about the microbiome because knowing that you cannot help but educate work within propagate, do your own part to improve the microbiome as a result of that, right?

So why is this happening to our microbiome? Well, it's all of these reasons here, right? High processed foods, lack of fiber, lack of diversity in the diet, over sterilization, the hygiene hypothesis. One of the estimates is that the average adult spends 90% of their time indoors, 90 upwards of 95% of the hours in the day indoors, and most of our indoor areas are fairly sterile, so we're getting no exposure to microbes like we normally would. Keep in mind that humans evolved in the outside environment. And even though we lived in caves and huts and things like that for a long time, those environments were not sterile. The industrialization and the sterilization of our internal environments became a overshooting of the age where people were pooping in pots in their rooms and dumping that outside the window and all that. So we've gone past that renaissance and we've over-corrected to being overtly sterile, and it has a huge impact on how our microbiomes function.

The lack of diversity in diet is another thing I'll hit on. I'll elaborate on that when we get to the diet portion that we're going to talk about. Lack of fiber is another thing that I'll hit on as well, but just a couple of mentions on processed foods. Why are processed

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foods so bad for your microbiome? There's a couple of main reasons. Number one is because processed foods do contain compounds in them that can hurt the microbiome because our microbiomes not adapted to deal with these compounds. These are certain flavoring agents. They are coloring agents that often are essential oil-based or are volatiles that can actually harm and kill microbes. They also, of course have pesticides, herbicides, antimicrobials, preservatives, all of these things that all kill microbes. And so when you're eating food, you don't want that food to end up killing microbes. You want the food to feed microbes.

Processed foods do the opposite. The other problem with processed food is they have a low diversity in macronutrients. You take a processed chip or something like that. It's made off of one thing. It's made out of cornstarch or it's made of wheat starch, and that is one molecular structure, carbohydrate that's been either extruded or baked or whatever it is to give it that crunchy feeling, but it's not a complex carbohydrate. It's not a diversity of carbohydrate structures. It's a single type of carbohydrate structure, which then just feeds a narrow range of microbes in your system. The lack of macronutrient diversity in processed foods is another reason it's not good for your microbiome. We know that lots of babies, about 33% of babies are born through C-section. Those babies already have an issue with the amount of microbes they get exposed to during the birthing process.

I'll elaborate on that in the upcoming slides. Acute and chronic stress, humans are very unique in the animal kingdom, and that we're the only species that has this issue of anticipatory stress. Anticipatory stress is this worrying component of it. Other animals and mammals don't have this. They have the fight-or-flight response like we do. But if I'm a gazelle and I'm sitting there and I'm eating grass and I'm just roaming and eating, I'm perfectly happy. I have food and the environment's okay. Then I hear a rustling in the grass behind me, and then I look over and maybe I see a predator. That increases my fight-or flight response. It causes me to fight or flee. I run away. And then when I get to safety, I don't sit there and worry about the next time I'm going to encounter that

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predator. I actually just go back to eating again.

That's how most animals function. If that was a human in that condition, they'd be sitting there worrying about what did I do? What were the choices I made? When is that going to happen again? All of this anticipatory stress that we put on ourselves is a very unusual mechanism for your body to deal with the fight-or-flight response. We're some of the only species that can be in a continuous fight-or-flight response, and that is very damaging to your microbiome, disruptive circadian rhythm, sedentary lifestyle, and so on. There's a lot of long-term consequences from losing these microbes. We have to be good stewards of our microbiome and preserve it, and it starts with something like this course. The microbiome regulates and drives lots of disease conditions. Think about the microbiome as a spectrum in terms of your relationship with your microbiome. On one end of the spectrum, let's say the left side of the spectrum, you've got a microbiome that is the most protective, supportive, enabling thing in your body.

It's giving you all the functionality you need. It's making you resilient, robust. You can deal with almost any kind of stressor. You can deal with any kind of issue. You can live an 80/20 rule where make 20% bad decisions and still be fine. There's no issue. You can eat gluten from time to time. You can have drinks socially. You are well-balanced, you're healthy, but it's all afforded to you because of your microbiome. That's highly diverse, highly supportive, and highly functional. Now, on the far other end of the spectrum, on the far right-hand side, not only is your microbiome not affording you all of that resilience and support. The same way it's actually driving disease pathology. Your microbiome is somewhere on that spectrum. We always want to try to work to push our microbiome to the left. It's not a zero sum game. It's not it's either good or it's either bad. There's a spectrum in how good or bad it can be.

There may be a lot of good aspects of a microbiome, but there may be a few bad aspects that's driving certain conditions. It's a nuanced segmentation and a spectrum that you have to think about. Again, we can't think interventionally. We can't go, "Oh,

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my microbiome's bad. I got to intervene and do things and kill stuff and modulate things in a very specific way, or my microbiome's all good, and it's just good because that's how it is." These are things that we have to continuously work on. We have to continuously keep pushing our microbiome from the right-hand side to the left-hand side. We'll go through many of these conditions throughout the course. I'm not going to elaborate on each of them right now, but just know that your microbiome is a driver of all of these issues.

Lesson 4- How Our Microbiome is Formed

Now, where does the microbiome come from? A lot of times we gain our first exposure in utero itself. There is now evidence that mom's immune cells, especially dendritic cells, can reach across her lining of her gut, especially in the small bowel, grab certain bacteria, pull it across, and then take it and deposit it to the growing fetus in utero through cord blood, through the amniotic fluid. There is some inoculation of the baby even when the baby is growing in the womb. Now, after that, of course, when the baby's born passing through the birth canal, you get a huge amount of exposure to mom's bacterial, vaginal bacteria, and then of course, when the baby's pushed out, you also get exposure to fecal bacteria because most women will defecate to some degree while they're pushing and struggling. That fecal exposure is also really important because mom's fecal bacteria is supposed to be really high in bifidobacteria, and that bifidobacteria becomes some of the earliest colonizers of the baby's gut.

Some of the facultative bacteria that you pick up from mom's skin. Or the vaginal canal are facultative, meaning they can function in oxygen or they can function in no oxygen environment. So what they do is when they come in the gut, they eat up all the oxygen that's in the baby's gut and makes the most of the gut anaerobic, and then the anaerobic bacteria like Bifidobacterium and all that start to take over. Skin-to-skin contact, kissing, snuggling, all with the parents and family members is an important

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inoculum. Breast milk, of course, is a very important inoculum. You've got almost 200 different species of bacteria in human breast milk. You've got almost 200 unique oligosaccharide prebiotics in human breast milk that the baby cannot digest. It's there just to cede the microbes. That is nature showing you how important the microbiome is to that developing child, right?

Breast milk contains 200 different species of bacteria. How does all of that bacteria get into the breast and breast tissue? Well, it's transported there through the immune system and the lymphatic system, which is amazing when you think about it, right? Mom's system is grabbing bacteria from her gut and taking it to the mammary gland so that breast milk contains these important bacteria. And then at the same time, the food for the bacteria is also being produced and transported to the mammary glands so that the baby not only gets probiotics, but the baby also gets prebiotics at the same time. So it's absolutely fascinating. And then after you're born, exposure to nature environment makes all the difference in the world in terms of the developing microbiome and then the early diet, early food, especially when you switch to solid foods, the diversity in those solid foods, all of that matters.

Now, there's a bonus module with Jaclyn Downs. She goes through the genetics and your microbiome. It's a great module, gives you even more information on this particular type of section. In this particular topic. I would absolutely encourage you to look at that bonus. I think you all have that bonus. So throughout the course, we'll reiterate certain bonus material that can reinforce information that we're sharing. Now, the gut microbiome is also very dynamic and always evolving. You could be 75 years old now and have had a dysfunctional gut microbiome for years, but it's not too late to change it and improve the microbiome and thereby improve your outcomes and your functionality. The microbiome adjusts in real time to your diet, to your environment, to your stress levels, to the things you're exposed to and so on. In as little as 24 hours, you can see a 15, 20% shift in your microbiome based on where you're going and what you're eating.

