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Okay, hello, everyone. Today's topic is how the gastrointestinal tract impacts hormones. And we're doing these topics on the [inaudible 00:00:09]. As some of you know, we are releasing a program that is actually going to be released February 18, in just a week, called Gut Health: Solving the Puzzle. And in this online course, we're going to have lots of videos and workbooks. And it's broken down to multiple parts to really teach you how to figure out what's going on with your gastrointestinal tract. It is absolutely not just a protocol that you follow.

In order to really figure what's going with your gut, you have to understand the concept of how the gut works. And when the gastrointestinal tract is not functioning well, what kind of symptoms you get for different parts and for different kinds of dysfunctions. So it's really a process of going through the course material to then figure out how to develop an individualized program for yourself. And that's really what makes it different than just following the next person's theory on how to treat the gut and just bombard someone with every single supplement and remove every single food. So that's not what we're going to be doing in that course.

There's also a little bit of confusion for people that follow some of that materials that I teach. So I actually have two different educational resources. One is the Kharrazian Resource Center, Dr. K. News, where we'll be launching this Gut Health: Solving The Puzzle program. And then the other courses are taught at the Kharrazian Institute. And the courses at the Kharrazian Institute are really designed for healthcare professionals. It's based on lots of research. It's based on teaching practitioners how to practice. So that's the difference between the two programs.

The information and programs we put together at Dr. K. News and the Kharrazian Research Center like the gut health program we're launching are designed for a person that doesn't have any training as in healthcare and they're trying to figure out what to do to improve their own health. The information that we teach at the Kharrazian Institute is really designed for people that need relicensure hours or practitioners trying to improve their skills as a clinician. So those are the main differences between the two, because we have a GI program that we teach in the Kharrazian Institute as well.

Okay, now, what I want to do in this discussion is really talk about the gut. And one of the things you have to know about the gastrointestinal tract is that, first of all, the gastrointestinal tract is actually classified as an endocrine gland itself, that the GI tract actually produces hormones and then the GI tract is influenced by hormones, and really plays this overlapping interplay between all the different endocrine glands we have like the thyroid gland, like the ovaries, like the testes, like the adrenal glands. And there's this bidirectional communication that is taking place all the time.



And when you're looking at the microbiome itself, the microbiome is very reactive to different hormones. And not only is it very reactive to the hormones, it's essential that you have healthy hormone balance to really improve your gut function. And vice versa, your gut can have a major impact in how you process and utilize hormones.

So, this is one of the problems we have in healthcare and in the way we learn about how the body works. The way we learn how the body has always worked has really been based on we have a gastrointestinal tract so we have gastroenterologists, we have an endocrine system and then now we have different endocrinologists. And that's kind of a model of just what was physically visibly obvious when they studied the human body.

But now as we've learned more about the human body, we see that all these different systems are all interconnected. And you really have to trick and treat the whole person. The problem with healthcare is we have people that's just focused in one area and this is why when people develop chronic diseases, which isn't just a specific disease in one area but just the loss of interplay. If not all these systems work, they have a very hard time getting well because they're not really being treated by the whole system, they're just really focusing on one single area.

And this also transcends into alternative medicine, because then you have your adrenal specialist and natural hormone replacement specialist, and they don't really do much really gut. And then you have your person who's just focused on the gut and they don't really understand these other connections. And this is why sometimes it's so hard to breakout of chronic disease because of the lack of understanding of how these interrelationships work.

Now, let's talk about what hormones do to the gut first, and then we'll talk about how the GI tract impacts hormones. So, looking at the gastrointestinal tract, the gastrointestinal tract has to be able to regenerate cells. Cells are always dying off. Cells can be destroyed just from inflammation. There's lots of normal inflammation, oxidative stress in the gut, even in a healthy person so cells have to regenerate. So you have to have things like growth hormone and testosterone and estrogen and progesterone to actually regenerate your gastrointestinal lining.

So, you also need those hormones to synthesize things like digestive proteins that prevent your gut from developing what's called leaky gut. You need the hormones to impact motility. Your gastrointestinal motility is impacted by hormones. Hormones affect blood flow to the GI tract so it can have healthy amounts of nutrient delivery and absorption.

So, when people have severe thyroid hormone deficiencies, they have bad guts. So if someone has hypothyroidism and they haven't been diagnosed, they're going to have motility. As a matter of fact, one of the most common symptoms of hypothyroidism is



chronic constipation. When people have hypothyroidism, their microbiome is totally disrupted. When people have significant estrogen deficiencies, or men have testosterone deficiencies, we see similar types of imbalances in the gut. So we know that these hormones, that hormones themselves are really critical for healthy regeneration and function of the gut.

Now, we also know that the bacteria in the gut themselves can change by your lifestyle and various things. So during pregnancy, for example, hormonal fluctuations in pregnancy actually change the microbiome and produce more and promote the promotion of the species of bacteria that allow a person to gain weight. And this is normal and healthy for a pregnant woman because they have to gain weight because they need extra body fat when they start to breastfeed. And then when they start to breastfeed, there's a release of things like prolactin, which then changes the gut and changes the bacterial species in the gut and these bacterial species then are more efficient in burning calories.

We also know that, for example, things you do in your lifestyle, like exercise and run and eat healthy foods or healthy fiber, change the bacteria in your gut and then those things change how you process energy. So it's kind of like this interplay between your diet and lifestyle, changing your hormone releases, and your hormone releases then impact your gut. So people that are sedentary have different bacterial species in their gut. When they start to exercise, their bacterial species change.

People who eat a lot of carbohydrates and sugar and have lots of insulin surges, they end up with different bacterial species in the gut. And they've even done studies with obese and non-obese humans and animals and they see they have different microbiomes. And then they've even done fecal transplants when they transport bacteria from one group to the other and then they see different types of changes and how they process and use calories. So these are all the different variations of what's happening in the gastrointestinal tract.

