

The leptin obesity anxiety connection

- Leptin as an appetite-regulation hormone
- How leptin effects on immunity, inflammation and cortisol
- Leptin and the microbiome, LPS and leaky gut
- How leptin plays a role in anxiety, stress, PTSD and depression
- How to exercise, meditate and do yoga to decrease leptin levels



Trudy Scott: Welcome to Season 4 of *The Anxiety Summit*. I'm your host, Trudy Scott, food mood expert, certified nutritionist, and author of *The Antianxiety Food Solution*. Today our topic is “The Leptin Obesity Anxiety Connection” and we have Mike Mutzel here to talk all about this. Hi Mike.

Mike Mutzel: Hello Trudy. Thanks for having me.

Trudy Scott: Welcome. It's good to have you here and I'll go through your bio and then I'll talk about how we met and then we can get right into it. Mike Mutzel has a BS degree in cellular biology from Weston Washington University and an MS in nutrition from the University of Bridgeport Connecticut. He has completed the Applying Functional Medicine and Clinical Practice Course and all six of the advanced practice modules at the Institute for Functional Medicine, IFM.

Since 2008 Mike has broadcast hundreds of webinars and video interviews on the latest integrative health developments and

regularly speaks at seminars throughout the U.S., Canada and Asia. He is the author of *Belly Fat Effect: The Real Secret About How Your Diet, Intestinal Health and Gut Bacteria Help You Burn Fat*.

Mike and I actually met at IFM last year and it's very interesting because I would not have typically considered the topic of leptin for the anxiety summit simply because of what I knew about leptin or maybe what I didn't know about leptin. And that it's this hormone that affects your appetite.

So how did we get here and why am I introducing Mike and this topic in the *Anxiety Summit*? Well I introduced Julie Matthews to Mike and she's an autism nutrition expert. She's actually speaking on anxiety and autism on this summit. Mike was planning his autism summit and Mike invited Julie to speak on *The Autism Intensive* earlier this year. Absolutely brilliant summit Mike. And Mike asked me if I'd like to share it with my community. And I was so impressed with the topics and the speakers I said absolutely yes. And my community absolutely loved it. If you tuned in I'm sure you would agree with me it was a fantastic event.

As I tuned into the event and I got to know more about Mike and what he was doing and his research based approach I thought I really want to interview this person and pick his brain. And I knew about your book *The Belly Fat Effect* and your expertise in leptin Mike. And out of curiosity I went to Pubmed and I typed in leptin and anxiety. And wow, what a surprise.

Mike Mutzel: Right.

Trudy Scott: And I came across all this research on leptin and social anxiety and leptin and panic attacks and leptin and fear. And the connection between leptin and serotonin and GABA and I just said, "Wow, this is so interesting."

So as well as sharing great resources here on the summit with you and highlighting great experienced practitioners like Mike I get to learn too. And I've just learned so much just preparing for this interview and I look forward to learning more today as I go through and interview you Mike.

Mike Mutzel: Yeah, me too.

Trudy Scott: So why don't we start with the dual roles of leptin. We know that it's this appetite regulation hormone but it's also involved in inflammation and affects cortisol levels. So let's start there.

Mike Mutzel:

Yeah that would be a great launching point but let me just pause and say I'm grateful and honored to be here. Thank you for that really warm and, you know, kind introduction. It was really serendipitous to connect with you and was it Austin I believe last year I think in an elevator of all places. But anyway thanks for that Trudy.

You know leptin is really unique. I mean like you said in the introduction I've been working with healthcare practitioners since 2006 in the functional medicine space and a lot of practitioners that are very advanced in detoxification and hormone modulation and, you know, how the environment affects our physiology and how to restore that balance. Similarly just like I was, you know, four or five years ago kind of ignorant about how leptin does so much more than just, you know, modulate energy regulation. And so a lot of people have heard about leptin resistance in the context of obesity and so forth.