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That's the exciting part about the microbiome, because a microbiome impacts your functionality so much, and it can always be changed. That is the beauty of it. If all of our functionality was coded for by our genes including dysfunction like disease, we'd be screwed because you really can't change your genes that much. You can change gene expression, which is complicated to do, and not as effective as shifting your ecosystem to change your outcomes. This is another very important lesson to keep in mind. What are the main things that are shaping your microbiome in a good way and what hurts the microbiome's diet and diversity of your diet and fiber intake is probably one of the biggest things that can improve your microbiome. Again, we'll elaborate on that when we get to the food section. Exposure to nature, stress management, regular exercise. I'll elaborate on that as well.

Quality sleep, we'll elaborate on that when we get to the lifestyle section. Circadian rhythm, spore-based, probiotics, prebiotics, these are all things that can improve the resilience of your microbiome. Of course, the things that really hurt the microbiome. Processed foods limited or restricted diets. I'll elaborate on that during the diet section. Antibiotic use, stress, sweetness over-sterilization, trauma, injury, stress, all of those things have a negative effect on your microbiome.

Lesson 5- The Gut-Microbiome-Immune Connection (Part 1)

Main roles and functions of the gut microbiome. One of the first things to really understand is the role of the microbiome in immune development, because the vast majority of chronic conditions, even if they're not specifically immunological conditions like autoimmune disease or eczema, psoriasis or latent infections and things like that, if they're not specifically immunological, the immune system still plays a significant role in the pathogenesis of almost every chronic disease. Take dementia or Alzheimer's, or take Parkinson's or take anxiety, depression.

The immune system is playing a role in all of those. Take metabolic disease like

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cardiovascular disease, diabetes, the immune system and inflammation derived from the immune system is playing a significant role in all of those. Of course, all primary immune issues like autoimmune conditions and all that, the immune system is playing a very important role. The immune system is a critically important system. It's the only system designed to protect the host, but it is a system that is completely dependent on the microbiome in order to function properly. To understand this relationship and where the rubber hits the road and what is the ground zero of immune functionality as it relates to the microbiome, we have to talk about the mucosal barrier. Your digestive tract, your entire digestive tract, your entire respiratory tract, and your entire urogenital tract, which are basically all the ways in which things enter inside your body. Your eyes, your nose, your mouth, your ears, your urogenital tract, all of those are the ways that things generally enter your body, and all of those orifices and all of the tissues connected to those orifices are covered in a mucosal layer.

Your mucosal system is almost 4,000 square feet of surface area inside your body. Think about that for a moment. If you had a house or an apartment or a condo that was 4,000 square feet, you'd be very happy because that's a very large home. You have all of that surface area inside your body as your mucosal tissue. And every square inch of that mucosal tissue is covered in microbes, right? The 40, 50 trillion or so microbes, most of them live in that mucosal tissue. That's also the area where your immune system is all the time.

There's all of this interaction that's going on between this massive surface area of mucosal systems and the microbes that live there and the immune tissue that is adjacent to it. This is where the rubber hits the road in how your immune system functions. Now, what is the role of the microbiome in that mucosal tissue?

The microbes in your microbiome, let's assume you have a healthy microbiome, are constantly communicating and training your immune system. It's the microbiome that's teaching your immune system what is friend and what is foe, what it should attack and what it shouldn't attack. The development of tolerance to things like food

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antigens and commensal bacteria and environmental particles that you're always breathing in, ragweed and pollen, and all of these things that you don't want your immune system reacting to. The tolerance to all of those things are dependent on commensal microbes teaching your immune system not to react to those compounds.

That building of tolerance is incredibly important to function in the world because what's as bad, or maybe even worse, than a non-reactive immune system, meaning one that allows you to get sick often is one that overreacts to everything because that leads to sensitivities, intolerances, mast cell activation, histamine intolerance, allergies, asthma, all the way to autoimmune conditions. So the microbiome is the key trainer of the immune system to teach the immune system what to attack and what not to attack, and all of those decisions are made in this mucosal tissue.

So having the right diverse microbes is a key component to your immune system functioning the way it is. So it prevents that overreacting and underreacting as well, right? Because when there is a pathogen there, when there is a virus there, when there's something that you want the immune system to go after, it is the microbes that signal to the immune system that yes, that's something you should go after.

There were some fascinating studies that came out in 2020, which is accumulation of 10 years' worth of study on this, where they showed that in sterile mice, so mice that are raised without a microbiome, they have all of their immune components because all the immune components that are made in the thymus and made in the bone marrow and so on, they have all of those. They infect the mice with the virus, so they inject a virus in. The immune system is there, but the immune system does not react to the presence of the virus. It's like the immune system has no information. It doesn't know what this thing is, and it doesn't know what to do.

The moment they introduce a microbiome into that same type of mouse and expose it to the virus, the microbiome sends a signal to the immune system that says, "Hey, there's a virus here. You got to go after this." Then the immune system responds.

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There's an immune activation. There's a threshold activation that the microbes in the microbiome provide to the immune system in order to get the immune system to understand or respond. So overacting and underacting are both a consequence of the microbiome not speaking and training the immune system adequately. So imagine all of the disease conditions that are associated with overreaction and underreaction. All of those are in part driven by the microbiome.

The microbiome is also responsible for the development of something called the GALT, gut associated lymphoid tissue. This is the largest sampling site in your body. This includes areas like the Peyer's patches. This is a little error here. It says Peter's patches. It's not Peter. It's actually a guy named Peyer who discovered them. P-E-Y-E-R, Peyer's patches, which is at the end of your small bowel, the appendix, the lymphoid follicles, and all of these other lymphoid tissue associated with the gut. The development of the gut is in part the responsibility of the microbiome, especially the early microbiome and the early exposure of the microbes. The microbes actually extend the volume and the surface area of the immune tissue that's being developed in your gut, right? Imagine that.

So if a baby is born and in the first few years of life as the immune tissue and all that is developing, if the baby is not exposed to enough microbes, the baby gets an underdevelopment of the gut-associated lymphoid tissue, which is the biggest portion of the baby's immune system, right? So the GALT, the gut-associated lymphoid tissue, is dependent on the presence of the microbiome. The microbiome is also a key component to helping the proliferation of T cells and B cells. We know that as our adaptive immune system, that is really important to build long-term protection against things that we encounter over and over again. It also is very important in the production of IgA and secretory IgA.

Now, secretory IgA is so important because secretory IgA is a neutralizing antibody that's found in all of your secretory fluids, but it doesn't elicit an inflammatory response, which means that you've got in all of your secretory fluids, so in your tears,

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in your saliva, in your mucus, in semen, in discharge, all of these things, all of these secretory fluids in the body, you've got IgA, which is an immunoglobulin, and the IgA can have an affinity towards lots of different things. Your body produces this awesome, complex array of immunoglobulin A that can bind to and neutralize lots of things that are entering the body. Viruses, bacteria, bacterial toxins, environmental toxins, environmental particles, all of these things that may cause a problem, the IgA can bind to it, neutralize it, and render it ineffective that eventually gets sloughed off as layers of your mucus and everything goes out. Or as you tear out, as you sweat out, as you urinate, as you defecate, all of those things are removed.

But when IgA binds to these things to neutralize them, it doesn't elicit an immune response, which is good. Then you don't feel inflamed, and you don't have that inflammatory response that creates all of this symptomology. Now, if you don't have enough IgA, your immune system will make IgE instead. But IgE drives a hypersensitivity reaction. That means if there's something coming into your system, and instead of IgA binding to it and neutralizing it, IgE binds to it. What happens when IgE binds to it is IgE activates eosinophils and basophils, which then produce histamine and leukotrienes and all that, and cause massive amounts of inflammation, fever, and other discomfort, right?

So you need adequate IgA so that your body doesn't default to IgE, which then comes with it an immune response. IgA doesn't create an immune response. This is why it's the predominant antibody in all of our secretory fluids, and it's the highest volume of antibody being produced in your body because your body is so smart, it knows that we want to be able to neutralize things and neutralize potential threats without causing a profound immunological response every time, because that'll be incredibly uncomfortable for the host.