So, really important concept that you have to understand about these interrelationships. When you look at the microbiome, all the different bacteria in your gut, about one third of the bacteria in your gut is based on your genes, your genetics, and that will always kind of have an influence on your health. Now, the bacteria species you have in your gut are going to play role in many things.

Because gut bacteria themselves can impact your energy metabolism, good bacteria can impact your immune system, good bacteria are highly active than enzymes, dead bacteria can even produce hormones, so some people genetically have gut bacteria that tends to make them lean, that they have bacteria that really helps them process energy and calories.



Some people have gut bacteria where they're prone to gain weight. Some people have gut bacteria where they're more prone to mood disorders because of how their gut bacteria processes neurotransmitters and clears up certain hormones. Some people have genetically different gut bacteria that allows them to have severe vascular inflammation if they eat red meat where some people don't. So this is what's happening in the field of microbiome research.

Now, one third of the bacteria that you have in your gut can change. It can change with your diet and lifestyle and be expressed more or less with various things you do. But there is a percentage that the bacteria that you have is based on your genome which you're born with. And then those can definitely express differently with different things that you do. Some people definitely need to have lots of fiber and lots of exercise to, let's say, stay lean versus other people can get away with less fiber and less exercise and stay lean, and part of that may be explained by some of the gut bacteria that they have.

Now, at the end of the day, you're trying to optimize your gut bacteria. There's some very obvious principles that optimize gut bacteria which is diets very high in fiber, high in fermented food, physical activity, those things all have been shown to really make an impact on the gut.

Now, let's get to the actual topic of today. So the actual topic today, I just wanted to give you that background. So, just in summary, the background is your hormones impact your gut. Your gut is actually an endocrine gland, your gut actually makes hormones, your gut actually makes hormones like GLP, glucagon-like peptide one which controls your pancreas' release of glucagon and modulates insulin control with blood sugar. Your gut makes a hormone called ghrelin. Ghrelin activates your appetite centers in your brain. Your gut bacteria produce ghrelin which also impacts your ability to encode memory and has an impact on your cognitive function.

Your gut bacteria produce hormones like leptin which control appetite regulation and have an impact in how you use energy. So, not only the hormones impact your gut, your actual gut actually produces hormones. So it is classified technically as an endocrine gland also. And then your gut plays a major role in balancing hormones which is where I want to get into.

So, when you look at your gut, the gastrointestinal tract, one thing that's very obvious is that bacteria in the cells in the gut have the ability to bounce out hormones. And they do this in several ways. And I want to explain those concepts to you in a little more detail. But the major function of these endocrine<sup>6</sup> modulating bacteria is to help with either conversion of hormones from one state to another to help detoxify, metabolize hormones, so you can eliminate the amount of your body to make hormones more or less reactive. Those are the major functions of gut bacteria.



Now, when you're looking at bacteria, gut bacteria and hormone balance, let me explain a few things that put it into the context to the real world. When you're looking at a hormone imbalance, like if you do a lab test and you measure testosterone, and you measure things like estrogen, and you measure things like progesterone, those are hormones that the endocrine gland is making and those are being measured in blood. And once the endocrine gland produces then synthesizes these hormones, they're not done. These hormones get converted and metabolized to other products that then have impacts on your system. And those are really then considered hormone metabolites.

So, for example, the ovaries, the adrenal glands, they make estradiol and estrone, right, these are different estrogens. Now, estradiol and estrone get converted to metabolites, this happens in the liver and this happens in the microbiome, to things like 2 hydroxyestrone or 4-hydroxyestradiol or testosterone can be converted to epitestosterone, or testosterone can be converted to alpha-dihydrotestosterone.

So, basically, with all these different terms mean is that the hormones then have some type of biochemical compound attached to a different part of that and then it gets a different name but it also gets a different structure. So, when your endocrine glands like our ovaries or testes or adrenal glands are making hormones, they're released into the bloodstream but they don't immediately bind to receptors. Hormones then circulate into the liver, they circulate into microbiome and they get converted to hormone metabolites.

Now, if you ever had a urine hormone test, you're going to see things like 2-hydroxyestrone, 4-hydroxy, 16-hydroxyestradiol, estrone. You might see things like epitestosterone, you might see things like tetrahydrocortisone, these are different metabolites. So these metabolites, once they're converted by the liver and gut, go back in circulation and they bind to receptors. So, hormones that are released by the endocrine gland, they're not ready to just bind to things, they have to then be metabolized by the liver and by the gut microbiome to these metabolites. And then these metabolites have far reaching effects.

One of the major understandings of these estrogen hormone conversions really involved estrogens and this has now progressed to an entire field of study called the estrobolome which is all the different bacteria in the gut that modulate estrogen function. And what they initially discovered was that when estrogen was produced by the ovaries that it then got converted to different types of estrogen and [inaudible 00:14:54] the metabolites. And the first ones they studied were called two-hydroxyestrone or estradiol, 4-hydroxyestrone or estradiol and 16-hydroxy.

And basically when you hear the word 2, 4, 16, they just mean that a hydroxy group is just like oxygen and hydrogen got attached to the 2 carbon, the 4 carbon or 16. It's nothing complicated. Sounds really complicated when you hear to 2, 4-hydroxy something or 16-hydroxy but it's just basically a little change in the structure of the estrogen.



So, when things like estradiol, which is one of the most powerful estrogens produced by the ovaries, when estradiol gets metabolized by gut bacteria to 2, 4, 16-hydroxy metabolites, those different metabolites have different effects and functions on receptors. And what they found was that there was a ratio where they looked at 2-hydroxy versus 16-hydroxy and they found some of these metabolites were protective and some of these metabolites were very proliferative, and they found a link between these metabolite ratios in breast cancer.

