Build Your Resilient Gut
MICROBIOME & BEYOND

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MODULE 2 - Video Transcript

Introduction:

Now let's talk about module two. I'm super excited about this one because this is a really fun module to do. It's really gut health 101, which is really how does your digestive system function? What is it supposed to be doing? How is it supposed to be functioning? And then what does it feel or look like and what are the symptoms if certain parts of the digestive tract aren't functioning properly? So remember, you are in a course which means there's a curriculum, which means there's a strategy behind building and layering information one on top of the other. And generally you really can't understand what's going on with your gut or what's going on with your overall system or what's going on with your immune system and your microbiome. What are the symptoms telling you unless you understand how it's all supposed to work. So that's the purpose of this part. It's to talk about how it's supposed to work and if it doesn't work the way it's supposed to, what does that feel and look like? And then the role of the microbiome in each of the components of the digestive tract. So we're going to start all the way at smell and visualizing and seeing food all the way till pooping it out. We're going to follow the digestive tract and talk about the most important aspects of how each of these systems work. By the end of this, you should all be very well versed in how your digestive.

Lesson 1: A Gut Health Disaster - The Root of Chronic Disease

We know that people's guts are a disaster generally, in the western world, and there's lots of reasons for that. So we know that 10 to 15% of the US, which is a massive number of people, think about 30 to 40 million people suffer from IBS, right? That's an astounding number of people. And approximately 20% of the population has some degree of GERD and reflux. We'll talk about how things are going wrong in certain parts of the body that can create these types of symptomologies and these types of conditions. We know that gastritis and peptic ulcers impact millions of Americans every

year, and we know around 20 million Americans have some level of gallbladder disease and over 600,000 people get the gallbladders removed every single year. This number is actually going to increase because one of the documented side effects now of the use of things like Ozempic, the GLP-1 agonist peptides is dysfunctional gallbladders that end up in massive inflammation and pain.

So people are getting their gallbladders removed as a result of using peptides. So you want to be careful there as well. And I'll mention a couple of times where those peptides play in this digestive process as we go along because I'm sure many of you're probably heard about it and interested in those. Inflammatory bowel disease affects around 1.6 million Americans. So these are Crohn's colitis, ulcerative colitis, micro colitis and so on. And we know that this estimated annual spend for GI issues is 136 billion a year, right? That's an insane amount that people are spending for gut issues. And 99% of the money that's spent on gut issues is money that is being spent just to mask or cover symptoms of the issues and not really anything that goes after any of the root causes. So by the end of this, you'll start to understand root causes of common dysfunctions in the gut because you'll understand how the gut is supposed to work, what can go wrong if it doesn't work the way we think it should?

And remember, all chronic diseases start in the gut, right? We've gone over this numerous times. All of these areas of dysfunction start in the gut.

Lesson 2: GI System Overview & Understanding Transit Time

So let's talk about the digestive system, right? We're going to start at this phallic response. I'll talk about what that is. We're going to go to the mouth, what's happening in the mouth, what are the key items? What's the role of the microbiome there? What happens in the stomach and what goes wrong if things aren't working right in the stomach? What is the role of the liver in the gallbladder? What's the pancreas and the pancreatic enzymes doing? What happens in the small bowel, and eventually what

happens in the large bowel? And as we go through this, you'll get a nice overview of how each of these systems functions, and of course, what's the role of a healthy microbiome in each of those systems' functionality?

But to start, let's look at transit time. So I get a lot of questions about this generally on social media and all that about, "What is the normal transit time for food to make its way through the digestive tract?" And knowing this information is critically important, and also calculating or measuring your own transit time is also critically important, right? So when we're talking about transit time, we're talking about once you swallow the food, it makes its way down, the esophagus enters the stomach. How long does it take from when it enters the stomach all the way through defecation? So the stomach is generally between one and four hours. So the food can spend as much as four hours in somebody's stomach. Now, on average you want to be around two hours. One and a half to two hours is a much more average, normal time, you don't want to be one hour or less.

Then it's moving too fast. And you probably don't want to be closer to four hours. Then you're having gastric emptying issues and it's moving too slowly. But around two hours is about ideal. In the small intestine, once it drops in, it can be anywhere from three to six hours, and in this case, you really want to be in that four hour range, four to five hour range. It's okay if it's at six hours. It typically will depend on your fiber intake and a few other things about your diet itself. But normally you want to be right kind of in the middle of this range, around four to five hours with some variation, but less than three hours is way too fast, and then much more than six hours. If it's seven, eight hours, then the bowels are moving way too slow. Talk about Ozempic.

This is where one of the effects occurs with Ozempic. So some of the things that dictate the motility, and I'll talk about motility, are signals from the gut that go through the vagus nerve and to the brain. One of the things that the peptides do is it skips the vagus nerve and it goes right to this brain stem where it triggers a neurological response to slow down the bowels, so then the bowels go extremely slow. That's part

of what makes you feel full for a long, long period of time and causes people not to eat. That's how it causes weight loss. That's also how it helps with blood sugar regulation for diabetics because the slower the gastric motility is, the slower the absorption of glucose, and it blunts the postprandial glucose curve and it also makes you feel full longer so you don't eat as much sugar and calories and so on.

But there's a downside to that because you also don't want your bowels to be too slow, too slow. In the case of the peptides, of course, one of the potential side effects is it creates complete stasis in your bowel where your bowel doesn't move so the food's not actually moving through, and we'll go over motility and moving through in more detail. But it also then sets up room for issues like putrification, inflammation, overgrowth, all kinds of other disturbing things, which is probably what leads to some of these side effects that are known from the peptides like gallbladder dysfunctions and other inflammatory conditions. So, we don't want the bowels to completely stop or slow down. In the case of the small intestine, you want to be around four or five hours. And then the large bowel, you can be anywhere from 10 to 60 hours. The healthy level is around that 18 to 30 hour mark.

It's a big spread, but it's really dependent on the diversity of your microbiome. What is the amount of fiber that you're consuming in your diet? Is it soluble fiber, insoluble fiber? I'll talk a little bit more about those as I go along, but fiber generally is really important, but you can tweak transit time by increasing soluble or decreasing insoluble and so on. You can do some of those tweaks a little bit. I'll talk about that towards the end, how you can do some of those things. So overall, transit time is anywhere from 14 to 48 hours, but in some individuals it can go as high as 72 hours. In reality, where you really want to be is a couple hours in the stomach, so about two hours there, four to five hours in the small intestine. So you're looking at about six hours there total.

And then another like 15, let's say 20 hours, 20, 25 to 30 hours in the large bowel. So you're anywhere from around 26 to 36 hours for total transit time. Even up to 48 hours is probably okay, but you really don't want to be at 72 hours and lots of people do

clock in at 72 hours. Now, it's really important to test your transit time and it'll come up as we go through other slides in terms of functionality. So how do you test your transit time? Well, some people might be aware one of the easiest ways is to eat a meal. Make sure you haven't eaten a meal for at least seven, eight hours and then eat a well-balanced meal. Don't go too high in protein, too high in fat or too high in fiber. Just kind of eat a well-balanced meal. What does that mean?

I would say something like 20, 25 grams of protein, maybe 15, 20 grams of fat, and then 15, 20 grams of fiber. So try to be about equivalent. It doesn't have to be precise. I'm just saying don't eat a meal with 150 grams of protein or don't eat a meal with 200 grams of fiber in it because that's going to screw up your normal transit time calculation. So eat a somewhat balanced meal, but eat a lot of beets in that meal. And what you're looking for then is the time from which you swallow that meal and then you notate the first time in the toilet that you start to see the pigment from the beets coming out, right? Not the last time, the first time you see it coming out. So that's going to be the leading edge of your meal coming out. First. You will see red in the toilet. When you do, of course, don't be alarmed, you're not bleeding.

It's the beets, right? The coloration from the remains red throughout the digestive system. Beets are a good one because a lot of other colored fruits and vegetables, the color can change in the digestive tract, so you can't really pick up the distinct color in the toilet in the case of beets, you can pick that up and it'll be really telling. You want to measure your gastric motility time. You don't want it to be 10 hours and you don't want it to be 70 hours. As I mentioned, you want it to be somewhere in that 20s to even low 30 hours. And then your digestive system is generally functioning and there isn't something really alarming about the transit time. So know your transit time. It's an important thing to keep in mind. Now, here are some factors that I mentioned that can upregulate transit time. So, things that may speed up transit time is high fiber, right?

And keep in mind, insoluble fiber, right? Soluble fiber can actually slow down your transit time. So this is a little bit of a tweak you can do. And I'll talk about the Bristol

stool chart at the end as well, but I'll mention it here. If the chart is showing you your type seven-ish and your stool is very runny, which means you have a very fast transit time, and then you measure your transit time and it is a very fast transit time, you're getting like eight, 10, 12 hours, then you want to slow down your transit time and you want to increase your intake of insoluble fiber. So just Google, "What is insoluble fiber, what are the sources of insoluble fiber?" And just use any of those kinds of insoluble fibers and then measure your transit time again to see if you've been able to slow it down.

What you'll be able to do is figure out what amount of insoluble fiber your gut needs per meal in order to slow down the transit time to a normal time. If you're at 10 hours transit time and you're going, "I want to go to 2021 hours because that's a much more reasonable transit time," and we'll talk about why that's important. And then you look at your stool consistency, you can start by adding in 20 grams of insoluble fiber with a meal. See how that goes. And then next time, add 30 or 40 grams. See how that goes? You can find an amount that actually gives you enough, sorry, slow down your thing by adding soluble fiber that can slow down your transit time in a way that is really beneficial to you. So Google insoluble fiber and soluble fiber, use the two, take insoluble fiber if your transit time is too slow and take soluble fiber if your transit time is too fast.