Imagine every time you ate something, you got a fever, and aches and redness, and flushing, and all of those things, life would be absolutely miserable and you'd be non functional. But when you have a healthy system, every time you eat, you do get

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thousands of antigens coming into the body. Many of them are neutralized by IgA, and you never even know it. But the expression of IgA is dependent on a healthy microbiome. So if you don't have a healthy microbiome, you're not producing enough IgA, which means your body overcompensates by producing IgE. Now, all the things that are entering your body are getting bound by IgE, which then elicits an inflammatory response. This is how you become hypersensitive to things, intolerant of things, right? Foods, environmental things, and so on. And this is where another theme is really important because more often than not, I see people becoming intolerant to certain foods and then they avoid the foods, right? You do an immune test, a sensitivity test, and it tells you you're intolerant to these eight, nine foods and then you eliminate them, or you go through an elimination diet and you do those types of things. The problem with it is the issue here is why are you developing sensitivities to these foods, not that the foods are sensitive to you. And so avoiding the foods doesn't do anything to the underlying mechanisms that are driving the sensitivity, which will simply drive more sensitivities over time and then eventually lead to even more complex immune dysregulation. This is why I don't like avoidance as a therapeutic to try to improve a condition.

You can avoid certain things for a short period of time, but the goal should be to get those things back into your diet, right? And when you hear all of these, the online people that are talking about, "Kale is bad for you and Brussels sprouts are bad for you and lectins and all of these things," all of that is mechanistic data that hasn't really been proven in human studies. And in fact, the opposite has been shown in most human studies. Those plant based foods and all that that they say is really bad for you and has anti-nutrients and all of these terminologies, all of those have been shown to be very beneficial for your microbiome, very beneficial for overall health and longevity as well. So be very careful with when you hear about those types of things, always go back to how do these things impact the microbiome. And generally the more diverse your diet is, and generally the more diverse the plant-based component of your diet is, especially the healthier you are going to be.

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Another thing that the microbiome up-regulates with regards to the immune system are Treg cells. Treg cells are called regulatory T-cells because they regulate unfavorable immune responses, not only in your gut but throughout your body. But the expression of Treg cells are dependent on a good, healthy, diverse microbiome. So the Treg cells are critical to allow you to tolerate the world around you because your immune system is supposed to learn what to attack and not to attack, and part of that learning is through the function of Treg cells. The moment a Treg cell sees an unfavorable immune response, meaning let's say your immune system's going crazy because of ragweed, the Treg cells come along and go, "Nope, let's suppress that activity. We don't need to react to that anymore." You need to build tolerance against this so you don't get all of the allergic symptomology and so on.

That's another very important component of immune system. So if you have a dysbiotic gut, you have all of those things within your immune system dismantling. The last point here about the cancer therapy, this is just an example of how in certain cancers like non-small cell lung cancer or melanomas where they use immunotherapy very successfully, they have been able to show that if your microbiome is healthy, the immunotherapy works much better. Immunotherapy, if you're not familiar with cancer, is the use of your own T-cells. It's called checkpoint therapy where they encourage your own T-cells to go after the cancer because T-cells naturally go after tumor cells. That's one of their roles that they're supposed to do.

And so when you can encourage your own T-cells to go after the tumor, what happens is not only does the T-cell go after just the tumor, not the surrounding tissue, and does so very effectively, you also get long-term protection against that tumor because now the T-cell knows what to look for, right? So immunotherapy can be incredibly successful for certain cancers, very good therapy that doesn't create a bunch of side effects that chemotherapy and radiation does. And then it also provides long-term protection against these cancers. And at the end of the day, what the studies are showing is that a healthy, diverse microbiome is important for the immunotherapy to work. So it's just a great example of how the microbiome enables the proper function of the immune

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system.

Lesson 6- The Gut-Microbiome-Immune Connection (Part 2)

Just to give you a quick overview, we'll go into more detail in other modules, and I do have a deeper dive training on the functionality of the immune system as well. But just know that the immune system is really broken up into two large phases, and each of those large phases are broken up into smaller phases, right? You've got the innate immune response, which is the early and late innate immune response. And then you've got the adaptive immune response. The innate immune response is typically driven by non-specific immune cells, meaning they show up to an area. Imagine there flies in the room and they're going to kill all those flies with a blowtorch, right? So, they're blowtorching the area. They're absolutely killing the flies, but they're also burning the walls a little bit, but that's their job. Their job is to show up quick when there's a problem and blowtorch the area to try to kill anything that's in that area that might be a problem, including some of your own cells. They're going to damage your own cells.

And then in the middle of that late innate response, you've got these cells called dendritic cells and macrophages that come along and start gobbling up cellular debris from all of these areas and then presenting that cellular debris to your adaptive immune system as if that is the potential culprit that's causing the problem. Then your adaptive immune system, which is a T-cell and B-cell and antibody system, creates very specific immune responders to that potential target. And then the next time you encounter that target, you don't have to go through the innate immune response, your T-cells and B-cells respond right away, and then they use antibodies to neutralize it without creating all of this inflammation because the innate immune response is where all the inflammation occurs. That's the part that makes you sick.

When you encounter a virus or something like that and you feel fever and lethargic and

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nauseous and all those things, that's your innate immune system responding to the presence of the virus. Once those symptoms start to go away, it doesn't mean that the virus is completely gone. It just means that your adaptive immune system has now taken over. The innate immune system steps aside, the adaptive immune system is now really targeted at killing all of that virus without creating all of this symptomology. And every phase of this immune response requires signaling and influence from the microbiome. So essentially, your immune system can't operate the way it's supposed to if you don't have the right signals from your microbiome.

One of the things that might happen is if you don't have the right signals, you may get stuck for a longer period of time in the early innate response, which is very inflammatory and very damaging in general, right? So some individuals will get exposed to a virus and then they'll be in that state for five to seven days. Some individuals will get exposed to the same virus and in two days can move to asymptomatic dealing with the virus. And that's in part dependent on how quickly your immune system can shift from one phase to the other. And it also is dependent on what your microbiome looks like and what it's doing. So, your immune system function is critical. And there's tons of crosstalk between your immune system and the microbiome, and there's lots and lots of mechanisms in action here.

A couple of things I'll just mention, the IgA. Remember the excretion of secretory IgA? That comes from signals from your microbiome, short chain fatty acids like butyrate and all that. They activate so many mechanisms in your body in the lining of your gut, in your immune system that it's critical, that they're critical for immune function. So in particular, goblet cells. Goblet cells make up your mucosal tissue. So, goblet cells require butyrate and short chain fatty acids to function. You've got other cells like GPR. This is a G-protein couple receptor on the enteroendocrine cells that then secretes other effectors after that, including some of these other GPRs that create 5-HT, that's a precursor to serotonin, other GPRs that activate GLP-1. Those are all mechanisms that are needed for metabolism, for immune function, for motility, all of that. And all of these signals are coming from the microbes up here, right?

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Primary bile acids and secondary bile acids and metabolization of bile acids to secondary bile acids are also really important for motility and managing the homeostasis in large bile and in particular for activation of GLP-1 and 5-HT. Again, completely microbiome dependent here, right? So these are just some of the examples to think about and absorb so that you really start to understand all of the roles that the microbiome plays. Thereby just from the things I explained just now, if your gut is imbalanced and if your microbiome is not working with your immune system, that starts to look like frequent digestive issues, right? Intolerances of food, reaction to certain foods, allergies, asthma, chronic skin conditions, eczema, psoriasis, all of that can also be traced back to triggers from the gut and the immune system that are overreacting. Chronic fatigue, frequent infections, persistent joint pain, chronic inflammation, autoimmune conditions, eventually anxiety, depression, brain fog, and then weight fluctuation and metabolic issues as well.

So lots and lots of things can stem from just a couple of these mechanisms here not functioning properly because you don't have a healthy, diverse microbiome, right? So if you have a particular condition, let's say you're dealing with an autoimmune condition. Let's say you're dealing with Hashimoto's. The interventional mindset will be, "Okay, what do I do about Hashimoto's specifically?" Now, the thing is, it's hard to think about what to do with Hashimoto's specifically and ignore all of these things and work on just one mechanism. That doesn't work. You actually have to work on everything. All of these things become important in getting your body to move away from a Hashimoto's-like response because you need Treg cells, you need IgA, you need to tighten up tight junctions, you need to reduce LPS, you need to increase diversity, you need more crosstalk, you need secondary bile salts.