And they were able to show that when there was an unhealthy gut, when there was dysbiosis, a greater population of what's called unhealthy bacteria, there's an abnormal shift of these metabolite ratios. And these metabolite ratios had a strong association with those that developed breast cancer. And this is one of the first areas of breakthrough that was published. This is over, I don't know, almost 20 years ago now, where they found that the gut bacteria play a significant impact on metabolizing hormones to hormones that can either be protective or promote proliferation.

Now, these estrogen hormones, these estrogen compounds, have now been found to be linked to things like infertility, to mood disorders, to depression. So, again, the entire field of gut bacteria, the estrobolome, which is now focused on just looking at how these gut bacteria metabolize estrogens. Over time, they're going to have specific bacterial species that impact just testosterone and progesterone and so forth. But estrogen has really been the area where there's been a lot of research and focus and discovery.

So, what's interesting is that they found that these different conversions take place. They also found a very important enzyme called beta glucuronidase. And beta glucuronidase is an enzyme that converts estrogen to a form that cannot be eliminated from the body. So let me explain another concept. When your body produces hormones like your ovaries, for example, or even in a male in the adrenal system, estrogen is important males and females, but let's say we have estrogen production.

Now, estrogens bind to receptors, a percentage of them are just going to directly bind as that form of estrogen produced by the gland into receptors. Percentage of them are going to go to the liver, go to the microbiome, become metabolites. Those metabolites then have some effect at some point. All these hormones have to be cleared. So at some point, these hormones will have to be cleared out of the body. And the way they're cleared out of the body is through the liver. And these hormones are what's called fat soluble.

And when they're in a structure that's called fat soluble, your body can't eliminate them in your urine or in your sweat or even you have a hard time with elimination with them. So your body converts them into something that's called water soluble so they can easily metabolize and convert into a water state, an easy way to explain that. And in a water soluble state, they can be eliminated.



So your liver takes these hormones and adds a biochemical substance to them, like it may add a sulfur compound or it may add something like glucuronic acid to it or something, and then these hormones become water soluble so you can eliminate them. So when you look at total endocrine function, your endocrine glands produce hormones, a certain percentage of them are in the exact form that was produced by the gland that bind to receptors like estradiol, a certain percentage that go to the liver and gut and then become metabolites that then bind to receptors. But at some point, they all need to be cleared out.

And then they cleared out through what's called the phase II pathway of the liver. And one of the most important pathways for your estrogens is a pathway called glucuronidation. And this is a pathway where biochemical compound called glucuronic acid binds to the, let's say, estrogen metabolite or other hormone metabolite, and then now it can be eliminated.

Well, the enzyme in the gut called beta-glucuronidase can uncouple that and change that. So now you have people that, and this may be a good or a bad thing. Sometimes your body needs to keep estrogens circulating and having effects on tissues receptors longer. Other times, it needs to be eliminated and be cleared out of the body. So, the beta-glucuronidase enzyme in the gut has an impact on doing those such things and this is a really powerful mechanism.

And what they've also found in studies is that when people have dysbiosis, unhealthy guts or unhealthy bacterial populations which usually happens from basically the standard American diet, diet is very high in sugar and carbohydrates and fat, low in fiber, they have abnormal alterations in beta-glucuronidase and these people end up with hormone imbalances, symptoms of having issues with obesity, having issues with mood, having swelling, having symptoms of depression, and so forth.

So, we know that these gut bacteria play a role. Now, the interesting thing is you're not going to necessarily run a hormone test and see, these slight variations show up on your blood test. So if you go and do an annual physical and they measure your total progesterone levels or total estrogen levels, you're not going to necessarily see those levels changed. So, remember, you're going to only, only can really see metabolites, well, most commonly, you can see these metabolites as we look at urine test.

Now, some blood tests can measure them but the problem with these metabolites is these metabolites get produced and they have a very short half-life, meaning before they get broken down, and you don't always get the most accurate picture of them. So what they're finding is there's just some degree of, you have to have your GI tract balanced, you have to have your microbiome as healthy as possible, to really balance out your endocrine system and then clearly can see when there's patterns of dysbiosis that these mechanisms do take place.



So, that's kind of like the estrogen story. Now, another interesting thing that has been found was, for example, thyroid hormones. Thyroid hormones, which are very important to control metabolism, energy and those basic functions of what's called the metabolic rate and your temperature regulation, your gut microbiome plays a huge role in that. When your thyroid gland produces thyroid hormones, the majority of what it produces is a hormone called T4. And T4 has some degree of thyroid cellular activity but it needs to really be converted to what's called T3 to have the greatest response.

And the majority of the hormones produced by the thyroid gland itself is T4, about 90, 97%. But only a small fraction of them are actually T3 which is really highly metabolic form. So your thyroid gland really produces all this T4 and this T4 then is going to get converted to T3 and then T3 can bind to receptors and that's where you really get the majority of your thyroid metabolic effect.

Well, your gut microbiome plays a huge role in converting T4 to T3. So there are enzymes called 5 DAPase enzymes, and there's two different types. Percentage of these five Davidson's enzymes, they're in the microbiome and they help convert T4 to T3. We also know that when your body converts T4 to T3 to these 5D Agnes enzymes, percentage of these thyroid hormones, they get converted to what's called T3 sulfate. And you actually have to have pathways in the gut or liver called sulfation, clear them into actual T3 so then you have a thyroid metabolic effect.

So, again, more and more discoveries get made all the time of how important this interplay is between the gut and these different thyroid hormones and so forth. But because we're not at a place where as a clinician, we can order things like T3 sulfate. We don't have a laboratory test to specifically measure our 5 DAPase activity in the gut in a patient. These are being investigated different research models that don't have clinical commercial test available yet. But we are definitely seeing an explosion of research of how the gut microbiome really impacts things like thyroid hormone conversion, thyroid hormone metabolism, and different metabolites of estrogen and testosterone and so forth.