I might've said that backwards earlier, I apologize. Those are the two things that you can tweak in your diet in order to dial in your transit time. Adequate hydration. So hydration will speed up your transit time. So if it's really slow, you may not be hydrating your food enough, so you may not be drinking enough either during the meal and you don't want to drink too much during the meal, but you may not be hydrated generally, right? So in between meals, you want to think about hydrating and keeping that up appropriately. Regular physical activity also improves transit time if you're too slow. And again, when you're too slow, we're talking about going beyond 48 hours, right? So you're at that 50, 60 hour mark too fast as you're in that less than 20 mark, especially if you're in that eight to 12-ish hour time. Healthy gut motility.

So peristalsis, NMMC. So fasting and a few other things can upregulate that the healthy microbiome, which the production of short-chain fatty acids, especially butyrate, can improve transit time if you're going too slow and then low to moderate fat in the meals. If your transit time is too slow and you're eating a high-fat diet, typically you might want to reduce the fat intake to speed up your transit time because fat does slow down your transit time and then supporting a healthy and adequate stomach acid, bile, digestive enzymes and so on. So these are some of the tricks you can do to speed up the transit time once you measure it and you see that you're too slow. And then these are things that you can do to slow down your transit time if you're too fast. Now, low-fiber intake typically means a fast transit time, but if your transit time is really fast and you do want to slow it down, increase your insoluble fiber, not your insoluble fiber.

So you want to be able to distinguish between soluble and insoluble fiber. You may be dehydrated, you tend to have higher fats in meals, potentially a sedentary lifestyle does slow down your transit time too much. Stress and anxiety of course will inhibit motility medications. There are numerous medications that are known to throw down transit time, gut dysbiosis, and then hypothyroidism as well can slow down the transit time. So again, transit time is very important. Know your transit time. Try to be somewhere in that low-20s to low-thirties in terms of hours. So anywhere from 22, 23, 24 to 33, 34, 35-ish hours. You don't want to be in the fifties and sixties and you don't want to be in the tens or even low teens on your transit time, and you can use things to adjust the transit time. We'll talk about a little bit more about what happens if you're too slow, too fast as you're going through.

And then overeating. This is a very important one. This is one that probably most people do that creates a too slow transit time, is the meals that you're eating are too big. So you're going beyond that satiety mark and going to that mark of being way too full.

Lesson 3: When, Where, and How You Eat... Matters!

Now, digestion is an interesting process, right? Because your digestion actually starts well before you start eating. Just smelling, seeing, handling, cooking food or even thinking about food starts to trigger really important digestive processes. So it starts to activate the salivary glands to increase the production of saliva, which is critically important. The vagus nerve then starts to stimulate the stomach to produce hydrochloric acid. So this is part of that gut-brain connection that's really important. Your pancreas begins to release digestive enzymes and insulin. So now your system is getting primed for the food to come in, and that's really important.

That priming is really good. And then the gallbladder is starting to get prepared to release bile. So then bile is now being transferred from the liver where the bile acid pool accumulates to the gallbladder where it's held and it's getting ready to start releasing it through the glands into the digestive tract. And then the release of hormones such as gastrin, which increases HCL production, starts to stimulate motility and can increase the formation of gastric mucin. Now, why is the gastric mucin important? Well, we now know that the pH of the stomach, which before eating, could be around three, right? Around two or three, once you start eating and your body starts releasing HCL. Because remember, as your saliva production starts and your vagus nerve starts stimulating your digestive tract, you start to produce and release hydrochloric acid. So the pH of the stomach can go down as low as one, a pH of one before food starts coming in.

Now, what's really important when your stomach goes down to a pH of one is that the mucin layer in your stomach is intact. If you don't have the mucin layer intact, then that low pH is going to burn a hole in your stomach, right? That's called a peptic ulcer. And this is one of the ways in which H. pylori creates ulcers is because it eats away and destroys that mucin layer, and then the low pH ends up creating an ulcer in that region. And so you want the gastric mucin to start secreting. So the release of these hormones, gastrin HCL production, motility increase, and increase in gastric mucin are all very important normal parts of the functionality of the digestive tract. And then this is another really important part. Just this whole smelling tasting, this pre-chewing action

starts to trigger the release of dopamine. Now, why does it release dopamine?

Well, when we were evolving, getting food was a very difficult thing to do. Getting food was either a lot of work, you're outside, you're vulnerable, you're foraging, you're gathering, you're digging for roots and tubers. And so that means predators could be lurking and you're in a vulnerable state, you're focusing on something and not watching your back, or if you're hunting, it's also a very energy taxing act and also creates a lot of vulnerability. You could very easily get injured, and once you get injured, you could get sick and infected. So it's a very difficult thing to get food and access food. And so what your body is designed to do is when you sit down to eat, it releases dopamine to increase the reward centers of your brain to tell you that, "Hey, you did a really good job," and cause you to want to have that feeling again.

This is part of the system's ability to motivate people to go out and find and forge and work for food. This is an evolutionary adaptation. Now, this is really important to note because even now, even though we're not, food accessibility is not a difficult thing. We're not putting our lives in danger to get food. You still get a dopamine release when you eat food, and so your practices around eating can trigger that dopamine response, which means that your food behaviors get tied to those practices, right? So I'll talk about what I mean in the next slide, but just remember that whatever you're doing around your meal gets incorporated into the dopamine response, which means that for you to get satisfaction out of the process of eating, you'll need to do those additional things that you're always doing, and I'll give you some examples of that.

Now, this entire process is really important because it prepares the body for efficient digestion. So digestion of food is a very taxing and potentially dangerous thing that your body does, because food becomes one of the largest exposure of bad things, including bad microbes that could come into the system, toxins. And food is not in a usable form when you consume it, it has to be broken down into its microscopic subunits. And so all of that is a lot of work for your system. This is why your body has to devote and divert a lot of energy towards digestion once food comes into the system. So there's a lot of

preparatory work that's happening in your system, even on the anticipation that you're about to eat. If these things aren't working properly, you'll start to suffer from lots of digestive issues. It sets up optimal nutrient absorption and assimilation because, again, the whole purpose of eating is getting nutrients into your system.

And if you eat and your body is not set up well to break down and assimilate the nutrients, and you're really not getting the benefit from eating, and it may play a role in preventing conditions like overeating, involving the brain's anticipatory aspect of eating. So let me mention that a little bit when we talk about meal hygiene. So meal hygiene is really about, what are you doing around eating time? And keep in mind that the dopamine response gets pulled into the meal hygiene and basically codes you for needing to do certain things around your meal. I'm equally guilty of this. I'll give you an example of what I'm talking about. So what you really need to do is get your system into a parasympathetic state, because in the parasympathetic state, that's the rest and digest and rebuild state. That's where your neurological system is diverting energy, hormone production, neurotransmitter production, and all of that stuff towards this very arduous and difficult process of breaking down nutrients, assimilating nutrition and metabolites and so on, and then also modulating immune response in response to the food coming in.

So you need to get into the parasympathetic state. If you're in the sympathetic state and your HPA axis is activated and your fight-or-flight response is activated, you actually cannot efficiently break down food. You can reduce the capability of breaking down food by as much as 70 or 80% just by being in more of a sympathetic state versus a parasympathetic state, right? So you could be eating, but you're actually still starving yourself because you're not going to be assimilating the nutrients and breaking down the food, and also the food will upset your system as a result of not properly being broken down and dealt with throughout the different compartments of your digestive tract. So being in a parasympathetic system is really important, and fortunately Michael mentioned the bonus that he's doing, that he's going to do as a live bonus. That is a very important bonus because it shows you how to get yourself into that

parasympathetic state.

So generally try not to watch or read anything or do things that are stressful. If you're watching Netflix, for example, you're watching Dance Moms. Unfortunately, I got into watching some of that show not too long ago, and it's a very stressful show because these people are nuts and they are fighting with each other nonstop, and it's very frustrating to watch them. So if you're eating food or watching Dance Moms, it's going to screw up your digestion. So if you can watch something that's completely relaxing and all that, I think that's okay. But generally don't do anything that could initiate any sort of stress in your system as you're doing that. And then avoid eating on the go. Eating on the go while you're moving and running and all that can also cause this sympathetic activation, which disrupts your digestion and appreciate the food and the experience of eating, because remember that pre-eating phase, that's the phallic phase where just the smell of the food, the preparation of the food, the taste, and color, and texture, all of those things start priming your system for digestion.

And so if you have a moment or you take a moment as the food is getting ready to really start to appreciate the food and get yourself excited about eating and the process of feeding your system and feeding your microbiome, if you're thinking about those things, it really provides a really positive association with the food itself, and then upregulates all of those pre-digestive systems. And then avoid excessive liquid consumption during a meal. There's a lot of acidic and pH balance going on during the digestive process. We'll talk about that as we get into the stomach and the small intestine and so on. So if you're drinking a lot of water, for example, during eating, not only are you of course creating an artificial sense of fullness, but you're also going to be diluting a lot of the enzymes and diluting a lot of the hydrochloric acid and buffering things, and you may not be able to digest the food as well.

You, of course, need water in your system when you're eating because many of the enzymes are what we call hydrolytic enzymes, meaning they use water, but you don't need much. And you can actually hydrate before the meal. So taking in too much of

liquid while you're eating is not actually beneficial. You want to remain hydrated throughout the day, and then while you're eating, just taking in small amounts of liquid as you go, you want to maintain a consistent meal time if you can. Your body and your microbiome cycles in response to the meal time. So if you have a very inconsistent meal time, it does screw up your circadian rhythm and your digestive capabilities, and also the function of things like your pancreas and your liver and so on. So you do want to have some degree of uniformity because the endocrine and the neuroendocrine controls of all of these digestive processes work on a 24-hour clock.

So sometimes you're eating at midnight, and then sometimes you're eating your last meal at six or seven o'clock, you're going to screw up your system and your circadian rhythm as a result of it. So you do want to be careful of that. Now, you don't have to be precise. It's not like you have to eat dinner at 7:01 every day, but sometime within a one and a half hour-ish range is fine, you don't want it to be a four or five hour spread normally. And then finish eating before you feel completely full. This is the biggest struggle for a lot of people. I struggle with it as well, especially if the food tastes really good. It's hard to stop eating when the hunger feeling goes away and not allow yourself to get to that feeling of fullness where your stomach is distended quite a bit, or your small intestine is distended quite a bit.