All of these things are required, so it's not an intervening single mechanism approach. You have to modulate the entire ecosystem and push it into the right direction. So these are all the things that are good signs and symptoms that your immune system and your microbiome are playing well.

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Lesson 7- The Microbiome is a Factory

Now think about the microbiome also as a producer of lots of beneficial compounds. Short-chain fatty acids, we mentioned that quite a bit. Microbiome produces a lot of vitamins that are required, a lot of methylated forms of vitamins as well. So even if you have MTHFR mutation, it may not matter. And maybe that's why MTHFR can be as prevalent as it is in the population because your microbiome does produce methylated vitamins. Neurotransmitters, we talked about a bunch of them, especially serotonin, but it does produce dopamine, GABA and more. Lots and lots of antimicrobial compounds to control pathogens and control dysbiotic organisms.

Anti-inflammatory compounds, your microbiome produces things like indolepropionic acid, urolithins, short-chain fatty acids. Many of those control inflammation in your body. Your microbiome also can help resolve some of the fatty acids that are coming in or fat really coming in in a diet like omega-three fatty acids or omega-six fatty acids and modulate them into fatty acids that actually reduce inflammation. And then of course, hormone regulation and the production of bioactive peptides, right? So a lot of functions within the microbiome. And again, we'll touch on many of these as they become very relevant when we think about how to support these functions in order to improve your overall health

Lesson 8- The Gut-Microbiome-Brain Connection

The gut-brain axis, there's some really great deep dives. I've got a really good training module that those of you that did that 48 hour bonus and got those additional six or seven advanced training modules as a whole gut-brain training module on that, that will go much more in-depth, and I'll go here.

But what I'll say here that's really important is that your gut is really thought of your second brain, and I often like to call your other brain and they're intimately connected,

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your gut and your brain through the enteric nervous system, which is the neurological system that covers your entire digestive tract. Then the vagus nerve connects the enteric nervous system directly to the brain. About 90% of the signals that go up the vagus nerve are going up from the digestive tract to the brain. About 10% of the signals are coming down from the brain through the vagus nerve into the gut, right? So it is a bi-directional highway, but so much of the communication is actually going from the gut to the brain. Of course, we know the gut also produces all these neurotransmitters. I went through a lot on serotonin, so you know. But we also produce GABA and ignore the spelling here, dopamine, brain-derived neurotopic factor, lots of different things that effectuate how the brain functions.

And we also know that dysbiosis and the resulting leaky gut is a major driver of anxiety, depression, and cognitive decline, right? We know that Alzheimer's has a component of it driven by LPS endotoxemia, and we'll talk about endotoxemia in great detail in one of the modules. But Parkinson's, also endotoxemia. LPS, once it leaks through and is present in serum becomes the best predictor of the onset of anxiety and depression, and not only the onset, but the severity of anxiety and depression based on the amount of LPS, right? So LPS leaking in from a dysfunctional gut microbiome that leads to a leaky gut becomes the best predictor for whether or not an individual is going to develop brain fog, anxiety, depression, and down the road, Alzheimer's, Parkinson's, dementia and so on because LPS has such a profound effect on the brain and brain inflammation. LPS also interferes with dopamine and serotonin binding in the brain. So, it affects the function of those neurotransmitters in the brain as well.

So the gut and the brain intimately connected. Short chain fatty acids that are produced in the gut are neuroprotective. They reduce neuroinflammation. They support mental clarity. So again, back to those short chain fatty acids that are produced in large bowel, where do they come from? Keystone species metabolizing fiber, right? Fiber that our cells, we can't extract any nutrients from fiber, but it's converted into things like short chain fatty acids, which is where all its benefit comes from. Stress of the microbiome, we know that chronic and acute stress disrupt the

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microbiome as if you're taking small courses of antibiotics. And that disrupted microbiome thereby creates a pattern that makes you more susceptible to chronic stress. Thereby creating a condition that's even better for those microbes and

then creating more stress, and the cycle goes on and on. So keep in mind when certain dysfunctional bacteria get a foothold, meaning there's a lifestyle factor that has altered the environment, that now makes the environment better for dysfunctional bacteria, that dysfunctional bacteria is going to want to propagate that environment in that dysfunctional way. So it does well, right?

So we need to work hard to bring it back and change the ecosystem so we change the environment away from that dysfunctional bacteria. This is true with brain health and everything else that we've been talking about, right? Psychobiotics are one of the ways that you can do that. It's a class of probiotics that have a direct and profound effect on the brain and the central nervous system. It lowers the impact of stress, lowers the cortisol peaking, enhances cognitive function and can even change brainwave activity, and it reduces neuroinflammation. And neuroinflammation is a big driver of anxiety, depression, and the flight or fight response in individuals. Lots and lots of neurological disorders are associated with the dysfunctional gut. They have mouse models of this and human models of this. But if you look at all these conditions, things like autism, spectrum disorders, depression, MS, Parkinson's, schizophrenia, all of these conditions have been tied back to microbial dysfunctions in the gut.

So our brain is highly dependent on our gut. So if you're experiencing anything neurological, whether it's in your peripheral neurological system, so things like numbness, tinglings, pain in your neurons or central nervous system, things like brain fog, memory issues, anxiety, depression, and so on, all of those things have some component within your gut microbiome that's driving those issues.

Lesson 9- The Role of the Gut & Microbiome in Digestion & Metabolism

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When you look at the role of the microbiome in digestion, the microbiome plays a very important role in breaking down complex carbohydrates and fibers. This is microbial fermentation. We touched on that and I'll talk about that a little bit more in upcoming slides. Supports nutrient absorption, helps with bile acid metabolism and the formation of secondary bile acids, which I showed in that one schematic, has an impact on GLP-1, 5-HT. So mood, metabolism, weight, blood sugar control, all of those things are dependent on these bile acid metabolites that the microbiome is producing.

It regulates gut motility, again through the enteric nervous system and through the production of serotonin and maintains a healthy gut barrier. Those tight junction proteins that keep the gut sealed and the mucus layer on top that create a barrier with your gut lining, both of those are completely dependent on microbes in order to exist and function. The microbiome also controls your metabolism, your appetite. So appetite regulation by regulating ghrelin, which is the hunger hormones, and then secretion of leptin, which is the satiety hormones. The secretion of ghrelin and leptin is based on getting signals from the gut through the microbiome as a result of the microbiome through the enteric nervous system, and then to the brain. So the brain doesn't necessarily know what's happening in the gut until the microbes in the gut tell the brain through this gut-brain connection. Now, when the microbes are dysfunctional, it's not telling the brain when the gut is full.

We talked about this, the motor signaling from the extension of the intestines and the stomach itself, that again is microbiome dependent. Then the microbes are also there to tell the brain that there's enough calories that have come in, stop producing the hunger hormone, and instead produce the satiety hormone, leptin, which also up-regulates metabolism. The GLP-1 system that's now become ever so popular because of the peptides that you have, your natural GLP-1 system, many of the GLP-1 agonists, which is what the peptides are mimicking doing, those GLP-1 agonists are produced by the microbiome, including short-chain fatty acids. So that's how you control blood sugar, that's how you control motility, that's how you control caloric absorption and satiety is through activation of GLP-1, and another mechanism called PYY that the GLP-1

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agonist peptides don't affect. The microbiome plays a critical role here.

So if you're struggling with weight, there's a massive microbiome component that's keeping you from being successful with weight loss. Influences cravings, your microbes have a huge influence on what you eat, why you eat it. There was a early, early article, I'd say, I don't know, 10 years ago that was titled My Microbiome Made Me Eat a Cupcake. That was one of the most fascinating first articles I saw on the relationship of behavior and choice and metabolism and the microbiome because there's evidence that certain microbes can create neurotransmitters that make you want to crave certain foods. If I'm a microbe that likes sugary foods, if I'm a fungus for example, or mold that like sugary foods, I'm going to try to get the host to eat sugary foods so that it's good for me, right? So that is a profound way in which the microbes can influence your behavior and thereby your choices. So, it's not just a matter of discipline for people that are struggling and eating the wrong things.