And so basically, you know, kind of the one dimensional model of leptin is that leptin is like an energy gauge. I was on a hike the other day kind of thinking about how to come up with an analogy and there was this Grouse Grind hike in Vancouver, British Columbia. It's this really steep hike. You hike up 2,800 feet and then you take a tram down.

And so basically when the tram is full, you know, the operator will say, "Okay, let's let all the people down." And, you know, off they go. So it means like there's an energy surplus. We've got to kind of move things along and let the tram go. But in the context of like leptin resistance it would be like all these people waiting for the tram to go and the line gets bigger and bigger and bigger and the tram never goes down the hill.

So that's kind of the one dimensional model of leptin is that between 10:00 p.m. and around 2:00 p.m. are our lowest levels of leptin. Ideally, people have proper balance of their Circadian rhythm and so that's going to trigger hunger. And that's why most people should, generally have their biggest meal at lunch.

So low leptin levels trigger the hypothalamus in the brain to signal the rest of the body to initiate hunger and to cause people to eat and so forth. And then as we eat calories throughout the day our leptin levels progressively rise. And once they're rising, you know, they peak around midnight or two in the morning, it just depends on someone's biological rhythms. Everyone is different.

And so when they peak that signals to the rest of the body that there's enough fuel on board and we can start burning fuel. So it's actually a good process, right, because it's going to stimulate all these mitochondrial pathways to be turning on basically cellular breakdown of the nutrients that we've ingested throughout the day and then the cycle repeats.

The problem though is that people get leptin resistant and this really actually refers to the hypothalamus. So that's really the main region of the body where the receptors become resistant. And so the problem then because people – and let me just pause and share with you kind of how people get leptin resistant. It's just leptin is released primarily from adipocytes, from fat tissue, okay. And so the more fat you have, the more body fat you have whether you're a man or a woman, young or old, the more leptin you're going to be releasing.

So here's analogy number two is like when you order pizza. Not that we're promoting pizza ordering but just if you hear out the analogy. If you order pizza and one pizza man comes to the door you're going to let him in, pay him, take your pizza and go. But if you order pizza and 100 Domino's pizza men show up at your door or women for that matter, right, you're not going to let any of them in for fear that they're all going to come in and bombard your house. So this is what happens when we hear about insulin resistance, when we hear about leptin resistance is there's too much of the message around so that the receptor, like in the analogy of the door and the pizza men are standing outside, the receptor becomes desensitized. And when that happens it's almost as though the message is not there.

So let's go back to the – let's talk about a person that's a little bit overweight that hasn't been exercising, that hasn't had, you know, good sleep and stress management. Basically what happens is their body fat, their adipocytes, their fat cells are releasing a lot of leptin and the hypothalamus is saying, "Oh my gosh. There's too many of you. I'm not even going to listen to you guys. I don't care what you have to tell me. We're going to ignore your message."

And so that creates a situation in the body where there's like the message of no leptin. So people are chronically hungry. They're craving carbohydrates. They're craving high calorie foods. They're mitochondrial pathways are not working properly because again leptin affects, you know, when it's increased in a leptin sensitive person. It's going to stimulate energy breakdown and stimulate the mitochondrial and so forth.

So that's what happens - kind of the one dimensional leptin model. And I'll just pause right there and we can talk about the immune system and cortisol. But Trudy, any questions about that basic overview of leptin and energy metabolism before we dive into the immune system?

Trudy Scott:

No that was great. I just want to make sure I've got it right. Because if I'm not sure then I'm sure people listening might want to just get a recap. So the big thing really with this is that when you are overweight, you're not exercising and I'm glad you mentioned not being well rested and not sleeping because a lot of people don't realize how important that is. When all of this is going on you've got more fat cells and then more leptin is released and then the body doesn't know what to do with it. So you're saying it just ignores it and this is when you become more hungry and then you just get in this vicious cycle.