So you do want to pay attention to that, and try to practice stopping eating before you get this feeling of fullness, and that makes a big difference on the overall health and function of your digestive system.

Grab Your Symptom Tracker!

One of the tools that you have is a digestive signs and symptom self-assessment. Most of you should have that you got when you got the course. That can be very useful right now because what I would love for you to do is as we talk about the different parts of the digestive tract, we're going to stop and say, "What are the signs

and symptoms associated with this part of the digestive tract not functioning properly?" And as you track your signs and symptoms, it'll start to show you and eliminate certain patterns or certain likelihoods of where your particular digestive issue may be. But keep in mind that there's a lot of overlap with dysfunctions in many areas of the gut.

You can have reflux as a result of a dysfunction in your small bowel and a dysfunction in your stomach. So if you mark reflux as your problem, what are your signs and symptoms, then it could be one of those two. But it's okay to see the overlap because it can really show you certain patterns and show you ways of identifying the possible source of your particular dysfunction. So if you have access to that, get it out because in a few slides we'll come to wanting to look at that.

Lesson 4: The Mouth, Oral Biome, and Cephalic Response

So tracking that symptomology in this context will really help you hone in on where your problem may be. So we talked about the cephalic response, the smelling, the visual, the feeling, the food, even if you're holding or touching it. All of those things prime numerous predigestion responses. Then the next part where food enters is into the mouth. The mouth plays a very important role because the mouth, the chewing action of the mouth, the mastication of the food breaks down...

... in action of the mouth, the mastication of the food breaks down the food and it increases the surface area of the food, which is critically important because most of the carbohydrates and proteins in the food are compacted and folded very intricately and they create dense macromolecules. What you really want to do is start opening up those macromolecules and exposing more surface area for the digestive process. So that mastication by the chewing action is really important. And you really want to chew for 20 to 30 chews per bite. And it really helps you slow down your process.

And that chewing action also coats that food with saliva. And you want an adequate

coating of the food with saliva for a couple reasons. Number one, in your saliva you have an enzyme called amylase and you have lingual lipase. So your amylase and lipase enzymes that are in saliva will start to break down the carbohydrates and the fats that are in your food. You want the carbohydrate and fat breakdown to start to occur in the mouth, and we'll talk about why that's important, but generally, it's because those things take much longer to break down enzymatically than, say, proteins, right? So you want that to start in your mouth and during the swallowing process. And exposing the surface area of the food is really important for enzymes because enzymes work as a contact sport. So the more surface area of the carbohydrate or the more surface area of the fat that you've exposed, the more enzymes can latch onto it and break it down faster, right? So your amylase is doing that and your lingual lipase is doing that really, really important function in breaking down those macromolecules starting in your mouth.

The other important reason of coating your food with saliva is because in saliva you have secretory IgA, immunoglobulin A, which is a very important compound because it's doing two things. It's doing lots of things, but two things I really want to. The first thing it's doing that's really important is that it is neutralizing any potential toxins or microbes or anything that may be a problem for your system. It's neutralizing it in the mouth itself, right? This is why you have secretory IgA in your saliva so that your saliva can be the first line of defense in neutralizing potential pathogens or toxins or viruses that are coming in through the food. But in order to do that, you have to have adequate time of chewing and adequate coating with your saliva in order for the IgA to find all of its targets.

The other thing it does is when IgA coats some of the food antigens, like the proteins and other things that may be coming in with the food, it is allowing your immune system to not react in an inflammatory manner to those food antigens, right? So IgA, coding these food antigens, and when I say food antigens, these are components of food that can trigger an immunological response in your system, including things like

gluten and other peptides, right? These are immunogenic components of food, meaning they can trigger an inflammatory response or an intolerance response. What you really want is you want your immune system to learn to tolerate those foods so they don't trigger an immunological response when they enter your body.

One of the key ways that that happens is these food antigens get hit or covered by secretory IgA, and then secretory IgA signals to the immune system that, "Hey, you don't need to pay attention to this. You don't need to react to it. It's perfectly safe. So negate that inflammatory response." This is called oral tolerance. This is arguably one of the most important things because if this system breaks down and you're not coding your food adequately in secretory IgA or you're not making adequate secretory IgA that's getting out into your saliva and your mucin and all that, you will end up developing food sensitivities. You will lose oral tolerance. And once you reduce and end up with food sensitivities, you will reduce the diversity of food you can eat and end up with food sensitivities. You end up losing diversity in the gut microbiome because you lose diversity in your diet, right? So the secretory IgA component is really important.

Now, the oral microbiome that's sitting there in the mouth does a number of things to support the mouth in its role in digestion. Number one, we know that dysbiosis in the oral microbiome can lead to digestive issues like SIBO, IBS and other GI conditions. We know that the microbiome in the mouth communicates with and contributes to by producing metabolites in the mouth itself that go down and interact with the gut microbiome to prepare the gut microbiome for food that's coming in. We also know that the oral microbiome can enhance carbohydrate digestion by making amylase itself, and it breaks down sugars that may be in monosaccharide form, which can be harmful to your teeth and your buccal tissue in your mouth. It can break down and neutralize those sugars and it can control the pH in your mouth as well.

Controlling pH in the mouth is really important. You don't want your mouth to be acidic. You want your mouth to be closer to neutral because the amylase enzymes and the lipase enzymes that are so important to function in the mouth actually function in a

neutral or near neutral pH. This is why acidic foods like sodas and things like that can really disrupt digestion because the acid from those sodas and drinks and all that actually reduces the functionality of the amylase and lipase enzymes starting in the mouth and then causes an issue of your teeth and your buccal tissue potentially getting harmed and decaying as a result of that acidity. So you do want a pH balance in your mouth. You want to drink water as much as you can with your meal versus acidic things like soda and juices. The water does not affect your pH in any negative way.

And so these microbes will produce alkaline substances to increase a pH if you're eating something that's acidic. So if you're eating, for example, a citrus fruit to negate the effect of the citrus fruit, the citric acid that's in the food, your microbiome in your mouth will produce either ammonia, which will buffer the citric acid, or it'll produce an alkaline substance that'll buffer the pH of the citric acid to bring the mouth back to close to neutral, right? It's a really, really important role because it really impacts the accessibility of the food, and then it also controls the health of your oral cavity and the health of your teeth and gums and so on. It plays that role in this bio accessibility and therefore transformation of nutrients during the digestive process.

Now, some of these oral microbes can also form biofilms in the mouth that improve the integrity of the oral tissue, and it protects the teeth and the gums and all that from anything that could damage it that's coming through from the food. So the biofilm is actually a good thing, and it can produce all these metabolites, like I mentioned, the ammonia, the alkaline substances to balance out the pH in the mouth. It produces nitric oxide, which is really important for immune function, but also for vasodilation and reducing blood pressure, and that vasodilation becomes really important for circulation. Circulation becomes really important for distributing the nutrients that you're absorbing in the small intestine throughout the body.

So that nitric oxide is critically important that your oral microbiome is producing. And then it produces bacteriocins, which are antimicrobials to neutralize pathogens and so on, and short chain fatty acids as well. You get some short chain fatty acid production

in the small bowel. A tiny, tiny amount can be produced in the mouth, but the vast majority of it's produced in the large intestine. But all of these metabolites and all that the oral microbiome produces are just generally good for digestion. They protect the system, they modulate immune response, they provide tolerance, and they allow the system to function the way they're supposed to.

So you can easily see that if you have a dysbiotic oral microbiome, you could have significant issues with digestion. You may not relate the two, but they are absolutely related. So this is where the signs and symptoms come in. If you have a disruption to your cephalic response and you have poor meal hygiene and or mouth or oral microbiome, here are some of the symptoms that you may encounter. You may have bloating and gas because you're not breaking down the food appropriately. You might have heartburn and reflux because of a pH issue because you're not releasing enough hydrochloric acid. Your cephalic response is not causing the vagus nerve to up-regulate HCl production. You could have indigestion and feeling of fullness too quickly, nutrient deficiencies and anemia, chronic bad breath, undigested food, and so on. So just look at these symptoms and tick off any that may apply to your condition. And when you collate all of the ticks at the end, it'll help you hone in on where your problem may be, right?

Lesson 5 - The Stomach

So then once it goes from the mouth, it goes into the stomach. And of course, in the stomach, the key player here is stomach acid. And stomach acid is not a villain. There's this misconception that there's this issue of too much stomach acid. That's not really a problem. That's a tiny, tiny fraction of people that may have an issue with too much stomach acid. The vast majority of issues that are attributed to too much stomach acid are actually the opposite, which is too low stomach acid.

I'll put a little bit of finer point as we go along, but stomach, once you eat food, starts to contract to churn and mix the food with the gastric juices. This process is actually

called stomaching, and it creates a semi-liquid substance where it's gastric juices, and then those macromolecules of the food mixed together in a nice bolus of food that we call chyme, C-H-Y-M-E is pronounced chyme in this case.

Adequate stomach acid production activates pepsinogen into pepsin. So pepsinogen is an inactive form of a protease enzyme, which is an enzyme that breaks down proteins that's released by the pancreas, but it's released in inactive form. It needs to be activated through the increase in HCl production in the stomach. So then that pepsinogen, which is the inactive form, gets activated to pepsin. This enzyme starts to break down proteins in the stomach. Remember, proteins are not broken down in the mouth. They're masticated. So you're increasing the surface area of the protein, but in the mouth, it's carbohydrates and fat that starts to get broken down. It's only when the food enters the stomach there's the hydrochloric acid, and the activation of pepsin allow for the breakdown of protein. So protein digestion starts in the stomach, right?