As time goes on, more and more of these connections will take place. But at the end of the day, it really all comes back to just having a healthy gut. So, there's a lot of patients that are chronically sick, chronically ill, and their lab tests all look good. They have all the symptoms of hormone imbalances from whatever the hormone may be, maybe it's thyroid hormones, maybe it's estrogens, most common things are just altered metabolism, weight issues or depression or mood disorders, but they don't really have a clear disease.

And when they actually measure their total hormone levels of estrogen, estradiol or estrone or estriol, they really look at and they're all within the normal reference range. So they're confused and they're frustrated and no one believes that there's anything wrong with them, and they know there's something wrong with them because they don't





feel normal. And this is where this gray area where this research is showing where all these subtle changes take place and how we process and utilize hormones may explain part of the answer.

And the drawback we have right now is we don't have a lot of the clinical skills, the clinical tests that are available to us to be very specific and go, oh, yeah, your hormone issues are directly related to your gut bacteria. All we can tell and we clinically see all the time, especially in the field of functional medicine, is when we get patients that have just symptoms of general imbalances, if we can just fix their gastrointestinal issue, we can see some major improvements.

Now, when we say fix gastrointestinal issues, what we're really referring to is optimizing the gastrointestinal tract. So there's a difference between gastrointestinal disease like you have ulcerative colitis, you have Crohn's, you have a gastric ulcer versus just not having a healthy gut. So, if you have an unhealthy gut, that means you feel like you have a brick in your stomach after you eat. You get bloated and distended all the time, you don't have regular bowel movements, those are all signs that your gastrointestinal tract is unhealthy.

You have to use antacids all the time. You have to take digestive enzymes to have normal bowel moments. You have to use enemas to have a regular bowel movement. You have to use magnesium to have regular bowel movements. Those are signs that your gastrointestinal tract is not healthy, it's not ideal. That may not be a disease but those types of subtle changes, without question, have the potential to impact these mechanisms that research have identified that may be involved with beta-glucuronidase or the estrobolome or how T4 gets converted to T3 that are very subtle in the gray area.

That's why you always want to... If there's one thing you want to do is you want to make sure your GI tract is healthy. So a GI tract that's healthy basically mean you eat a food, you digest it, you don't have burping, distension, heartburn, you don't have severe bloating or distension every time you eat, and you have regular bowel movements, three bowel movements a day, and your stool doesn't float. Those are all normal signs.

Now, if that's not you, then that would suggest to you that even though you may not have a gastrointestinal disease, your gastrointestinal system is not ideal and healthy. And the problem we have is when people have gastrointestinal conditions that are just not ideal and healthy, one of the things that they're focused on is just, well, just take a probiotic and that should fix it, and that's not how this works.

So, the concept that you should understand, there's just a north to the south model of digestion, immune function, and then microbiome diversity, you have to really understand how these things all work together. And this is what we have to, which we teach in our gut puzzle program which I think it's like 14 parts where we walk you



through each of the steps, and you understand what the hierarchy is and you can go through that, but check that out at Dr. K. News.

Anyways, thank you all for joining me. I got into all over the place on this topic, but I just wanted to explain those things. I know a lot of you guys have questions. So, I do want to start answering some questions that people have. Now, a friend of mine did send me a question for today that let me get started with which is, what's this thing called pregnenolone steal and is this accurate concept or theory?

So let me explain that because it kind of relates to hormones, not as much to the gut mechanism. But in the world of functional medicine, there is something called the pregnenolone. In the world of biochemistry, I should say, there's a concept called the pregnenolone steal. So pregnenolone is a hormone that's a precursor hormone, meaning it's a hormone that's then used as a base. Hi.

Hi.

[inaudible 00:28:50] to help me, thank you.

[inaudible 00:28:51]. I heard you're going off book. Got your own questions?

Yeah, I'm going off. So, anyways, pregnenolone is a precursor hormone and it gets converted to testosterone, estrogen, progesterone. And one of the theories was that when people would get into a stress response, since pregnenolone is so hard to make and pregnenolone has to go to stress pathways that it doesn't go into estrogen and progesterone. And this is the theory that was based on the fact that it was very clear that when human subjects, human people, were exposed to a lot of stress, male or females, their estrogen, their testosterone, their progesterone levels dropped.

And one of the theorized models was that this could be due to a pregnenolone steal. So the phenomenon of stress response is increasing the stress hormone cortisol and dropping progesterone, testosterone and estrogen is a fact that's been reported in multiple studies. We know that's one in the effects in hormones and stress. The pregnenolone steal is a theory that may explain why that occurs.

Now we have some people saying, well, there's no published studies that actually show that this pregnenolone steal is real. Yeah, because you know what, you can't design that study. It's a theory. You can't inject a needle into someone's adrenal glands and their tissue in real time and measure how they're... it's okay. You can't stick a needle in someone's adrenal glands in real time and measure what type of pregnenolone as well. When people come in and start criticizing models and say there's no research behind it, you can clearly see they have no idea what they're talking about because they don't understand how research design works.

Once, again, the problem we have with experts trying to discredit every single model because they can't critically think and realize it would be physiologically impossible to



even evaluate out the pregnenolone steal theory because you can't in real time inject a needle on people's adrenal glands and see what happens under stress and when they're converting it to one or the other.

In the world of healthcare, we have a phenomenon and then we have different bases to explain them. So the pregnenolone steal is just an explanation to potentially a theory just to explain one of the reasons why some people like human subjects end up having progesterone and estrogen and testosterone drop under stress may occur.

Now, another theory is that the stress hormones suppressed FSH, LH, which also has some evidence that can be easily measured where they see those levels drop. Stress hormones can suppress FSH which can impact estrogen levels or LH which can impact testosterone. But there's lots of studies that show that stress hormones don't impact those pituitary hormones and levels of estrogen and testosterone still drop.