Often it's your microbiome that needs to be adjusted to some degree in order to improve your behavior and your choices. And then certain opportunistic bacteria like Enterococcus faecalis can actually produce enzymes that degrade GLP-1 and create an in effect of that GLP-1 system, which is so important for blood sugar regulation. This is why an elevation of Enterococcus faecalis, which is a gram negative opportunistic pathogen, increases your risk for diabetes very significantly. When they look at the gut microbiomes of individuals with diabetes, they tend to have higher relative abundance of Enterococcus faecalis, but they also tend to have a high relative abundance of Enterococcus faecalis in their mouths. So, they can actually predict if certain individuals are going to be susceptible to developing type two diabetes by looking at your oral microbiome and going, "Wow, you've got a huge amount of Enterococcus faecalis. You are likely going to end up with a blood sugar metabolism issue."

So that microbe is typically in the mouth we swallow, it ends up in the gut. If there are mechanisms that are supposed to be there to control a pathogen like that aren't in place, then that pathogen gets a takeover and then they can degrade GLP-1 and other

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things, and then lead to type two diabetes, right? Again, just looking at the power of a microbe to effectuate the entire system. Like I mentioned, blood sugar regulation through GLP-1, and PYY that's regulated through the microbiome. Microbiome metabolites, like phenolic compounds that are derived from foods, like berries can enhance glucose uptake in metabolism. I use bergamot all the time as a way of controlling blood sugar in a very, very healthy way. Bergamot is phenomenal for that. I use polyphenols. I try to eat a lot of berries and cherries, blueberries, blackberries and all that. You want to try to eat about a pound a day if you can. Put them in your smoothies and your breakfast or whatever you might want, however you want to use it.

Or even certain phenolic compounds like EGCG or catechins from green tea, for example. I do take a little green tea extract each morning myself, along with the bergamot that I use with my meals. All of that stuff helps the microbiome effectuate GLP-1 and PYY in order to have perfect blood sugar control because dysregulation of blood sugar is one of the foundational steps that occurs in chronic disease propagation, right? Dysregulated gut microbiome also up-regulates inflammatory responses through inflammasomes and cytokines. So then that way you get more and more inflammation, not only in the gut, but systemically, that leads to metabolic issues like insulin regulation issues, glucose control issues because the inflammation can damage pancreatic cells, can damage components of the brain, which makes it hard for the brain to read your blood sugar levels and your pancreas to produce enough insulin to respond to blood sugar.

Fat metabolism and storage. So microbes like bacteroidetes are associated with increased fat, fat breakdown versus firmicutes, which is associated with increased fat storage. Now, keep in mind the bacteroidetes and firmicutes are the phylum of bacteria. So there's lots and lots of species that fall under each of those phylums. So it's not one particular bacteria that's bad or one particular bacteria that's good. You want to look at the ratio of these phyla, right? So typically you want to have a higher bacteroidetes than firmicutes and that tells you overall you're probably healthier in terms of your microbiome and metabolism. Spore-based probiotics have been shown to switch this

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ratio and then favor the fat breakdown microbes over the fat storage microbes.

Lesson 10- The Gut & Microbiome Regulate the GI Environment, Hormones, and Detoxification

This is a really important component because your gut environment, what that gut environment looks like is critically important for which microbes end up being predominant in your gut microbiome.

Oxygen regulation is really important in the gut, right? So the vast majority of your gut is going to be anaerobic, meaning there's no oxygen. And that anaerobic part of your gut is critical for all of these keystone species because most of those keystone species are anaerobic bacteria. And so you want adequate butyrate, for example, because butyrate reduces oxygen levels in the colon and maintains a low oxygen environment for those keystone species. So again, here's another function of butyrate. This one compound that's being produced by the beneficial microbes in the microbiome by breaking down fiber and resistant starches, does all of these things, including regulating the gas environment of the bowel to reduce the growth of pathogens and increase the growth of beneficial bacteria, right? Your gut microbiome also releases things called hypoxia-inducible factors. Hypoxia is the absence of oxygen, and this increases oxygen uptake by the intestinal epithelial cells, so the lining of the gut cells start eating up all of the oxygen. That, again, removes the oxygen from the environment and favors the growth of the good beneficial bacteria rather than potential pathogens.

Dysbiosis is associated, and there's just a little spelling error there if we don't... Just to point it out. Dysbiosis is associated with increased oxygen levels in the large intestine, and that can lead to conditions like IBD because an increased oxygen levels means lower keystone species and higher risk for pathobionts or pathogens. And inflammation from dysbiosis also then contributes to the increased growth of these pathogens itself. And then of course, the lining of the gut, the gut barrier, the proteins that make up the tight junctions, those are all microbiome dependent as well, and the microbes regulate

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the expression of those tight junction proteins. Then we look at the pH balance, right? So lactic acid being produced by lactic acid bacteria is a key component of acidifying the gut. And then some of that lactic acid is then metabolized into short chain fatty acids. So remember, they're called short chain fatty acids, and they continue to acidify the gut, creating an acidic environment, which is good for the beneficial bacteria and bad for pathogens and harmful bacteria and bad for mold and fungus and so on. So the pH balance is also a critical part.

And then the beneficial microbes also control the presence and overgrowth of potential pathogens and the accumulation of toxins because a good, well-balanced, diversified microbiome controls the growth of pathogens and then metabolizes a lot of the toxins to reduce their impact on the liver and the body in general. We know the microbiome also controls hormones. Well, there's a couple opportunities for deeper dives into this, but know that estrogen, for example, your stress hormones are regulated and filtered through the microbiome for getting sent out of the body, getting inactivated, we call it conjugation, and then excreted from the body. That is the job of the liver, but the excretion part is the job of the microbiome. But if you have too much of certain bacteria that make up a constellation of microbes called esteobalome, those microbes can reactivate the estrogen and cause you to reabsorb it, which then puts you in estrogen dominance, right?

So a dysbiotic gut can lead to estrogen dominance and a dysregulation of estrogen balance in the body. Same thing with cortisol regulation. Microbes can either increase cortisol response when you experience a stressor or decrease cortisol response. When you experience a stressor, you want the microbes that help decrease the cortisol response. In this case, psychobiotics play a really important role. Metabolic hormones like insulin are of course affected by short-chain fatty acids. In GLP-1, we talked about that. Thyroid hormone is really regulated by your gut microbiome. So the activation of-

... by your gut microbiome. So the activation of thyroid hormone is dependent on microbiome. Your microbiome is the key activator of the thyroid hormone. Without it,

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you end up with inactive thyroid hormone. You end up with hypothyroidism. Hormone detoxification, the getting rid of removal of hormones. And then of course, all the metabolic hormones we've already talked about, GLP-I, PYY, ghrelin, leptin, all of those are controlled by the presence of the microbiome. So sexual hormones, adrenals, metabolic hormones, all of those are controlled by the gut microbiome.

Detoxification is also controlled by the gut microbiome because remember, everything that enters your body generally enters through the mucosa first, that huge 4,000 square feet of surface area we talked about. The mucosa is where the microbes live. So things that enter through the body, through the mucosa, which may be toxigenic, are first taken care of by the microbiome.

The microbiome has the capability of biotransformation, of molecules neutralizing them, breaking them down, metabolizing them so that not all of the toxicity that enters your body ends up in the liver, which then it becomes the liver's job to deal with the toxicity.

Now, more and more dysbiosis means that your microbiome is not helping your body detoxify, which means your liver is undergoing a higher degree of toxicity, and this is one of the reasons why we see an increased prevalence of non-alcoholic fatty liver disease.

Non-alcoholic fatty liver disease is simply the liver undergoing too much toxicity and there being a problem with the liver trying to protect itself as a result of undergoing so much toxicity, and a dysbiotic gut not metabolizing toxins and putting all of the brunt on the liver, on top of that, a dysfunctional gut microbiome is also allowing the gut to be leaky, which means LPS that's leaking through is also going to the liver, creating more toxicity in the liver.

So the liver gets kind of a double whammy when the gut is dysbiotic and not functioning properly in the context of detox.

So then, this is where you get fatty liver disease, you get increase in triglycerides, you

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get a smaller bile acid pool, you get overgrowth of bacteria in the small bowel, you get all kinds of problems because the liver is one of those unsung heroes that's doing all kinds of amazing things, but not getting all the credit and not getting all the attention it should.