HCl also kills harmful pathogens and prevents bacterial overgrowth, not only in the stomach, but also in the small bowel to a large degree.

Adequate HCl production triggers a production and release of something called intrinsic factor, which is a glycoprotein essential for the absorption of things like B12 in the small intestine. So this intrinsic factor that's being released as a result of HCl being released starts to prep the small intestine for absorption and other forms of digestion as well.

Then adequate HCl is necessary for the absorption of minerals like iron, calcium, magnesium. So one of the causes of being iron deficient, for example, or calcium or magnesium deficient, could be that HCl production is low, and then magnesium becomes important for HCl production on its own, and zinc does as well. So you need HCl in order to be able to break down and absorb these minerals.

And then the acidity of the chyme entering the small intestine triggers a release of bile. That's one of the ways in which bile starts to be released from the gall bladder into the small bowel, and also the release of pancreatic enzymes so that more digestion can start to occur in the small intestine.

And then low HCl can slow down this entire process of food leaving the stomach and entering into the small bowel. So this is called gastric emptying. This causes bloat, gas, distension, reflux, and can mimic the symptoms of what people think of as high stomach acid when it's actually a condition of low stomach acid, right? Now, the other problem with low stomach acid is one of the functions of stomach acid is to kill

microbes and keep the microbial level in the stomach and the proximal part, when I say proximal part, I mean the part that is closest to the stomach of the small intestine, trying to keep those areas with low numbers of microbes because we don't want much fermentation to be going on in those areas. So stomach acid controls the growth of those microbes.

So if stomach acid is inadequate, you get an increased growth of microbes both in the stomach and in the proximal part of the small intestine, which means that now fermentation may occur in those areas, producing gas and producing bloating and all kinds of problems, and can lead to reflux and GERD because the pressure in the proximal part of the small intestine or in the stomach pushes things up. So then you get a refluxing of stomach acid and gastric juices and potentially fatty acids that all cause this burning sensation. So that reflux and that gastroesophageal reflux and heartburn, that's not a condition of too much acid. It's really a condition of too little acid in the vast majority of cases.

Now, what about the microbes in the stomach, the idea that stomach acid keeps the stomach sterile? That's not actually true. It does keep the numbers of microbes and the diversity of microbes very low, but you still have microbes like helicobacter pylori, lactobacillus and streptococcus that can live in the stomach at those very low pHs. And some of them play a very important role in modulating immune response, protecting against harmful gut pathogens, and then, of course, preventing conditions like gastritis, ulcers, dysbiosis, and so on. So the stomach has a microbiota. It's very low diversity, very low concentration, but they do play a role in the stomach itself, right? Now, they can overgrow and they can become a problem, like in the case of H. pylori. It can certainly overgrow and end up becoming a problem, but you are supposed to generally have H. pylori in your stomach.

Here's some signs and symptoms now to think about, hypochlorhydria, which is low stomach acid, or hyper, which is high stomach acid. Look at these and think about your symptoms and what may be associated with one of these two conditions. Now, keep in mind, heartburn and acid reflux is one of the first symptoms in the high stomach acid category, but as I mentioned, that's not actually true. It's not actually driven by high stomach acid. Very, very rarely is that actually a problem. But what the issue is that an elevation in stomach acid, if somebody has reflux due to overfermentation or a valve issue, and we'll talk about the valves towards the end, and things are refluxing, it can make the intensity of the reflux higher because the acid is more potent, but it's not an issue of being too high.

There are conditions where your stomach acid is too high, and those can lead to things

like nausea and vomiting, peptic ulcers, excessive hunger and lack of thriving, inability to put on weight, things like that because your digestive system is just moving too fast and you break down the food way too fast and your chymes at times will also be too fast. So really pay attention to the symptoms around the low stomach acid because high stomach acid is not really something you see very much.

And then more signs and symptoms of stomach-related dysfunction. This is dysfunctions that are related to the lining of the stomach. And then the second set is to gastroparesis where there's delayed gastric emptying where the time it takes for the bolus of food to go from the stomach into the small intestine, that is delayed. And again, remember, the food is supposed to spend around two hours in the stomach. If it's now spending six hours or seven hours, then you've got delayed gastric emptying, and that can cause lots of problems, including allowing fermentation in the stomach, which is really not good for the stomach at all, and that leads a lot of gas, bloating, distension, and other inflammatory conditions as a result. It can even lead to vomiting undigested food and so on.

And then the last thing is the H. pylori overgrowth. What do those symptoms look like? And remember, there can be overlap in many of these. So you might mark the same symptom for two or three or four reasons, but it's still going to give you an idea to look at what patterns you seem to see in yourself.

Lesson 6 - The Liver, Gallbladder, and Bile

Now, once it goes past the stomach, it's going to be taken over by functions of the liver and the gallbladder. So let's talk a little bit about the liver and the gallbladder.

The liver is responsible for fat metabolization, detoxification and essential nutrient storage, among other things. The liver does other things as well, but this is a really important part of it, especially as it relates to digestion. So the first thing is bile acid production or bile production is continuously happening in the liver and your liver keeps regenerating and generating your bile acid pool. It makes bile from things like salts, bile salts, cholesterol, bilirubin, and water. And then, in addition to making bile, it's also storing certain nutrients. For example, it stores all of the fat soluble nutrients, A, D, E and K, the specific transport for these nutrients from the lining of your gut to the liver,

right? There are carrier molecules that can grab these compounds, these vitamins in particular, and take them right to the liver where the liver can store them for use, and then it becomes extra hepatic. Extra hepatic means going outside of the liver. So most of these fat soluble vitamins first go to the liver, get stored there, and then leave the liver as the system requires it.

It can also store things like iron and copper and other essential minerals, and it also stores glycogen for energy. So your liver has somewhere between a hundred to 120 grams of glycogen stored. Now, that kind of glycogen storage, when needed, can provide you upwards of four to 500 calories worth of energy. So this is the liver's defense for starvation. It takes some of those, the glucose that is being made as a result of digestion and then takes it into the portal circulation and then covers it and puts it as glycogen, and it stores it, and it gets ready for when the body's starved to start breaking down the glycogen and sending out the free glucose into circulation. So your liver is doing all of these things.

The gallbladder, which is very important, it sucks if you have it cut out, but it's very important, it stores bile that is produced by the liver, and then it ends up releasing it into the small intestine in response to digestive cues. As we talked about earlier, some of the digestive cues to get the gallbladder to start to release bile is HCl and some of the targets of HCl. And then some of the other hormones like gastrin, for example, can get some of the bile to start moving as well to get the small bowel ready for food to come in.

Bile is triggered by a hormone called CCK, which is then released when fat enters into the small intestine. So when you have fat coming in, then bile goes up. It's time for me to work because bile works on fat, partially digested proteins or amino acids that are coming in from the stomach. Remember, the primary site of protein digestion is in the stomach. It's not in the mouth. It happens in the stomach. And then as those amino acids are coming out of the stomach or those peptides that didn't get fully digested, as they're entering into the small bowel, you're getting this activation of the hormone

CCK, and that allows for bile to be released and prepare for dealing with the food bolus that's coming through.

And then the acidic chyme enters into the small intestine, and that also triggers the release of bile because the acidic chyme is coming in with a very low pH, and your intestines want to buffer that pH and increase it, right? They want to increase it closer to six instead of one. And so that's one of the roles that bile plays is to actually neutralize some of that acid. And
then this whole process also causes the release of bicarbonate, which also then buffers the acidic chyme that's coming in.

Now, having the acidic chyme drop into the small intestine momentarily is a good thing because that acidic chyme actually kills off dysfunctional bacteria in the proximal end of the small intestine. That's the part of the small intestine that connects to the stomach. And you don't want a lot of microbes in that region. It becomes a big problem if you have an overgrowth of microbes in that region. One of the ways in which the microbes are continuously knocked down in that very important region is the presence of the acid from the chyme, and then subsequently the release of bile as well, because bile also plays a role as an antimicrobial.

Now, here's an incredibly important role of bile, right? Bile takes lipids and then makes it accessible throughout the body. So lipids are generally not going to be accessible throughout the body because as you know, our cells are what we call a phospholipid bilayer. So it has a lipid tail, but an aqueous head. So the outside of the cells are aqueous, and it's hard for lipids to penetrate through. You need things that penetrate through water. So when I say aqueous, I mean water or water-soluble.

Most of our digestive tract is an aqueous environment. Our circulation, our blood circulation is an aqueous environment. Our lymphatic system is an aqueous environment, which means, for things to get through and around the body, it cannot be in full fat form because water and oil and water and fat don't mix. So you can't solubilize

lipids or lipid based nutrients in the blood or in lymphatic system or in circulation to travel throughout the body. It has to be emulsified, right? That's a very important function of bile. Bile has this hydrophobic side, which is a fat soluble side, and then a hydrophilic side, which is a water loving side, and it covers the lipids, and this is called an emulsification. So it's taking something that's insoluble in an aqueous solution and making it dispersable and/or soluble in that aqueous solution.

So in the small intestine itself, when fat is coming in, or fatty acids or lipids are coming in, BILE is released and then bile emulsifies the fat so that it can actually be absorbed through the intestinal epithelium. And then once it's absorbed, it can then be sent throughout circulation. So that's a very important thing. This emulsification step is critical, or you wouldn't be able to bring in any sort of lipids or lipid-based nutrients or metabolites and so on.

So the lipid, these fatty acids or these smaller lipids that are now emulsified get absorbed by the intestinal epithelial cells. The intestinal epithelial cells then turn them into something called a chylomicron, which is really a fat carrier. And these are called lipoproteins. So this is why LDL is low density lipoprotein, HDL is a high density lipoprotein. HDL and LDL are really carriers for fat and lipid nutrients. So those are being made in the cell from the emulsified lipids, and then they're putting them in these carrier systems called chylomicron or LDL or HDL, where then it can enter into circulation and circulate through the body. So these carriers, LDL, HDL, chylomicron, are really important to carry lipid and lipid-based nutrients throughout the body, but it's bile that makes that lipid or that lipid-based nutrient accessible to the cell in the beginning, right? Without bile, you're not absorbing any of those lipids at all.