So in summary, this pregnenolone steal debate is really based on someone being critical and having no research on it that completely doesn't understand the methodology of how you would even design a research study. And doesn't understand that the pregnenolone steal is really a theory. Now you have all these people in functional medicine, in the world of nutrition going, oh, my God, this pregnenolone theory is not this. And it's kind of the, I guess, the drama of the nutrition and functional medicine world that we live in.

But anyways, let's get into questions that people have asked. Sorry for getting distracted and a little frustrated.

**So, Adam is asking, can you comment on how childhood trauma/adverse childhood experiences can affect the gut?**

Yeah. So, first of all, we do know that there is a psychoneuroimmune response that stress responses, PTSD, even traumatic head injury, they have a dramatic impact on the gut because they impact autonomic function. So, your brain is wired in such a way or it has a response to stress. Sometimes it's proportional to the amount of stress you have, sometimes it's not. Sometimes it's genetics involved. Sometimes people get severe plasticity, what they call negative plasticity, where their stress pathways are finely tuned and developed.

For example, if you were a ballerina and you learn how to do a swirl and you've done that 100,000 times, the areas in your brain that connects the pathways to allow you to swirl become developed and integrated. One of the theories of posttraumatic stress disorder is you get so much significant and severe activity that develops plasticity in a certain pathway, that you have that pathway developed just like you did 100,000 times. And a traumatic event has the ability to create this negative plasticity involving an area of your brain called the amygdala which is the concept of things like PTSD.



So if you have a PTSD pattern and you're prone to exaggerated sympathetic response for various triggers, those sympathetic responses will absolutely impact your gut function. And sympathetic responses are the fight or flight and one of the key things that fight or flight responses do is they shunt blood away from the gut. And when you shunt blood away from the gut, you're shunting it to your muscles so you can run away and deal with the stress and you don't really need to digest under stressful times, you need to react to your environment.

So your pupils dilate, your heart rate goes up, lots of blood flow goes to your heart and vascular system and lots of blood flow goes to your muscles and you're ready to react and move. That's happening on a regular basis with people who are in a sympathetic mode. And in addition to stress, hormones that get released so you can raise your heart rate like epinephrine and cortisol so you can start to break down stored energy into glucose right away to deal with the stress.

Those stress hormones start to totally cause dysfunction in the gut and it puts the person into anti or non-parasympathetic mode where you need to digest enzymes and have blood flow and motility. So they can really cause all types of gastrointestinal problems, whether it's yeast overgrowth or immune dysfunction or dysbiosis and bacterial overgrowth, inability to digest foods, developing leaky gut, they can all take place when you have a sympathetic dominance.

So, to answer your question, if you had a severe posttraumatic episode as a child and you develop negative plasticity and you're in a constant sympathetic mode, yeah, you could definitely have changes in your gut because of that dysautonomia pattern.

**Okay. So, someone's asking, if you are... how are you sensitive to foods that you don't eat that tests that you're sensitive on a sensitivity test?**

Yes.

The question is jumbled but do you understand what they're trying to say?

Yes.

Because the sense, this food sensitivity test, they did say which one and there are some foods that they never eat are showing up as positive and sensitive to but they never eat them, so.

Okay, thank you. So, this actually reminds me of something I forgot to say earlier. When we're launching this gut health program, for those people that go to Dr. K. News and sign up on the waitlist to get information about the course before it launches, for those people, they're going to get a special offer where they get our new program releasing in March, all about food sensitivities. And we talked about this topic in detail and in various other things. So if you're interested in that promotion, please go to Dr. K. News.



But let me explain that concept to you. So when you do a food allergy test and you're sensitive to a food protein, let's say you're sensitive to crab, okay, but you hate shrimp and you never eat shrimp. And you do a food sensitivity test and then it shows you're also reacting to shrimp. And you go, well, how can I be sensitive to shrimp?

How can I make antibodies, because the blood test is actually measuring your antibodies, your immune system reaction to food proteins you had in the past three to four months? So how could you have antibodies against shrimp if you never eat them and they disgust you and they make you want to throw up but you eat occasionally you eat crab meat. Let's say in the past three to four months, you had some crab meat.

Well, the amino acid sequence for crab meat is very similar to the amino acid sequence of shrimp. So when the blood just measures the antibodies, they're so close together that it tests positive. So in reality, you don't actually develop food sensitivities to natural food, you develop food sensitivities to an amino acid sequence. And lots of foods have overlapping amino acid sequences. So even if you don't eat that food, you still will show a test positive on a food sensitivity test.

Now, assuming that the food sensitivity test is done well, there's a lot of sloppy testing out there that's available so beware of that. There's also a lot of tests that are being done by labs that are using microarray analysis, one of the [Zoomer 00:37:37] test using microarray.

I hear a lot of questions about that.

And those tests are using a type of technology that's doing a mathematical calculation. So what they do is they take a very small amount of the food protein to check against, particle size, and then they do algorithm, mathematical calculation, to determine if it's positive or negative. Well, that mathematical calculation makes it less accurate. The gold standard test is to do something called an ELISA, which is not based on mathematical assumptions and then mathematical errors for prediction.

So, personally, I'm not a big fan of Zoomer testing because I think they're using a technology that has lots of inaccurate information because of the methodology. I have nothing against labs that do it and I think it's personnel. People that do it, I just think they should use ELISA. If they would use ELISA, they would get much more accurate results, much higher sensitivity and high specificity. But ELISA testing is a little bit more expensive. So it's much easier when you as a consumer to see, oh, I get all these extra testing and it's much cheaper. But in reality, you're getting a test that may not be as accurate.

So, you may be showing up with foods because you're doing a form of testing that's not accurate like microarray, I shouldn't say accurate, not as accurate, higher degrees of sense so false testing or you could just have it because of cross reactivity.



**Okay. Okay. So, have you heard of the Gupta program?**

The what?

G-U-P-T-A program? It's like neuroplasticity retraining your movement?

No, I haven't heard of this program.

This is a program. Some people are asking about it. It's basically a neuroplasticity retraining. What do you think... Let's just say this, what do you think of neuroplasticity retraining to help with gut issues?