So a healthy gut microbiome can absolutely protect the liver and even start to reverse some of the damage that the liver is already experiencing, and this is a detoxification connection, so the biotransformation of xenobiotics, all of these environmental chemicals. Bacillus spores, for example, can degrade mycotoxins and glyphosate.

The microbiome plays a role in that metabolization and detoxification process to clear things like hormones and other metabolites in the body, reduce LPS, and of course, a healthy microbiome doesn't allow LPS to really migrate through and can neutralize LPS in the mucosa itself, and of course, the metabolization through bile acid formation and so on reduces and removes fat soluble toxins from the system.

Lesson 11- Not Just the Gut - Intro to Our Other "Biomes"

There's tons of other biomes, right? The oral microbiome, the respiratory biome, the vaginal biome, nasal and sinus biomes, your skin microbiome, urinary tract, and so on. Let's talk about a couple of them quickly. Your skin microbiome is another very complex ecosystem. You've got one and a half trillion bacteria over a thousand different species on your skin, and the skin microbiome absolutely dictates the function and the form of your skin.

Age skin is related directly to a change in your skin microbiome and age skin looks like things like fine lines, wrinkles, hyperpigmentation, loss of elasticity, dryness and so on. And now, we're coming to understand that when your skin ages, one of those consequences of that is you lose barrier function in your skin and your skin becomes leaky skin.

This massive 50 plus-year study called the Baltimore Longitudinal Study of Aging

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showed that age skin is one of the best predictors of chronic disease and mortality in the individuals they followed for over 50 years, and the age skin occurred first before any of the inflammatory pathologies inside the body that led to cardiovascular disease, metabolic syndrome, osteoporosis, Alzheimer's, and so on.

So imagine that changes to the microbiome of your skin leads to a symptomology of your skin that we know to be age-related symptoms, so hyperpigmentation, fine lines and all that, but all of those are early symptoms that your skin, as a barrier, is becoming compromised, and because the barrier function of your skin becomes compromised, you end up with leaky skin and then the skin becomes a source of chronic low grade inflammation and an independent driver of chronic disease.

So now, it's equally important to look at your skin from a health perspective, for your overall health than just a cosmetic perspective in terms of what your skin looks like, right? That's one of the key things I've been propagating a lot, is trying to push a lot of education around this idea of improving the look of skin by making the skin healthier and thinking about this issue of leaky skin, right? Because you can reduce wrinkles and all that by using Botox and other techniques, but it doesn't mean that the underlying driver of wrinkle formation has been resolved.

That underlying driver is a dismantling of skin structural components because of dysbiosis on the skin, and that dysbiosis and dismantling of the structural components makes your skin leaky, which then makes it an independent risk factor for chronic disease.

So the skin microbiome is critically important to understand, manage, and maintain, and keep in mind, we do thousands of things all the time that disrupts the skin microbiome, the personal care products we use, the over sterilization, the toxicity in the environment that we're in and so on. So the skin microbiome, we'll talk about how you can do that as well.

This is what healthy skin looks like versus a dysbiotic skin. Dysbiotic skin looks red,

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sensitive, irritated prone to conditions like acne, eczema and so on, tends to be thin, dull and dry, sagging, many wrinkles and lines, discoloration and hyperpigmentation. Healthy balanced skin microbiome makes the skin resilient and has low levels of inflammation, skin repairs fast, looks fresh, glows and appears thicker. It maintains its moisture and adequate collagen production. Its pH balance and minimizes fungal and yeast overgrowth, and that pH balance also protects the overall barrier function of the skin.

All of those balanced healthy skin microbiome features are direct impacts of certain microbes on the skin itself. These are some of the things that disrupt the skin, your age, your gender. Estrogen, for example, is a great protector of the skin, and as you start to reduce estrogen, you start creating dysbiosis on the skin.

This is in part why women can seem to age much more acceleratedly, at least from an appearance standpoint, in their late 40s than men do because of the lack of protection that estrogen normally provides their skin. Genetic factors, to some degree, but not as much as everything else. Environmental factors, climate, cosmetics, hormones, lifestyle, gut health, and so on.

So the skin microbiome is arguably one of the most accurate predictors of biological age, right? And I've done a number of leaky skin lectures. If you Google some of the leaky skin information, you might see those lectures, but I do a deep dive into leaky skin and how you alleviate it through the work that we're doing with SIV in this particular product.

So we've done a number of studies now with a number of individuals on inflammatory conditions, on aging-related conditions on the skin, and we see profound effects on the skin by using the biome balancing serum on the skin. It's basically three fatty acids and spores, because the spores have a quorum sensing effect on the skin that modulates the skin microbiome similar to what it does in the gut, right? So there's a lot of amazing data here that you can use to understand how to rebalance your skin, but the spores and the SIV does an amazing job of doing that.

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The oral microbiome is very interesting, right? There are over 700 species of bacteria in your mouth. It contains upwards of 22% of all the bacteria in your microbiome. So this seemingly small area contains almost like a third of all the bacteria in your system because of all the surface area that you tend to have in your mouth, and the healthy microbes in your mouth are essential for preventing overgrowth of dysfunctional microbes that lead to gum disease and caries and inflammation in the soft tissue of the mouth.

It protects the teeth, it balances and regulates the pH so that you are mineralizing the teeth all the time rather than removing minerals from the teeth, and the healthy microbiome also prevents some things like periodontal disease and maintains gum health. When you look at the impact of your system from a dysfunctional oral microbiome, the oral microbiome is so important in part because it produces nitric oxide, right?

Lots of the microbes on the back of your tongue, especially in the microbes that are producing nitric oxide, and that's really important for blood pressure regulation, for compliance of your vessels, the ability of the vessels to open properly, to gain enough blood supply throughout the body for cardiovascular disease, for reducing inflammation, for controlling pathogens and viruses that may be in circulation. Nitric oxide does all of those things, and your microbiome in your mouth is the predominant supply of nitric oxide to your system. So you need beneficial microbes in your mouth.

Oral dysbiosis is also linked to systemic issues like diabetes, neuro degeneration, cardiovascular disease, and so on, because the gum tissue gives direct access to the blood for dysbiotic bacteria. So if you have a lot of gram-negative bacteria with LPS in your mouth, that LPS leaks through your gums, enters into circulation, the bacteria itself can leak through and enter into circulation and create systemic inflammation. That's part of how it drives things like diabetes, cardiovascular disease, autoimmune disease, and so on, by entering the bloodstream.

Humans swallow an average of 1 trillion microbes per day, right? Think about that. If

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your mouth has a lot of dysbiotic bacteria and you're swallowing a trillion microbes per day, and because of dysfunctional stomach acid and pancreatic enzymes, those microbes are allowed to survive through and enter into the small bowel, they become one of the biggest drivers of dysbiosis in the small and large bowel eventually, right?

So inadequate HCl production, inadequate bile salt production, which controls microbial growth, antimicrobials being produced by the lining of the small bowel, all of those things contribute to more and more dysfunctional microbes in your mouth, settling into your small bowel, leading to conditions like SIBO. So a healthy microbiome is really important.

Here's signs of a healthy microbiome that is free of dysbiosis, your fresh teeth, strong teeth, no sensitivities, healthy gums, no bleeding, pH balance in your oral cavity. With the dysbiotic oral microbiome, you've got persistent bad breath, cavities, tooth decay, periodontal disease where it bleeds when you brush, or they do bleeding on probing to look at the depth of the probing that creates bleeding, systemic inflammation and chronic conditions.

There's a great module with Dr. Burhenne on the oral microbiome, and they go through some of the hydroxyapatite type toothpaste, the Bristle Oral Microbiome Tests, the probiotics that you can use, all of that to support a healthy oral microbiome, but keep in mind, the vast majority of chronic conditions will have the oral microbiome as part of its component. So we have to really overcome oral dysbiosis as well.

Lesson 12- The 5 Pillars of a Resilient Gut & Microbiome (Pillars 1-4)

So let's touch on the five pillars. It's important to reiterate and keep emphasizing the five pillars to building a resilient microbiome and a healthy gut, right?

Now, you have to do something in every one of these five pillars. It's not just one of these things. It's not just one of the pillars you focus on. It's not just supplements. It's

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not just lifestyle. It's not just food. You have to do some things in all of these in order to create an accumulative factor to push the microbiome in the right direction.