Fat soluble vitamins like A, D, E and K are absorbed this way and then stored, of course, in the liver. And then you have other fatty acids, like DHA, EPA and so on, that has to get absorbed into the cells for them to function, and this emulsification is a really important step for those nutrients to get absorbed in.

And then it detoxes and eliminates. Bile carries waste products, both in and out of the body through the system and into the portal circulation and takes it to the liver where the liver can neutralize the toxin itself.

And then the other aspect of bile is that it's release of antimicrobial peptides and functionality, and then also acting as an antimicrobial itself. So bile has that detergent-like structure, right? So it is an emulsifier. Soaps or detergents are emulsifiers. And these emulsification processes do disrupt the membranes of certain bacteria, so it ends up killing certain bacteria. It also prevents bacteria from adhering to the mucosa lining. So imagine in your small intestine where we want to keep very low numbers of bacteria, bile is constantly circulating through the digestive process. You can get about 15 rounds of bile circulating through, being released by the gallbladder, going through the entire small intestine, being reabsorbed at the end of the small intestine, and then being sent back to the gallbladder for release. Again, you can get 15 to 17 cycles of bile during the digestive process. One of those roles is its cycling through is to maintain low levels of microbes.

And it promotes low oxygen environment in the small intestine as well. You do have oxygen in the small intestinal environment, but bile does help quench some of that oxygen so it's not a very high oxygen environment. And this is good for controlling pathogens, which is really important. And it's also a signaling molecule that positively influences the composition and behavior of the gut microbiome. So the rest of the gut microbiome takes bile as a signature of proper functionality. And then, of course, there are microbes that will convert bile into secondary bile salts or secondary bile acids, which then feed beneficial microbes as well.

It also up-regulates an antimicrobial system by the intestinal epithelial cells, and that's called an FXR receptor. So bile triggers this receptor to get the intestinal lining cells to release antimicrobial peptides because these antimicrobial peptides, again, control growth of microbes in the small intestine where we want there to be very few microbes compared to the large intestine.

It helps neutralize and acidify the acidic kind from the stomach. So it prevents intestinal damage by two acidic chyme coming in and damaging the intestinal borders, the layers of the cells itself, and then gets that system ready for pancreatic enzymes and so on.

And the enterohepatic circulation is a circulation of bile. Bile is produced in the liver, sent to the gallbladder for storage, and then released by the gallbladder. It emulsifies fat in the small intestine, and approximately 95% of the bile salts are reabsorbed by the small intestine, go back to the liver, get cleaned up, take all the nutrients taken out, toxins neutralized, and then goes back and gets recirculated through the gallbladder again. But keep in mind, it's 95%. So 5% of the bile makes its way into the proximal part of the large bowel, right? And this is for a very, very good reason because when that 5% gets to the proximal part of the large bowel, there are microbes that convert that into secondary bile salts or bile acids.

Those secondary bile salts play an important role in conjugation or deconjugation of toxins that are being secreted into the GI tract. They neutralize the growth of pathogens. For example, C. diff. C. diff growth in the large bowel is heavily controlled by the presence of secondary bile salts. So that's how your body normally controls C. diff. Most of us have some amount of clostridia difficile in our system, but our bile, and then the metabolization of bile of secondary bile salts prevents the overgrowth of C. diff. If you take a course of antibiotics and it knocks down a lot of the good bacteria, and you're not getting the production of secondary bile salts, that means C. diff can now have an opportunity to

Or bile salts. That means C. diff can now have an opportunity to increase its numbers. That's one of the ways in which antibiotic use increases your risk of a C. diff infection. And then it also binds to this FXR and TGR5 receptors, which enhances metabolic pathways and improves lipid and glucose control within the system as well. An unhealthy or dysbiotic microbiome can disrupt metabolism affecting fat digestion and toxin removal. Those of you that got the bonus seven training sessions that are already

pre-recorded, look at the deep dive I do on SIBO in that advanced training vault. I go really deep into bile and its actions and the impact on the microbiome in that particular module. So what are the signs and symptoms of a poor liver, gallbladder and bile dysfunction? These are some of the ones, so take a look at those symptoms and try to decide if some of these are relevant to you, and of course, mark off the ones that you think are relevant to you.

Lesson 7: The Pancreas, Sphincters, and Motility

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

Lesson 7: The Pancreas, Sphincters, and Motility

After the liver, we've got the pancreas. The pancreas is such an interesting organ because it has both a enzymatic function, so as part of the digestive system, so things like lipase, amylase, elastase and so on, but it also plays a role in the endocrine system where it produces hormones. These hormones are like pancreatic polypeptide, somatostatin, insulin, glucagon and so on, and we'll talk about what each of those do. So when you look at the digestive enzyme, so you've got CCK, which we mentioned earlier. This triggers the release of digestive enzymes from the pancreas itself, and then these digestive enzymes from the pancreas are released into the small bowel. Protease enzymes like trypsin, chymotrypsin, these are used to break down proteins into amino acids. Lipase enzymes breaks down dietary fat into fatty acids and glycerol for absorption, and then the bile comes along and emulsifies those fatty acids in those smaller lipids and allows those to be absorbed as a result of the emulsification.

And then amylase, more amylase is released also by the pancreas, and that converts

starches into simple sugars like glucose, maltose, dextrose for much more easier absorption into the system, and that gets either stored as glycogen or the insulin causes your cells to take those up and burn it as fuel. Now, the pancreas is also a regulator of the small intestine in a number of different ways, including the pH of the small intestine. The hormone secretin, which the pancreas releases is stimulated when the acidic chyme enters into the small bowel and it stimulates the pancreas to release bicarbonate. Bicarbonate is important to neutralize the acidity of the chyme that's coming in. So that is also another role of the pancreas is to help manage pH by releasing bicarbonate, which is a neutralizing buffer for the very acidic chyme that's now entering the small intestine. It also has blood sugar regulation and digestion regulation by releasing insulin and glucagon.

So insulin of course causes your cells to take up sugar and metabolize it. Glucagon actually causes your cells to make and release sugar when blood sugar levels are low. So you have the opposite functions there, both of which are regulated and driven by the pancreas. Now, the pancreas also makes these other two endocrine compounds called somatostatin and pancreatic polypeptides. Now these are really interesting because these are digestion regulators. They can actually slow down all of the processes involved in digestion. So slow down the release of HCl, so slow down the release of pancreatic enzymes, slow down the release of bile, slow down the motility and the movement of the digestive system.

Now, why would we want this? Well, we need balance in our digestive tract. You don't want a digestive tract that's moving too fast. You want a mechanism to slow down some of the digestive processes, and then generally a slower digestive system is better than a very fast digestive system because the slower digestive system improves metabolism, satiety, and also controls blood sugar regulation postprandially meaning after the meal. So you do want the ability to slow down some of the digestive system if it's moving too fast, and that's what some of these hormones do. It helps kind of manage the pace of the digestive tract, and that's really important generally for digestion.

So what are the signs and symptoms of pancreatic dysfunction? These are some of the things you can notate and then again, we'll collate it at the end so you have the time to look at where are all of my symptoms? What does that mean? Does that mean I need to improve my pancreas, improve my liver, improve my stomach acid, and so on. So take a look at this and mark down your symptoms. Now the connection between all of these organ systems are regulated by certain sphincters, which are muscles. I love that word sphincter. It was one of my first and favorite scientific words or biological words when I was a kid. But sphincters are circular muscles that act as valves and they regulate the movement and passage of things like food and liquid and waste through the GI tract.

So here are some of the main sphincters, the upper esophageal sphincter. This is at the very top of the esophagus, which is kind of right in your throat, which is where it controls the entering of food from your mouth into your esophagus. So the swallowing action, that's where that sphincter is located. The lower esophageal sphincter, typically abbreviated LES, is between the esophagus and the stomach. So that's at the very end of your food tube. Once it enters the stomach, that's the lower esophageal sphincter that opens and closes so that it opens when food has to move through into the stomach, but then it shuts down because it doesn't want the churning and the pressure in the stomach to push food back up into your esophagus, which is actually a big component of reflux and gastroesophageal reflux of GERD.

Now, lower esophageal sphincter dysfunction is often associated with people that have long-term chronic GERD and reflux. So this is one of the areas that can go wrong. Again, not an overt production of stomach acid, it's really the sphincter that's opening up too much and is not functioning properly, allowing stomach acid and digestive secretions and all that to move into the esophagus. Then on the other end of the stomach you've got the pyloric sphincter. So this is between the stomach and the small intestine, which controls the release of the chyme into the small intestine and then is regulated neurologically as well.

And then the other main one is called the ileocecal valve. This is the valve of the sphincter between the end of the small intestine and the beginning of the large intestine. And the functioning of the ileocecal valve becomes really important because if that's not functioning properly, if it's inflamed, if it gets damaged somehow, then it doesn't shut very well, which means that microbes from the large intestine can move up. Food particles may be able to move up, especially when you're laying down and you don't have gravity to assist things continuing moving down. It could move up back into the intestines and cause a lot of problems. And then finally you have the anal sphincter, which is the very end, which is how you pinch and release the stool hopefully into the toilet.

So riding the wave of motility. So in order for things to move through the stomach and the small intestines, you need peristalsis. Peristalsis is this rhythmic contraction of the smooth muscle cells that surround your stomach and surround your intestines that moves the bolus and the solids out of the intestines. Gravity assists to a certain degree as well, but this peristaltic contraction is critically important. So there's a couple of different components to gut motility and peristalsis.