Neuroplasticity retraining, well, first of all, neuroplasticity is a concept where you activate the brain to reconnect pathways, right? And anytime you do anything, you're getting some plasticity. And every time you repeat doing it, you're getting greater plasticity, right? So, if you hit a tennis ball wrong and you keep doing it over and over again, your brain just gets used to firing that sequence of impulses so you hit that. And then at some, you might have to retrain and get new plasticity in how to hit the tennis ball right which should be really hard to do but you could do the work over some time, right?

So, sure, the concept of neuroplasticity is great. Now, whether neuroplasticity is going to train the gut and do all that, that's a huge jump. Well, theoretically, yeah, that's possible but is that program, like how do the program find those different areas of the brain? How effective was it? How sensitive was that? I don't know. I have no issues with that neuroplasticity part. I just [inaudible 00:40:34] without knowing anything about whatever this program is.

My immediate doubt is how do they figure out exactly which brain pathway to activate from one person to the next because that is an absolute real variable in clinical practice. And then how [inaudible 00:40:47], like similar programs, and I don't think it's that easy. So, I'm all for neuroplasticity. I just don't know about any general program, yeah. Yeah.

**Right, right. Okay. Okay, that's it. Someone's asking, given we have an access between the gut and the brain, how can we tell if a neurological condition or mood changes are happening due to a neurotransmitter issue in the brain itself, due to hormonal imbalance, gut imbalance, or both? How do you tell?**

Right. Right. So if we have this gut to brain access relationship and brain to gut access relationship, how do we know if we're having any kind of mood disorders? Is it really in the gut or is it the brain or neurotransmitter in the brain or neurotransmitter in the gut? And the answer is, we don't know. And the answer is, probably all dynamic at the same time, at a constant every time, anyways. So, this is the problem. For example, if you take 5-HTP to impact your serotonin, you're just as much changing your gut serotonin levels as you're changing brain levels.



And things like 5-hydroxytryptophan had been shown to cross into the blood brain barrier and impact brain neurotransmitters but does not impact the gut. So that's one of the key things you have to know is they're probably happening at the same time altogether. And many of the people that are actually using different types of nutraceuticals to impact the brain with, let's say, neurotransmitters, or without question having an impact in the gut whether they realize it or not.

So, unfortunately, we don't know how to tell those things apart. Now, but we do know and clinically see sometimes changes in the gut are directly associated with changes in the brain, right? So a great example, if you totally, let's say, overeat something and celebrating with friends and maybe it's Thanksgiving or whatever it maybe then you have nightmares all the time or something like that afterwards, well, that's a direct relationship.

So people don't, like for example, if they drink milk, they get really, really cranky and really angry and they get mucus and they don't feel well. I mean, some of those relationships I think we can observe, but we can't tell one from the other and they probably are not independent. They're probably codependent on each other.

**Yup, okay. People agree with you. Yay! So, someone's asking, Christine, what are your thoughts on polycystic ovaries? But that's just the only question. [inaudible 00:43:08] relation to gut, in relation to hormones?**

Well, there's been studies on polycystic ovarian syndromes and abnormal gut microbiome dysfunction. The estrobolome has shown that people that have dysfunction in their gut have dysbiosis, can have some associations, not direct link, some associations with PCOS. So, again, but we also know that one of the major drivers of polycystic ovarian syndrome is really insulin resistance. And we definitely know, insulin modulation is very much impacted by gut.

There's actually a pathway they called the incretin pathway where you have to actually eat sugar. When they give someone a glucose load through an IV and they measure their insulin response to how they process that glucose whether they have orally ingested just the same amount of glucose load, it's totally different. When you actually orally ingested glucose load, it has a much different effect if you get the same amount of glucose in the IV directly into your bloodstream. And this is mediated by different cells in the gut called K cells and L cells that release things like GLP-1. And those types of gut pathways have been impacted by changes in diet and dysbiosis.

So, there's probably some overlap between PCOS and some of the pathways in the gut, the metabolites, the estrogens, are definitely changing the microbiome, they can impact blood sugar insulin levels. So, there's some link there. How specifically it applies to one patient is difficult. And how do you know from the lab test, you just want to know that



one of the deal breakers when you don't have a clear disease and just things aren't balanced out is at the very least make sure your gut is working properly.

And sometimes it's fallacious. We'll see a patient, every single lab test is normal. They don't feel well. We know there's something wrong. They're just in the shades of gray. They don't have a clear disease. And then we're just trying to optimize their health and physiology like we're just trying to make sure the blood sugar handling system is perfect as best we can.

We're trying to make sure their immune system is perfect. And we're trying to make sure their gut is perfect and they don't have any gastrointestinal symptoms. And just sometimes optimizing these different regions can have an impact on really changing some of these non-diseases but physiological imbalance patterns. So it may be the same case with PCOS to some degree.

**Okay. So, Beverly is asking, is it possible to increase bacteroides and reduce from firmicutes from weight loss? Or are there certain strains of probiotics that can help? Say those words.**

Bacteroides and firmicutes.

Bacteroides and firmicutes. Thank you.

So there's original studies that were done with two different populations of bacteria called firmicutes and bacteroides. And what they initially found was that firmicutes species, if they were higher than bacteroides in the measure of ratio, they found that those people tend to have their bacteria influence metabolism in such a way the gut bacteria where they would regain weight.

And when they looked at initial studies with people that had obesity, initially, these were most, just so you guys know. These initially were done in animals and then some of these were done in humans. And they actually found that firmicutes, bacteroides ratios were associated with weight gain if you have more firmicutes than bacteroides.

Other studies that have been published, they show it's not that clear, it's not that perfect. So, the firmicutes-bacteroides theory has kind of changed over time. What they're really finding, it's really just about diversity. It's not about just one group of bacteria versus another group of bacteria. And, really, in the human microbiome research world, they are so many variations and what they're finding, it's not one group of bacteria but how they work in combination with other groups that it's like a multivariate model.