Mike Mutzel:

Right. And that's exactly right. So then – and basically cellular metabolism slows down so that's why we see this weight loss resistance. And people just really struggle. They have low energy, you know, they're lethargic. Their workouts aren't very productive. They seem to be doing all the right things in the gym but they're not losing weight. I think it really comes – I mean there's many issues here, the microbiome and all that. But leptin – and we can talk about how the microbiome effects leptin signaling later but I really think it comes down to leptin. I mean this is what all the research is showing.

So this is the big picture overview of leptin. Now let's take a deep dive into what I like to call leptin 2.0. The cool part about leptin that not many people understand is that leptin affects the immune system. It also affects the HPA axis and the hormonal system, cortisol and even sex hormones like testosterone and estrogen in a really profound way.

But how it affects the immune system. Leptin suppresses the T regulatory cell within our entire body, our body's immune system called the T regulatory cell. So think about, you know, if you think about the L.A. riots, you know, back in the 90s right. You know police will go in there and try and break this up to prevent looters from, you know, robbing their own stores in their community and causing problems, right. Policemen would help to break that up.

Well the T regulatory cells do that. They're really protective. When you have allergies or asthma and we all have some low level of autoimmune processes going on in our body. But these T

regulatory cells are preventing that from manifesting as disease. The problem is that leptin suppresses the activity of these Treg cells. And so this is a huge issue. And so we see elevated levels of body fat, elevated leptin, a higher prevalence of allergy, asthma, autoimmunity, lupus, multiple sclerosis. Any inflammatory disease that you can think of and even anxiety and depression. And we'll get into that in a second.

So why is that? Fundamentally because leptin suppresses these really protective cells in our body called the T regulatory cells. And so that's why we see, that's kind of the link between body fat and inflammation. And we know anxiety and depression and other mood disorders have a neuroinflammatory basis, right. There's this underlying inflammatory load that's affecting neurotransmission, that's affecting cortisol release, that's affecting norepinephrine and epinephrine and so forth. And so that's kind of the molecular link if you will between again body fat, elevated levels of leptin and these other inflammatory processes. So that's one aspect of it and we'll pause in a second here.

But I also want to share with people how leptin affects stress response in a very specific way. It tends to put the brakes on corticotropin releasing hormone in the hypothalamus. So we know that this hormone will help to stimulate the adrenals to release cortisol. So leptin in leptin sensitive people I might add helps to decrease cortisol in a beneficial way.

In contrast when you become more overweight, more sedentary, you eat outside of your Circadian rhythm basically when leptin levels get imbalanced and you become leptin resistant, leptin doesn't have that brake mechanism to suppress cortisol release. So again it helps in a positive way, you know, in leptin sensitive people it helps to regulate cortisol. So that's another huge aspect and that's why we see elevated levels of leptin in PTSD, in stress responses, in overweight people and so forth. And so it affects our body's ability to adjust to our environment which is really what we're trying to do.

We all have stress. We're just trying to balance that better. The problem though is leptin, if we have excess levels of leptin that's going to affect our body's ability to cope with stressors and make life seem more challenging than it needs to be.

Trudy Scott:

Very interesting. We hear so much about the inflammation connection to anxiety and depression without thinking about where's that coming from and if it's the leptin that is affecting

these T regulatory cells. That's so interesting that this is not talked about a lot.

I like that you talk about leptin 2.0 and that's the cool part. It really is, it's fascinating. Now you mentioned the effects on cortisol and if you're leptin resistant it's going to have more effect on your cortisol levels. And you talked about the HPA axis at the beginning of this when we were talking about immunity and the effects on the HPA axis. So just explain to everyone what the HPA axis is in case they're not aware of it.

Mike Mutzel:

Sure. So the hypothalamic pituitary adrenal axis. And so the hypothalamus is really kind of the master, it's like the White House of our body, you know. It's the federal government. It's the central processing of all of our hormonal systems. And once messages, you know, a lot of messages start or are initiated in the hypothalamus. Then they go to the pituitary. And then there's different neuroendocrine routes, you know, to tell men the testes to make more testosterone or, you know, in both men and women the HPA axis will govern adrenalin release, cortisol release, estrogen release and so forth. And so it's a really key hormonal system, right. And so we measure things indirectly like TSH, thyroid stimulating hormone. There's ACTH and so forth. There's all these different hormones that, you know, integrative physicians and traditional physicians kind of can extrapolate hypothalamic, pituitary, adrenal function and so forth.