Number one, mortality is that movement of food, liquid and waste through the GI tract. This is controlled by smooth muscle contraction and it's essential for proper digestion. We know that if motility is compromised, it leads to lots and lots of conditions. SIBO is of course a very famous condition associated with stasis in the bowel. When you hear the word stasis in the bowel, it means that motility is compromised in the bowel, it is not moving. The enteric nervous system, which is that that massive bundle of nerves that coats your entire digestive tract, the second brain, if you will, plays a very important role in coordinating the contraction of food moving through the GI system. Now, your enteric nervous system is sending signals to your brain to send signals back down for your smooth muscle cells to contract. So it has to go through the vagus nerve, then the brain picks up the signals, then it causes a contractile signal in the smooth muscle cells of your stomach and your intestines.

The vagus nerve is doing this communication, so it's influencing motility. So the vagus nerve and that gut-brain connection is really important for digestion. This is why IBS, Irritable Bowel Syndrome, which is hallmarked by this kind of haphazard peristalsis, either complete stopping of peristalsis in IBS-C for people that are constipated or overactive peristalsis in IBS-D for people that have a lot of loose bowels and diarrhea. IBS is a gut brain issue because where things are going wrong in the case of IBS is that connection between the enteric nervous system and the vagus nerve to the brain. There's inflammation there. There's disruption of the signaling and so on causing the bowel to react in really unusual ways. So the vagus nerve is really important.

And then you have the migrating motor complex, which is one of my favorite things because the migrating motor complex is this cyclical reoccurring motility pattern, which is like an electrical signaling or it's an electrical sweeping of the stomach and the small bowel. It essentially cleans out the stomach and the small bowel, especially the small bowel in between meals. And that is so important because it's actually removing undigested food particles. It's removing unwanted bacteria. It's certainly cleaning out the system, getting it ready for the next meal. Now, the migrating motor complex kicks in only once the stomach and the small intestine are devoid of food for a given period of time. Typically, it's at least four to five hours. My recommendation based on the reading I've done is six hours may be the best, so five to six hours, let's say, and then you'll get the migrating motor complex kicking in. So you absolutely want the MMC to be kicking in in between your meals. That is so important to maintaining a healthy functioning digestive system because the MMC is there to clean up all of the dysfunctional things, the partially digested foods, the putrefaction that occurs in the small bowel, the overgrown microbes that are now present in the small bowel.

Any of the debris that is now present in the small bowel through the digestion process, it cleans that out and dumps it into the large bowel. You need to have that happen in the small bowel after digestion, but the way you trigger it is by waiting to eat again. This is why snacking becomes such a problem, and overeating becomes such a problem because when the food stays in the small bowel for so long that it empties

from the stomach and it moves into the small bowel for so long and the food just sits there for a while, the stomach may get sensations like you're hungry and cause you to eat again while the food is still in the small bowel. So you haven't gone through the MMC cleanup process yet. And then snacking continuously puts food to the stomach and the small bowel, which means you never trigger the MMC.

This is why most people when they wake up in the morning, you hear that term that morning skinny, everyone looks like they're thinner, their waistline looks better, their tummy looks better in the morning when you wake up, and that's because the MMC has gone through a couple of cycles at that point really cleaning out your bowels. And as a result of that, you've got a flat and better feeling tummy because it's cleaned out all of the things that are going on in your small intestine that shouldn't be there after the digestive process. So that's really, really important to trigger the MMC, give time in between meals, ideally somewhere in that five-hour range or five to six-hour range.

Now, the microbiome's role in all of this is really important. So the microbiome impacts motility in the gut via its metabolite production. So short-chain fatty acids are really important for that motility movement, especially butyrate. And of course, serotonin that's also produced by the microbiome is really important for this peristaltic activity and even for the migrating motor complex. So both of them stimulate and regulate healthy motility. The microbiome can also impact motility by altering the production of secondary bile salts. So secondary bile salts when they're produced in adequate amounts actually do trigger motility signals within the bowel as well because it's a sign for your small intestine that things are getting towards, say, end of the small intestine and entering into the large intestine. So if you recall, fat that's moving through the system is absorbed in the small intestine by the release of bile in the small intestine. Now that bile continuously circulates and then makes its way to the terminal end of the small intestine, and it gets reabsorbed and sent back to the gallbladder for release during the process of digestion.

This cycle can happen upwards of 15 to 17 times in a single meal, but each time that it

makes its way to the end of the small intestine, 5% of it goes into the large intestine where microbes break it down into secondary bile salts. That is in part to control microbial overgrowth like C. diff overgrowth. It's feeds some of the beneficial bacteria, getting them primed and ready for the fiber and other things that are coming in so that they can start fermenting the fibers and all that come in. But it also sends peristaltic signals to the small bowel saying, "Hey, bile is circulating. The large bowel is getting ready to receive the undigested food, so let's move the things along so that you can end up with the undigested food moving into the colon." So this is all the signaling throughout the digestive tract to keep things moving.

As a result of that, the disruption in the microbiome causes stasis in the bowel and overgrowth of organisms in the bowel like SIBO. It can impair the MMC function and lead to stagnant motility and increased bacterial buildup as well. So this can be highly problematic. Oh, and then with the MMC, the other function it has is to ensure that it's clearing microbes past the ileocecal valve. If the MMC is not functioning properly, you can get microbes moving back up the ileocecal valve from the large intestine entering back into the small intestine. So that can be a source of microbes in SIBO as well, and MMC is important for that. So signs and symptoms of sphincter dysfunction and impaired gut motility. So again, notate that and see at the end how your data collates.

Lesson 8: The Small Intestine

Form and function of the small intestine. The small intestine is an amazing organ. It's 20 feet long. It's got 2000-3000 square feet of surface area. It is made up of this villi and microvilli, and the reason it has these finger-like projections called villi and microvilli is that improves surface area quite dramatically. Why does it want all of this surface area? Because it provides more opportunity for digestion and absorption of nutrients. Your body is trying to maximize its capability of absorbing nutrients as food is moving through the system and increased surface area does that more. Now on that surface area, you have these brush border enzymes that are released by these

microvillis and these finger-like projections so that when those components hit that surface error, the intestinal epithelial cells cannot absorb big macromolecules. So the brush border enzymes ensure that proteins and carbohydrates are broken down to their smallest subunit, so they can be absorbed through.

You have the duodenum which is closest to the stomach. This is when I say proximal, the word proximal, it means closest to the previous organ. In this case, the previous organ is the stomach. So you've got the duodenum, which is the most proximal part of the small bowel, the jejunum, which is the middle part, which is where most of the nutrient absorption happens. And then the ilium, which is a final section where things like B12 and bile salts and all that either get made or absorbed. And then also the ilium is where most of the immune activity occurs in the small bowel as well. 90% of nutrient absorption occurs in the small bowel, including macromolecules or larger molecules like carbohydrates, proteins, and fats. Now, carbohydrates, proteins and fats are digested with the help of that pancreatic enzyme and the release of those enzymes and bile salts and brush border enzymes and so on, and those are broken down into glucose, amino acids, fatty acids, which get absorbed. So that should hopefully make sense.

Now, the small intestine has a very deep relationship with the microbiome and also a very tenuous relationship with the microbiome because the microbial population in the small intestine has to be minimal compared to the large intestine. And I'll show you what the numbers look like in the large intestine, but specifically in the most proximal part of the small intestine, so that's the duodenal area, closest to the stomach the concentration of microbes is around 10^4 cfu/ml. That means about a 1000 bacteria per milliliter of gastric juices that you would pull. Now, as you move closer to the end, it goes up as high as 10^6 cfu/ml. That's about a hundredfold increase. So from the very beginning of the small intestine to the very end of the small intestine, you see about a hundredfold increase in the amount of bacteria. So 10^6 is about 10,000 microbes per ml of gastric juice that could be pulled out from that area.

So it's higher than the proximal part, but nowhere close, as you'll see, to the large bowel. And the control of this amount of microbes is a big factor of the microbiome because you don't want an overgrowth of microbes and you don't want a changing of the microbiome in the small bowel because the microbiome in the small bowel does a number of very important things. In addition, because of the 70-80% of all of the immune cells in the small bowel, the microbiome in the small bowel is continuously talking to and working with the immune system. So you want to make sure the smaller amount of microbes you have are the right microbes because the wrong microbes won't communicate with the immune system well, and they don't maintain a proper tolerance relationship.

I talked about some of that in the first module. We'll go into a deeper dive into that in subsequent modules, especially the leaky gut side, but generally understanding that a bunch of the immune tissue, 70-80% are in the small intestine, especially in the terminal end of the small intestine, where it's really important for the microbes to be adequately communicating with the immune cells. And the immune cells are typically found in the Peyer's patches, in the intraepithelial lymphocytes and the lamina propria lymphocytes. What does that mean? Peyer's patches are a type of immune tissue in the small bowel where lots of immune sampling is occurring, where your immune cells are trying to figure out what's coming into the system and should we attack it or not attack it. And that's where decisions are being made and the microbiomes helping those decisions. Intraepithelial lymphocytes are the immune cells in between the epithelial cells, the intestinal cells, trying to protect those tight junctions so that anything bad that comes through it can try to neutralize it.

And then lamina propria is the side beyond the intestinal epithelium. When things first move through the lining of the intestines, that's another layer of protection where your immune cells are sitting there and waiting, but your immune cells need to know what to attack and what not to attack. It's getting that information from the microbiome in the small bowel. And then adequate bile production/release is also essential for maintaining optimal microbial balance because remember, bile is an antimicrobial and it

can kill a lot of dysfunctional bacteria but allow some of the functional safe bacteria to grow well. So this is the balance there.