And the multivariate model is so complex that they have to use machine learning to try to translate it. Like the world of just like looking at a GI panel and going, oh, firmicutes-bacteroides ratio, that's off thing. You may have greater obesity, it's not going to be that simple. But that's where we're going in the field of looking at microbiome analysis. And maybe in some years, we'll be able to get a microbiome tested and have these





algorithms and these detailed variations and how one variable with another variable with another variable with another variable can really be associated with certain risk factors and some changes in metabolism. We're not there yet.

But they have found very clearly when they take, do a fecal transplant from overweight animals and they actually have done two studies now with humans and found similar results with stuff about the human ones. They take bacteria from overweight people, put them in skinny people and vice versa. The one they did with humans, well, they found that the body composition is change in animals.

The one in humans, is they took overweight, prediabetic subjects and took fecal samples from lean individuals and they did fecal transplant. And they found that the obese individuals lost weight and it lasted for about four months and then they went back to their normal weight. So there is an impact on that microbiome with them.

**Okay. Tina is asking, can you talk a little bit about beta-glucuronidase, please.**

All right. So beta-glucuronidase, we talked about, just an enzyme in the gut and beta-glucuronidase is involved with removing a compound called glucuronic acid. And glucuronic acid is a compound that the liver places on hormones so it can be eliminated. And you can measure beta-glucuronidase activity on some lab work. What it means or it doesn't mean is still up to debate because beta-glucuronidase activity can be very helpful for you because it can keep your level circulating longer before they're eliminated. And for some people, they need to do that because their endocrine production may not be as efficient. So if they can keep things circulating longer, they can maintain benefits.

For other people, beta-glucuronidase abnormalities can cause them to not eliminate hormones very well. So, they can have all these estrogen imbalance disorders that take place because they're unable to clear them out and they're getting too much exposure and too much activity. So, that's one of the key factors. So, those are the main concepts. So, I wouldn't say it's like good or bad. It's just we know that there's an influence of this enzyme on estrogen metabolism. And it's not just whether that's active or inactive, it's an issue, because it's activity can be beneficial or are unhealthy depending on whether you need hormones cleared or not cleared.

**Okay. So, Michael is asking, it's a little confusing, but, so how does a sedentary lifestyle in a short or long term impact the GI's ability to produce hormones where toxins produce energy relative to someone who lives a physically active lifestyle?**

Yeah. It's a fascinating research on exercise microbiome. So, they've done research where they looked at the microbiome on individuals that were sedentary and then have them exercise and it changes. So you can realize that when you exercise, certain hormones change. When you exercise, growth hormone levels go up, your testosterone can go up. And then stress hormones tend to go down. Your insulin regulation changes



where your levels of leptin and GLP and insulin can change. Well, those changes that take place from exercising, your hormones have an impact on your microbiome so they can see microbiomes change.

Now, interesting as microbiomes change, people become much more efficient in how they use calories. So, they don't store as well, they use them for energy, because their body needs to use energy, because they're going to run again and do things. This could be also why it's so frustrating for people when they first make dietary and lifestyle changes, they may not get any results for like months, but they keep going on and so they start to change.

Because they don't realize it's not just the calorie restriction at the time of the exercise output, it's their entire microbiome and their physiology starting to change over a period of time. That's why it's so easy to get frustrated if you're trying to change your diet and your lifestyle and exercise and in two weeks of doing it, your calories reduced and you maybe even gained weight because your body still hadn't adapted.

And then for those people that kind of stick with it and go past it and just go up, this is my lifestyle, I just want to, it's good for me. Over time, their system can change and that's where those patterns take place. So in summary, it's like when you exercise, your hormones change. As your hormones change, your microbiome changes. Your microbiome changes, your microbiome becomes more efficient in using calories for energy versus for storage. And those are what we see in the literature.

**Okay. Dean is asking, how to best address gut bacteria after a very stressful event?**

Well, I don't know if I understand it. But, I mean, stressful events have an impact in the gut in the sense that you could, again, how you define stress, right? So, let's say it's a, for sure, physiologically, negative stress response. Lots of cortisol, lots of chemical, means lack of personal activity, those things tend to cause things like intestinal permeability, when they looked at people, athletes that go into hell week where they're training soldiers. They get leaky guts, gut bacteria changes, the gut gets unhealthy.

And here's the thing, what we find is, you're not going to take lactobacillus and fix it. You're not going to go to the health [inaudible 00:52:37] take a probiotic, it's really not that simple. You're better off eating a lot of fermented foods. You're better off sort of go getting a probiotic, go buy some pickled mixed vegetables, get some kimchi, that's going to have a much, much greater effect. And a lot of probiotics tend to be really expensive. Take a prebiotic. Let your body make bacteria.

And also, when you take a prebiotic, you have a greater potential to make, your gut can decide which bacteria species they can make versus the strain that you bought. Because the strain that you bought may not even be the one you need to elevate. So as time has gone by, as a clinician, I'm realizing, I'm not getting the impact versus cost



benefit for patients when they take a lot of just individual probiotics. But if they can take things that increase their short chain fatty acids or actually even supplements, short chain fatty acids, like butyrate, that might be a good idea, but actually taking fermented foods.

And, also, since we're talking about gut and estrogens. You may have heard the word phytoestrogen. So, what is a phytoestrogen? It's like a natural estrogen, it's not. A phytoestrogen, by the way, is a compound that's a selective estrogen receptor modulator, it can balance out estrogens. And it's not just soy. Basically, everything that's high in fiber is a phytoestrogen. So, when you look at like you have gut issues and you want to improve your health, you really want to ingest more fiber.