So let's look at pillar number one, food, right? The most basic thing is eating a diverse diet. Colored fruits and vegetables, polyphenol intake, all of those things feed the microbiome and diversify the microbiome. Adequate fiber intake is absolutely critical, right? Leafy greens, root vegetables, legumes, whole grains, nuts, seeds, all of these things are very important sources of diversified fiber in your diet.

What you want to do is try to get at least 50 grams of fiber in your diet per day, and for every 10 grams per day you add, it reduces your mortality by almost 10%, which is absolutely amazing. That's the power of fiber being converted to things like short chain fatty acids and so on in your body.

Prebiotic rich foods are also really important. Resistant starches, things like green bananas, oats, cooked and cooled potatoes, sweet potatoes, plantains, all of these things, cassava, they all contain a lot of rich resistant starches. Inulin, so chicory root, garlic, onion leeks, fructooligosaccharides, that come from things like asparagus, artichokes, dandelions, kiwi fruit, those are all equally important as well, and minimizing the processed foods.

So adding diversity to your diet, you have to do that in one way or the other in order to improve your microbiome. And this first pillar cannot be overstated, right? This is one of the most important components to it, and I just see far too many people becoming susceptible to these very narrow diets that are being propagated out there. Carnivore, where you're just eating steak all day long, steak and salt and butter, that does nothing for your microbiome.

Maybe you'll feel better for a short period of time, but that's going to have a very negative effect on your microbiome, and you're not being a good steward of maintaining a healthy microbiome to pass it on to the next generation. So all those people that are obsessed over carnivore and doing nothing but eating steak all day, they're not helping the human race in general, and they're certainly not helping the

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microbiome.

Meat is a perfectly good part of a balanced diet. There's nothing wrong with meat, and of course, you don't want highly processed meat. I eat red meat, I eat fish, I eat chicken, I eat all kinds of meat, but it doesn't mean that I have to become obsessed about being a carnivore. It doesn't mean I have to be obsessed about being ketogenic or have to be obsessed about being vegan, right?

You can eat a varied diet and add in lots of different things. You want protein, you want carbohydrates, you want nuts and seeds and roots and tubers and all that. So the more diverse your diet can be, the better it is for the microbiome, right? That is the important message, and my goal for everybody is to get a minimum of 50 grams of fiber per day and continuously increase the diversity of your diet.

Try to add one new food into your diet every single week, and then measure that and follow that, and then look to see by the end of the year, if you've added 40 to 50 new foods and maintain those foods, and your microbiome will be eternally grateful and we'll protect you as a result of that.

Other parts of the diet is incorporating healthy fats, right? So wild-caught fatty fish, flax seed, chia, walnuts, olive oil, rich in polyphenols. Don't get scared by a lot of the seed oil stuff. Yes, if you're eating a ton of processed foods that are all made with seed oils, too much of it can be bad, but it doesn't mean you've got to chuck your flax seed oil and you have to chuck your peanut oil, if you wish. You don't necessarily have to do that.

Seed oils with a linoleic acids can be perfectly good for you. In fact, there can be a lot of health benefits of linoleic acid and seed oils, and if you look at the accumulation of human data, there's very little to no data that consumption of seed oils is actually killing you in some way, but there is a lot of good data on consumption of good seed oils that can be beneficial for you. So you have to take those things with a grain of salt.

Remember, there's a lot of sensationalism on the internet, and people get obsessed

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with certain things and keep propagating the message, so you don't have to be afraid of that, right? You don't have to be going to restaurants if you're going out to eat and asking them about the seed oils and how do you avoid seed oils and can you cook this in tallow instead, and so on.

All of those things are blown out of proportion, tend to be exaggerated. I would say focus on trying to get some healthy fats and getting your olive oils in. Flax seed, ghee, tallow is perfectly fine, fish oils, all of those things, a nice diversity of these things.

Reducing artificial sweeteners is important. Local honey can be a great source of sweetening things if you wish. Honey has so many benefits for the microbiome, so many benefits. Not only can it control microbial growth, control fungal growth, it has a lot of immunological benefits as well, and great for your microbiome. I would not be concerned about honey being added to your tea and toast and things like that to sweeten things a little bit. It's not the same insulinogenic response as adding sugar. So honey is perfectly fine.

Staying hydrated is critically important. Moderate meat consumption. You don't want to do really processed meats. So I get meats from the farmer's market, or there's this farm that you can order for. It's called 4 Health Farms, the number 4 Health Farms. It's all Wagyu. So I get Wagyu brisket from there. I get Wagyu ground meat, which is super lean. It's really, really tasty, really healthy grown, pasture-raised, free roaming, all of that good stuff, no antibiotics, and it's not processed because the meat is sent to you as raw meat, and then you cook it however you want.

So I would say, if you're going to consume meat, try to get the cleanest version of it, just like the cleanest version of almost anything that you consume, and then avoiding pesticides, preservatives, and other food chemicals. So try to eat organic as much as you can. If you have the privilege of having a small garden in your facility, grow some of your produce yourself, your cucumbers, your tomatoes and things like that. That'll have a profound benefit on your health by doing that.

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So all these things I mentioned in the diet, it doesn't mean it's a diet, right? Because there's no label for this. The label is just eating like a human. We're omnivores. We ate lots of things. You want to eat a huge variety. Anthropological studies show that humans ate on average, 200 different types of foods on an annual basis. The average Westerner, if you did a food diary, we took an average standard American diet and did a food diary, they're eating about 10 or 15 types of foods.

So it's about the diversification. It's about eating real food, not packaged and processed things, and just trying to get a variety into your system. That's how you think about eating for your microbiome and the fiber. I cannot emphasize that enough, getting enough fiber into your system.

Pillar two is stress management. Stress is one of the biggest effectors of your microbiome. Michael has an amazing module, so I won't say too much about that because he's much more of an expert in dealing with trauma and stress and mindfulness work and all that, but he's got this amazing bonus module on stress reduction and nervous system support, dealing with trauma, all of that that can disrupt your microbiome.

He has lots of tools and techniques that you can follow to reduce stress. So you have to do something in this pillar as part of a resilient gut microbiome, because we all experience stress. We know that, and it's not great for your system. We need to be able to modulate that to some degree or the other.

Lifestyle, right? Lifestyle, I would say the most important things in lifestyle to think about is resistance training, right? So anytime your muscles are under stress and contracting, you are not only, of course, building strength and so on, you're also releasing myokines, which are a set of compounds that have a huge profound effect on your system. They reduce inflammation throughout your body. They seal up the lining of the gut, and myokines can actually diversify your gut microbiome.

Now, at the same time, you don't also just want to be inside on a gym all the time because that's an indoor sterile environment. So taking some of your workouts outside

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is also a great way of doing that. One of my new favorite workouts is I put on a weighted vest. I've got a 30, 35 pound vest, and I go out for a walk and I go through our natural environments, the woods and places like that, and then I stop in areas and I do squats. There's a couple areas where there's steep hills that go up and down the hills.

So I'm getting outside. I'm getting my cardiovascular system pumping and moving and putting some demand on it, but I'm also getting some really deep muscle contraction, which is releasing the myokines, right? So you can do rocking. You can put on weights. You can just carry kettlebells if you wish.

Go outside, walk around, carry the kettlebells for a minute, put it down, take a rest, carry the kettlebells for another minute, put it down and take a rest. You can do that back and forth, or you can just use body weights or bands and go outside. Not saying not go to the gym, of course, go to the gym, weight train. I go to the gym and I lift, but I also like to make sure I'm getting out and getting some of my activities outside because that exposure is so important, right?

Sleep and circadian rhythm, it's really important to be consistent. It's not good to get eight or nine hours of sleep one night, then five the next night, then seven the next night, then nine again, and then five again and so on. What's actually healthier is a more uniform sleep cycle. If you can only get six and a half hours, you're better off getting six and a half hours every night, then fluctuating between five and nine and five and nine, right? That's what the study show, and it's better for your microbiome, and it's better for your overall health as well.

Consistency is really the key. That's the same with out. You can't go through one week of being really motivated in working out, and then next week, you're all lethargic and lazy. It's about the consistency. You're better off working out two days a week every single week than working out three or four days, one week, taking a week and a half off, working another two, three days, another week, and so on. So those are the

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important parts of this lifestyle pillar.