And then the microbes in the small intestine, they produce vitamins, metabolites, things like polyamines, indole, short-chain fatty acids like butyrate. A small amount of butyrate is produced in the small intestine, about 8-10% of the butyrate. The vast majority of it's produced in the large intestine, but those compounds modulate immune response in the small intestine. They upregulate tight junction proteins, polyamines and indoles, upregulate tight junction proteins to keep the lining of the small intestine sealed well. But those are all byproducts of the microbiome in the small bowel, the immune signaling that I talked about, and then the motility regulation through short-chain fatty acids and even serotonin. The pH of the small bowel tends to be more neutral, so 6-7, and this is maintained by that release of bicarbonate and also by bile neutralizing the acid that's coming in from the stomach, and then the short-chain fatty acids that are produced, and also the bile negates some of the oxygen accumulation in the small bowel. You don't want too much oxygen. There is oxygen in the small bowel, but you want to reduce it if you can because some of the pathogens do really well in a higher oxygen environment. The commensals do better in a lower oxygen environment.

And then finally, butyrate plays a role in maintaining this low-oxygen environment as well. So maintaining the ecosystem and the functionality of the small bowel is a function of the small bowel microbiota, which can easily become disrupted based on diet, lifestyle and other functions. And then you actually disrupt the function of the small bowel when you disrupt that ecosystem. So leaky gut happens. Now, I'm not going to go into this because we're going to really hit this hard in module three, but if the microbiome of the small bowel is not functioning properly, what you end up getting is an eating away and mucus layer, too much inflammation, loss of oral tolerance, the immune system and the microbiome not communicating properly. Everything that comes into the system gets attacked, and then eventually the intestinal tight junctions open up and you end up with leaky gut. So we'll go into that pathology as well in the

next module. So small intestinal dysfunction and dysbiosis signs and symptoms. So take a look at this and then see where you fall into on this list.

Lesson 9: The Large Intestine & Bristol Chart

Now, the large intestine, the large intestine has a few critical parts, and the large intestine is only about 5-6 feet. Compare that to the small intestine. That's about 20, 21 feet or so. The large intestine has a cecum. This is where it starts. This is where the ileocecal valve is, and that's where the ilium of the small intestine connects to the cecum of the large intestine, and the thing in between them is the ileocecal valve. So that's a very important component because again, SIBO and other problems may occur as a result of a dysfunction in the ileocecal valve. Now, how do you know if your ileocecal valve is having a problem? You'll find pain and sensitivity in the right lower quadrant of your abdomen.

So if your gut hurts when you eat or after digestion and you're trying to feel around where it hurts, if you poke around in the right lower quadrant and you feel specific areas of tenderness there, it could be an issue in your cecum and your ileocecal valve are inflamed, and it may be causing regurgitation and other inflammatory processes in that area. Then the colon has the ascending transverse and descending part of the colons, and then the final part of it's called the sigmoid that connects into the rectum, and then of course the rectum and the anus of the section where waste is stored and then finally eliminated. Now, what's distinct about the large bowel is that's where most of the water is being absorbed. It's 90-95% of the water and electrolytes are getting absorbed there. And then of course, all of the undigestible food or the food that just didn't get digested end up in the large bowel where it ends up getting fermented.

Now, the fermentation is why the transit time in the large bowel can be so slow. Anyone who's fermented anything on your own you know fermentation takes a while. It could take 10, 12, 14, 24 hours. And so we know that because fermentation is a primary

action in the large bowel, it can take a very long time for things to transit through. That's so when you look at the transit time when we're talking about it, you can have upwards of 24, 30 hours just in the large bowel itself, and as water is absorbed while the food bolus is going through the large bowel, it hardens and compacts the stool. This is one of the reasons why water absorption occurs in the large bowel, because that's where you want, you want the stool to be well hydrated, moving through the small bowel and so on, and then once it gets to the large bowel, you want it to start getting dehydrated so it's a little bit more solid and it can be compacted into a tube-like shape.

The large bowel is where microbe fermentation happens with undigested food, and of course, the large bowel is an oxygen-free environment largely. That is done so by the microbiome and also the production of short-chain fatty acids that allow the intestinal epithelial cells to take up oxygen and utilize it, and then they start using short-chain fatty acids like butyrate for fuel instead of other sources of fuel. The pH of the large intestine is slightly more acidic, and it's a low-oxygen environment than the other parts of the bowel.

The large bowel is the main home of your gut microbiome. The large bowel has trillions of microbes in it, and it's the most densely populated microbiome in the body. It's 10^12 cfu/ml. Remember, the highest amount in the small bowel was 10^6. The difference between 10^6 and 10^12 is a millionfold difference. There's a million times more microbes in the large bowel than there are on the small bowel. Just think about how purposeful that design is. Just millimeters apart, the end of the small bowel to the beginning of the large bowel, you can have a millionfold increase in the microbes that live there. The microbes, of course, break down fibers, resistant starches, and other remaining carbohydrates. They produce short-chain fatty acids, including butyrate and lots of other compounds as a result of it.

Microbes in the colon also help metabolize bile acids, converting them to secondary bile salts that I've mentioned that controls certain microbes. It enhances peristaltic activity

and it can improve tight junction function, but it also feeds beneficial bacteria, which is really good. And then in the large bowel itself, during that course of fermentation, there are over 10,000 other compounds produced when you include things like proteins and enzymes and all that. Some of these compounds are vitamins, so all kinds of vitamins like vitamin K, vitamin K-2 are produced in the large bowel urolithins, conjugated linoleic acids that are really important from metabolic health, brain health, and so on. Tryptamine, which is a derivative of tryptophan, which also has an immune modulatory effect, secondary bile salts, GABA, dopamine, all of these compounds are being produced in the large bowel by the microbiome.

This is why you want to have a very diverse and well-functioning microbiome in the large bowel because there are thousands of critical components and compounds that we need to function that are produced only in the large bowel by microbes. The large bowel also works hard with the microbiome to balance out immune function because the microbiome and the immune relationship in the large bowel basically balances out the immune response and builds tolerance for the immune system. This communication with all of the compounds coming into the large bowel from the small bowel and in the small bowel itself, where the immune sys-

... the small bowel and in the small bowel itself where the immune system is encountering all of these food particles, the microbiome is teaching the immune system what to attack and what not to attack. This is where a lot of the tolerance work comes in. It starts in the mouth with the secretory IgA like I mentioned, but as these antigens move into the intestines, the small and large bowel interaction with the microbes, the microbes are teaching the immune system what to attack and what not to attack it.

Also, the microbes in the large bowel upregulate Treg cells and pattern recognition receptors. These are the cells that recognize food particles and food antigens and suppresses immune responses against them. These cells require the microbiome to upregulate. Right? IgA secretion is also created and stimulated in the large bowel by

the microbiome. This continuous development of the gut-associated lymphoid tissue that's happening from large bowel interacting, the cells of the large bowel, the immune cells of large bowel interacting with the microbiome.

And then finally, communication with the systemic immune response also translates from the large bowel throughout the rest of the body. All of those tolerance signals what to attack, what not to attack, that type of intelligence. All of that translates from the large bowel, the interaction of the immune cells in the large bowel to the rest of the system providing us overall tolerance and overall a balanced immune response.

If you have large bowel dysfunctions, here are some of the signs and symptoms you could start to look at and then you could kind of discern what part of your large bowel may be problematic when you look at where it might hurt. Right lower quadrant is that sigmoid area. The transverse colon is upper, the part right below the stomach where you feel where your stomach is distended. Right below that is a transverse colon going across, and then the descending colon is on your left side.

If things hurt on your left side, it's likely in the descending colon and then down by your belly button and deeper in if the pains there, then it's likely around the sigmoid end or the rectum area where you're holding stool itself. You can kind of guess like, okay, where are my dysfunctions? Where am I feeling pain or discomfort after I eat and after digestive process? Incidentally, it's quick to, I want to remind everyone of a thing about the gastric transit time.

This is where I've talked about this a bunch of times where people say, oh my God, I have SIBO. And I go, well, how do you know you have SIBO? They go, well, as soon as I eat something I bloat or as soon a few minutes after I start eating I bloat. Well, remember gastric transit time, once you eat and swallow something, it sits in the stomach for up to two to four hours.

And in a normal functioning digestive tract, it's around two, maybe two and a half hours so it doesn't get into the small intestine. And in the small intestine it can sit there for five or six hours making its way from the beginning of the small intestine, the end of

the small intestine where it can get fermented.

If you have SIBO, if you have small intestinal bacterial overgrowth that's causing a fermentation and a bloating and gas production, that can't happen for at least an hour or two after eating, even if you have very fast transit time through the stomach.

Lesson 9- The Large Intestine & Bristol Chart

If you're getting bloating at the moment of starting to eat or within a few minutes of starting to eat, it's not necessarily SIBO, it's other immunological issues and reasons. And if that's you, save that question for the Q&A session because we can really tackle that mechanism during the Q&A session.

The Bristol Stool Chart can be quite useful. It goes from Type 1 to Type 7 as you see here. The ideal stool is Type 4. Type 1 is indicating constipation. If you tend to be constipated, you're going to look like Type 1 or Type 2, and then Type 6 and 7 are indicating loose stool or diarrhea. If you're constipated, you want to bring it towards 4. If you're at 6 or 7, you want to bring it towards 4.

You can use some of the tactics we talked about earlier. For example, if you look at your stool and you're consistently looking like Type 1 or Type 2, it means you're constipated and your bowels are moving too slowly. You can increase the transit time of the bowel by adding that insoluble fiber and then exercising after a meal and maybe even adding coffee and other stimulants relaxing a little bit more because maybe your peristaltic activity is compromised by stress response.

You want to allow the migrating motor complex to kick in before your next meal, so wait five to six hours before your next meal to allow some of that cleaning process. And incidentally, the way you know you're migrating motor complex is starting is you feel that gurgling in the stomach. Right? The gurgling in the stomach is the start of the migrating motor complex, or sorry, the phase three of the migrating motor complex. That's really the phase that's cleaning out the system and the gurgling and the sounds that you hear is the movement of air through the digestive tract from the stomach into

the small intestine and through the small intestine.

You want that to occur. Let that occur, give that another 40 minutes or so and then you eat. Right? That's one way of timing that you eat and then you don't eat again until you feel those hunger pangs and then you hear that gurgling system.