But here's the deal, if your gastrointestinal system isn't healthy, you may try to ingest more fiber, but you get super bloated and you get distension and you feel worse than before, that's because your gut may not be healthy or you may need to certainly slow, increase your fiber intake. So, you have to have a healthy gut to process fiber and digest fiber but you also need it to stay healthy. So, I'm not even sure if that's good.

[inaudible 00:54:25] with the question-

I wanted to get [inaudible 00:54:26].

### **What about fasting? Is it good for gut health?**

Yes. Fasting is good for gut health. Let me explain something. Because there's some people who can't jump into it a fast. If you're hypoglycemic, and let me explain this to you. If you're hypoglycemic, that means you wake up, you have to have coffee, you get shaky a little, you get shaky, jittery in the afternoon. Your indication to eat is when you can't think and focus and concentrate, not because you actually noticed you're hungry. If that's you, you shouldn't be fasting. If your blood sugars are running low, you should not be fasting. You will absolutely crash, okay?

So, for hypoglycemics, that's not the way to go. We did an actual talk on intermittent fasting. We talked about what you do if you're hypoglycemic which is first get into ketosis and then keto adapted and then eventually go into it. But just to answer your question on fasting, well, fasting has a tremendous impact in the gut. I mean, your cells need to take a break and your gut needs to take a break.

So, all types of fasting have some degree of benefit for the gut. Whether you do alternate day fasting or you do a three day fast or if you do time interval fasting where you're fasting for 18 hours and eating for six like an 18:6 fast. When you go to a fasting state, you're basically turning on genes to help cells regenerate and you're helping to get rid of debris and unhealthy cells. So, it really is, is really important.

Then one of the other thing that's really important for the gut is a normal circadian rhythm. So if you're used to something eating at the same times throughout the day,



that really helps, what really throws off gut. So your gut cells have a circadian rhythm, your pituitary and pineal have a circadian rhythm, all your cells have circadian rhythms.

One of the best things for your gut is to just get used to eating meals at the same time. And if you can do that with an intermittent fasting model where you have like 18-hour feeding window or even a 20-hour feeding window, but it's the same every single day, you have some major benefits in how your gut function, is and how healthy your gut can repair and so forth.

It's not feeding-

I'm sorry, 18-hour fasting window.

[inaudible 00:56:43], 18-hour fasting?

Yeah. So if you're going to do intermittent fasting, one of the advantages of it is you start to eat at the same time. Most common one is an 18:6 fasting, intermittent fasting window, where you fast for 18 hours and eat for 6. So you might eat from like 1:00 to 7:00 or something, right?

**Right. Okay. So, can you do a talk on leptin sensitivity so like everyone is affected by it.**

Yeah. I mean, I'm not sure. I don't think if we said, hey, leptin resistance Thursday, everyone's going to jump up. We try to make them a little more broad. But, basically leptin resistance happens from overeating. It's that simple. Leptin resistance happens from diet very high in food or having chronic insulin resistance versus leptin resistance is basically controlling insulin and food intake. And by the way, investing is a great way to change leptin resistance.

**Okay. Someone is asking, what would be an example of a prebiotic?**

So, a prebiotic is basically a fiber source, a high fiber source. So, all your vegetable, all your foods high in fiber are prebiotic. And then you can add to it and say, if you had a better source of prebiotic would be a fermented fiber source, like pickles, or pickled cauliflower, or kimchi, those fermented fibers are even a better prebiotic because the fermentation of those vegetables allows them to really promote healthy bacteria formation in the gut and diversity. So, that's what a prebiotic is.

And then you have superfoods which are foods really high in fiber like [inaudible 00:58:38] berries, blueberries, but they also have really high antioxidants. So if you can really increase your diet with superfoods, you can Google them and see the whole list. And fermented foods, I mean, that would be better than any probiotic you can buy at the [inaudible 00:58:50].

Okay. Last one is a thyroid question, okay?



Yeah.

**Okay. What if you have low T4, what can be the cause of that in hypothyroidism?**

So low T4 by itself is pretty much meaningless. T4 levels fluctuate all throughout the day when you do a blood test as a snapshot. So, you have to know what's happening with TSH as the key thing. TSH is normal and T4 is low. It doesn't really mean anything. You could really have done the blood test two minutes later and it would have been totally fine. So, you always have to look at the feedback loop. You can't just look at T4, T3 by itself. You absolutely cannot ever diagnose anything from a laboratory test with a thyroid unless you have TSH.

So, I can't really answer that question. But if it's just T4 that's abnormal in a thyroid test, that doesn't matter. And you guys remember, these ranges for T4 and T3, they're bell curve. You may just be outside the bell but if the other markers of your feedback loop were fine, that doesn't necessarily mean anything wrong.

Do you want one more?

I want to take one more question.

**Okay. Catherine just joined. Good job Catherine. Just wondering about low estradiol, low progesterone and low testosterone, their relationship to gut health.**

Yeah. So if you have hormone deficiencies like that, those hormones are needed by cells and bodies so that can impact your brain. So your brain is not going to work as well. They're not going to regenerate tissues as well. It's going to impact your bone. It's going to impact your gut. So if you're deficient in all those hormones, they're going to impact cellular regeneration, right? Those hormones have what's called anabolic effect to help your tissues build, to help your tissues recover. So you'll have a tendency for a leaky gut, a tendency for ulcers, you have a tendency for your gastrointestinal tract to just not be as efficient as possible. So, that's really the basic concept of it.

Okay. Thank you, everyone, for joining our talk. Please check it out, The Gut Health: Solving the Puzzle starting February 18 at Dr. K. News. Remember this week if you go to the sign up for the waitlist, you get not only the gut program but the food sensitivity program for free, but I think there's a buy one, get one free so you can get a code and give another one to your friend. So, hope to have you guys join us in that program. We're going to really be sharing a lot of very useful information and a step-by-step process to show you how to think, it's not just another protocol.

And if you need to really improve your GI tract, I have no doubt, that program will really be beneficial for you. Thanks again, everyone, and have a great day!