Add in some resistance training. Try to get some of your workouts outside and incorporate resistance training and muscle contraction on your outside workouts. You don't have to just go for a run for five miles. You just need to be outside, walk and create some resistance there, and then with your circadian rhythm, you want consistency. That's the most important thing. So try to do the same thing every night. That helps your microbiome a lot.

And then, community and social connection. That social interaction is so important in all of the blue zones, in all of the places where people live a hundred plus, that is one of the foundational things that they tend to have for their entire life, is community, right?

So whether you need to get on meetup groups or whatever, if you don't have people around you that you can get together with regularly, try to form some sort of community if you can, because you want to be among people physically, because we're sharing microbes with one another, and it also increases hormones like oxytocin, which reduce stress, which then reduces dysbiosis. So you have to do something within this pillar in order to improve your gut microbiome.

Intermittent fasting is something you can consider as well. I've been doing a sixteen-hour fast, eight-hour feeding window for years now, and I kind of naturally do it. That's just how my lifestyle has adapted to it. There are times where I eat breakfast and I shift that window a little bit, perfectly fine, but from time to time, if you're adding in some intermittent fasting, that can be quite good for your system as well.

Exposure is important. We went through early birth exposure, skin-to-skin, contact with parents, formula-fed versus breastfed, all of that is your early exposure. But then later on in life, we want to try to increase our exposure to beneficial microbes by getting outside, getting a pet, even doing things like going to farms if you can.

Now, near me, we actually have a lot of farm area about 15 miles west of where I am. That's one of the areas where I used to cycle a lot, and you can actually stop by some

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of these farms and walk around and pet some cows and do some of those things. Interaction with the natural environment and animals is a big thing.

Eating in the natural environment is a really, really great way of interacting with the microbiome of the outside world and increasing your microbes as well. So if you go out for a hike in a natural environment or go for a walk in a natural environment, bring some food with you, and at some point, sit down and eat that food in the natural environment, that can have a huge impact on your microbiome and be conscious of while you're hiking and all that, pick up a stick and walk with it and pick up a rock and feel the leaves and do things like that.

Touch the environment. That has a huge impact. And then when you grab the food that you're about to eat, don't go and hand sanitize yourself. Use the dirt and all that you've picked up from the environment, you can eat with it. It's perfectly fine. You're not going to get sick. What's going to happen is your immune system's going to become more robust and your microbiome is going to become more robust.

Getting a dog is another great way of doing it. There's studies that show that people that get dogs end up with a higher life expectancy and reduce stress, reduce inflammation as well. So that's another, not everyone can get a dog, but just so you know, if you're able to adopt one, there's a great health reason for doing that.

Overuse of antibiotics and over sterilization, I think everybody gets that. Trying to reduce the amount of sterilization in your household, right? Your toilet, maybe you want to sterilize that from time to time. Your shower, the mold and mildew, that's fine, but the vast majority of surfaces in your home do not need to be sterilized. Like my desk here, I have never sterilized this thing, right? I've never used a chlorine wipe and bleached it or cleaned it that way. I just let the microbes accumulate. That's what we want. We want a healthy home biome.

So the kitchen counter, if you get chicken juice, raw chicken juice on it, yes, you'll have to use a sterilization wipe to clean that, but most of the surfaces in your house don't need to be sterilized, right? We use a cloth and we use a water bottle spray with some

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essential oils in it just for some smell, a few drops of essential oils, so they're not killing things, but they provide you a nice natural smell, and that in itself, is enough for most surfaces in your place, so you don't need to sterilize everything around you.

Lesson 13- Supplements - The 5th Pillar of Building a Resilient Gut & Microbiome

Pillar number five is supplements, right? There's a lot of supplement options out there that you can take. Of course, the staples are going to be prebiotics, probiotics, and then there's a third staple, which I'll mention in the second, but when we go through the course, we'll address supplements as it relates to specific pathologies, and in some cases specific conditions as well, but **MegaSporeBiotic**, some of-

... to specific conditions as well. But MegaSporeBiotic, some of you know that I developed the MegaSporeBiotic a number of years ago. It's really designed to be a foundational gut supporting supplement because it increases the diversity, it reduces pathogens, it increases keystone species, it resolves leaky gut, it increases short chain fatty acid production. It does all of these foundational things that are really, really important to maintain a healthy gut microbiome. So if you're going to take a supplement for general gut microbiome support, **MegaSporeBiotic** is by far the best one, the best probiotic out there. And I know I sound biased when I say it, but we developed it for this reason, right? It does so many things. I think we have 18 published studies on it. There's so much backing MegaSpore in terms of protecting the liver, increasing diversity, reducing leaky gut, doing all of these things.

And again, these spores, you're supposed to be naturally experiencing them or exposed to them in the natural environment on a regular basis, but we don't live within the natural environment. We're not eating dirt, we're not drinking waters out of rivers and streams. So we do need to supplement it to a certain degree. This is one of the foundational products. Now, there are lots of other strains that have good research behind them for very specific functionality. You'll get, of course, this information. So

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you can look up some of these strains, if you want to use them. For example, Bifidobacterium longum 1714 and Bifidobacterium longum 35624 are in the ZenBiome product, right? **ZenBiome Dual**, and then **ZenBiome Cope** and **Sleep**. Those two are absolutely fantastic for mood regulation and or IBS. Now you've got Lactobacillus crispatus, which can reduce bacterial vaginosis symptoms and support the vaginal microbiome. So if you're dealing with vaginal dysbiosis and issues, Lactobacillus crispatus is a good one to look into.

Reuteri DSM 17938 reduces abdominal cramping and regulates bowel movement. So if you have a lot of bowel movement issues, that may be one you want to try for a period of time. Boulardii has a lot of effects as well. So here are some individual strains that have clinical research behind them that support their use that you can use for these specific conditions. So you can just Google products, and for example, you want to do the Bifidobacterium animalis lactis BB-12, you Google that, you'll find the product that contains it, that can help with some of the lactose digestion, indigestion of dairy products, and then some of the epithelial barrier function as well. So these can be functional for specific conditions. The prebiotic is one that I mentioned because oligosaccharides are so critical for enhancing the diversity of the gut microbiome and supporting keystone species. And we simply do not get enough of these oligosaccharide prebiotics in our diet.

It's hard to do it as well because you have to eat a lot of the fibrous components of fruits, and you have to have certain components of dairy to get the galacto-oligosaccharides. You have to have the certain components of certain vegetables like the corn cob in order to get the xylo-oligosaccharides. So it's hard to get adequate amounts in the diet. I encourage everybody as a foundational support for your microbiome in addition to the four other pillars, to be utilizing something like the **MegaPre** for the oligosaccharides. And another product that I've come to really love over the years, and I talked about butyrate so much, what a critical component it is. Not everybody produces enough butyrate, certainly not in the beginning. And as you increase the diversity of your microbiome and your consumption of resistant starches

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and fibers and all, you'll increase your butyrate production.

But the **Tributyrin-X** is an amazing thing to use every day. I use it every day myself. It's a great way to get butyric acid and tributyrin, three different types of butyrate, forms of butyrate into your system, that's really bioavailable, that does all of the things we talked about modulating metabolism, reducing inflammation, improving the lining of the gut, feeding the goblet cells to produce more mucin, doing all of these amazing things in your system. So I call this one of the foundational products of supplementation as well. So when you're thinking about overall gut health and you're looking at the first four pillars and you're trying to figure out all the things you can start doing within those four pillars, there's lots of options. And you don't have to do all of them right off the bat. Don't overwhelm yourself. Pick a few things that you start doing.

Pick resistance training, for example. Pick fasting. Pick a particular type of food that you're going to start adding to your diet. Start becoming more consistent with your sleep. Create a new schedule for yourself, where you can sleep about the same amount of time each night and maximize that amount. So all these things you can start adding and doing. And then on the fifth pillar, on the supplement side, if you're trying to create foundational health for your gut, these are the three supplements I would recommend. These are the three that I use without fail every single day as a foundational part. I use lots of other things for other reasons. We'll address some of those as we go along. But this particular module is about foundational health, so that's what I use.

[End Module 1]

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