Now the gurgling system actually cures the hunger pangs. Most of you have probably noticed this when you feel really hungry. And then if your tummy gets to a point where it's gurgling and doing that sound, then the hunger goes away. And that's because the migrating motor complex actually shuts down the hunger signal because it doesn't want you to eat while the MMC is happening.

My recommendation is wait till you feel that gurgling, let that go through for about 30, 40 minutes and then eat, and then that should be a normal practice. But certainly if you have a Type 1 or Type 2 stool on this chart, you definitely want to do that. If you have Type 6 or 7, your transit time may be too fast, your large bowel may be too inflamed to absorb the liquid that it should be absorbing, so it's not forming the stools properly.

What you want to do is then increase your soluble fiber to slow down your gastric time. You might want to increase some fat intake to slow down your gastric time. You may increase protein intake to also slow down your gastric time and you might be too stressed when you're eating because stress increases gastric time and causes loose stool as well. That's the way you would really kind of look and use the Bristol Stool Chart.

Lesson 10: Digestion Optimization 101

All right so just a quick summary here. How, when and where do you set up for digestive success? Right? Remember, mindful eating, preparation, that food hygiene. Right? Taking your time, smelling, appreciating the food, creating that dopamine response, but create that dopamine response around the food specifically not around all of the occurrences around the food. Meaning if your practice is normally to sit down

and watch something or have certain conversations with certain people while you're eating and those aren't really healthy practices for you, you're going to build a dopamine response where you need to do that in order to look forward to eating. Right?

Try to associate your dopamine response to the food itself, which means the look and the taste and the smell of the food is the key part to triggering dopamine response because that also programs you to look forward to that kind of healthy, balanced food. This is what the processed foods do so well for us. Right? Processed foods because of the way they look, the way they smell, the way they taste, they create an intense dopamine connection, and this is why people can get addicted to the taste and profile and texture of processed foods.

When companies are making processed foods, they do huge amounts of consumer tests on mouth field. Mouth field is an entire psychological thing where the way a food feels in your mouth can trigger a dopamine response and you get addicted to that feeling. Right? Ice cream for example, as a fat memetic mouth feel. It's very creamy and filling in the mouth. That triggers a dopamine response, which makes you want more ice cream. This is why you can have cravings for these things.

Try to trigger your dopamine response around things like fiber. I know it's not so exciting, but try to do it. That's an important thing to be mindful of. Relax before meals. You want to shift into parasympathetic. If you just had a really stressful phone call, don't put the phone down and start eating, or don't answer the phone from someone that may stress you while you're eating. Sit down, relax, turn the phone off or put it on do not disturb and allow yourself to enjoy your food in a calm fashion.

Focus on the food, not of course, driving, working and so on. Don't be distracted, which can cause stress as well and eat at regular times as much as you can. Consider time-restricted feeding and intermittent fasting. Right? It's really good for your system to go through a cleanup phase and intermittent fasting allows for a significant cleanup phase within your system, and that's one of the benefits that it provides.

Chewing your food adequately. I mistakenly said 20, 30 minutes per bite. If you did that, you would of course never finish and you would be really filling your system with food too much throughout the day. You really want to chew it 20 to 30 times. Now it's actually helpful. And one of the things I always did that was problematic was I chewed too fast and so I started becoming prescriptive about it and I would actually time my chews to get this connection in my brain of how long is the right amount of time to chew.

Because when you chew your food too fast, if you're chewing your food in seven or eight bites, going to 30 bites feels unusually long, but you want to do that deliberately over several meals so you reprogram your mind as to what feels normal. And I've been doing that for years now and trying to get myself to slow down. And again, eating slowly makes a big difference.

The other thing with eating slowly is you don't pull in too much air into your digestive tract as well. When you eat fast and you chew fast and you swallow fast, you pull in a lot of air into your digestive tract as well. That can create disruptions in signaling in your stomach and intestines and of course can create belching and other things as well. And don't drink too much liquid. I mentioned this earlier, it can dilute some of the enzymes, dilute the pH within the stomach and so on. You don't want to have a huge amount of liquid in your system while you're chewing or while you're eating food, actively hydrate throughout the day, drink a little bit of liquid while you're eating, but that should be it. And then eat until you're about 80% full.

This is a very important practice. Right? Because overfilling yourself screws up all kinds of signaling in your digestive tract. It screws up transit time, it screws up movement of food from your stomach to your intestines. The release of pancreatic enzymes to release of bile, the release of gastrin, all of these things get corrupted when the food bolus is too big and it slows down your gastric emptying time too slow. Where then you get putrification, you get dysbiosis, you get inflammation, you get your immune system attacking the food. All kinds of bad things happen, and this is what

results in chronic eating. You get metabolic syndrome, which is an inflammatory process, so you really want to eat about 80% full. This to me is one of the harder things. I always work on this myself, so don't feel bad if you overeat, but try to monitor this as much as you can.

What to eat. I think many of you know this, avoid trigger foods that have underlying issues that haven't been resolved, or trigger foods that create immunological responses. You might have sensitivities that upregulate immunological responses in your system. You can reduce those foods or avoid them for a period of time as they're trying to fix your gut, but then reintroduce them as much as you can later on. Because again, we want to have a diversity of foods as long of course as those foods are healthy, whole foods and not processed foods. If they're processed foods, get rid of them anyway.

Eat fresh, local, organic, real foods as much as you can minimally processed. Minimal fried or highly processed foods. The fried part is a big issue because remember when they fry things or frying them in oxidized oils, those oxidized oils will trigger inflammation in your digestive tract. That inflammation will negate a lot of the digestive process and increase the likelihood of leaky gut. Those fats also then, because there are such high concentrations on those foods can negate the absorption of some of the nutrients from that food as well if there are any nutrients. Right? You really want to minimize the exposure to that type of oxidative, low-quality fat.

And then as tolerated, eat fiber. I try to get 50 plus grams of fiber a day, a combination of soluble and insoluble fibers. Some of it I supplement. I supplement up to 15 grams a day of fiber, but over 50 grams a day is a great goal. If you're taking five grams a day right now or eating five grams a day, don't go to 50 tomorrow. You want to very slowly increase the fiber intake. I would say increase your fiber intake by one to two grams a week, and then over 15 weeks, 20 weeks, you would've increased it by 30, 40 grams that whole time.

Then that way you're very carefully introducing fiber and allowing your system the ability to upregulate itself to handle the fiber. Animal foods are great, but they should be wild, pasture-raised, organic as much as possible. You want those clean as well. Then eating the rainbow. The microbiome loves polyphenols and polyphenols are all in these colored fruits and vegetables, and the microbiome converts those to really, really important compounds that you need.

Digestion Optimization 101. If looking at pillar number five for supplementation, that can be helpful for the digestive process. You might look at **HCL Guard+**, which can provide a boost if you have inadequate stomach acid and acid levels and improve digestion and absorption. And it triggers enzyme release as well and maintains a healthy GI tract. **Holozyme**, which is a broad spectrum enzyme product that can improve protein, fat and carbohydrate digestion and breakdown.

Now keep in mind that as you reach 30, your pancreas, even if you're healthy, starts to reduce the amount of digestive enzymes it produces. Why? That's not exactly known. And some people go deep into pancreatic insufficiency, but most people will reduce the amount of pancreatic enzymes that are produced once you hit 30 and beyond. Thirty and beyond, especially, it can be really helpful to take a digestive enzyme with every meal. **Holozyme** is the one I use so this is what I recommended.

For bile and upper GI support you can use **TUDCA** or **MegaGuard**. **TUDCA** is an amazing product, an amazing compound that does a lot of things to improve bile flow, bile functionality, emulsification, immune response, motility, all of that. **Megaguard** has a couple of ingredients in it that are really important. One is an artichoke extract that improves gastric emptying. The emptying from the stomach into the intestines where chyme and everything can be neutralized and it increases bile flow from the gallbladder and it also has a compound in that to control things like H. pylori, if you look back to Pylori is an issue.

MegaSpore of course helps the microbiome overall and **Tributyrin-X** with the butyrate, as you saw when we talked about it, butyrate plays a role in almost every

part of the digestive system. So getting some additional butyrate in there is always beneficial. I use that myself often. We'll get more info and specific supplementation for specific problems as we go along in other upcoming modules.

This is just to give you an overview of how your digestive system is supposed to function. And if it's not functioning that way, what that may look and feel like. And hopefully at the end of this, you now have adequate information and you might have to go and watch it again, but you have adequate information to understand how your digestive system functions.

And when you look at the problems you're experiencing when you go back to this information, it may help you hone in on where your problem may be in your system. That's really the goal here. Go back and listen to it again if you have to. But certainly look at your symptom tracking. Look at where your symptoms all collate to. It might show you a pattern that may illuminate through this process.

And then after you eat, there's a number of things you should do. Avoid stress. Movement. One of the best things you can do after you eat is going for a walk. 10 to 15 minute walk. Doesn't have to be anything intense. Even moving around. If I don't go outside, one of the things I do at home after I eat is I walk up and down my stairs for 15 minutes. I go all the way from the basement to the third floor. I do that after I eat and it feels so much better. 15 minutes goes by really fast. You don't necessarily have to put on all your clothes and go outside. If you eat at home and you're relaxed and you're comfortable at home, just after you're done with the food, walk up and down or around your home for 15 minutes.

I even do this in my hotel room. If anyone could see me, they would think I'm crazy. But even in my small hotel rooms, when I'm traveling, sometimes I eat in the room because I don't have time to go out to the restaurant or anything. I'm eating in the room. As soon as I'm done eating in the room, I get up and I kind of do a light jog in place or jumping jacks and all that for 15 minutes. I do that. I want that movement after I eat. That's really important. But you want that relaxation. You want that movement. You want to be

in a good state of mind to help the digestive process.

And remember, try not to eat again for at least five to six hours. Five to six to me is a golden period. You need that cleaning out of your system as well.

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[End Module 2]