And it turns out this is the hypothalamus which is the H in HPA axis. The hypothalamus is a main processing center, a main receptor for where leptin binds to. So it has a huge role, you know, in HPA axis function.

And so basically, you know, again going back to the research and it kind of makes sense if you think about it. You know, after a meal you kind of feel like ahh, relaxed and calm and things don't seem as stressful, right. I mean a lot of that is from leptin. That's how leptin affects, you know, it kind of suppresses cortisol release.

But in contrast, for people that are chronically hungry, eating, having these cravings, these food addictions and so forth, the meal's not as satisfying. It's not as satiating for them and so they feel like they need to constantly eat more and more and are kind of stressed by that. And really according to the research – and again this is all from scientists at Harvard and researchers in Germany. I mean this has been studied by really reputable groups throughout the world have shown that leptin really affects cortisol signaling,

particularly at that level of the hypothalamus. So that's kind of the overview if you will.

Trudy Scott: Excellent. Okay, I'm ready to continue.

Mike Mutzel: Awesome. So yeah, and so that's all kind of the good and the bad, you know. What can we do with this? What does the data really show? I mean we can talk about some of the disorders as I mentioned. Pretty much every inflammatory disorder we can think of from asthma, allergies, autoimmunity, Hashimoto's, depression, anxiety, poor ability to cope, post-traumatic stress syndrome. There's a myriad of ailments that are linked with imbalances in leptin and leptin resistance.

And then it goes even further if we talk about blood sugar control. And I'm sure you're well aware of this Trudy. I mean about 50 percent of Americans are insulin resistant. There's a huge prevalence of insulin resistance. And even more disturbing is more than 70 percent of Americans are either overweight or obese. And so we know that leptin levels start to rise when people get overweight.

So we can say that a super majority of our listeners right now, particularly if they live in North America and specifically in the U.S. probably have leptin levels that are in the unhealthy range, okay. And so we shouldn't be surprised that we're seeing problems with sleep, problems with stress, cardiovascular issues. I'll just pause and say that we know that like things like C-reactive protein are very specific and indicative of future cardiovascular issues.

Well one study actually showed that leptin is more sensitive and predictive than C-reactive protein in predicting who will have a heart attack versus who won't. And then who will actually – individuals actually this is one study I read that showed that individuals that were in an emergency room after having an MI, myocardial infarction, the people that survived generally had lower levels of leptin than those who didn't. So it predicts mortality. I mean it's really specific. So it's a real big deal, okay.

Trudy Scott: I've got a question for you about this because leptin testing is not frequently ordered outside of a research setting. Is that correct or is it more available now and is it something that is being tested?

Mike Mutzel: A wonderful question. It's more available now. The problem is it's pretty expensive. So it's kind of a one off lab test. Like Quest

and Lab Corp are kind of the biggest lab companies in the U.S. most widely available. It's not really part of the standard chem 24 which are CBC and thyroid and liver function panel and so forth. You generally have to request it. And insurance has an issue paying for it sometimes because it's an expensive test. If you pay cash, like when I go and do my labs. This is totally a tangent but it will make sense when I'm done.

When I do my labs I always pay cash because if I go through my insurance they're going to bill the insurance like \$3,000 and all this. It gets really crazy. So I would suggest – well number one, you don't really need to test your leptin levels because the most accurate gauge is body fat percentage, right. Because leptin's not released from your muscle tissue. So we can just infer and test indirectly by looking at body fat percentage.

And so for women if your body fat percentage is over 20 percent [editor correction: over 25 percent] and for men if your body fat percentage is over 20, you know, if it looks like a duck, walks like a duck, quacks like a duck it's probably a duck, right. And so we know from that standpoint, from those body fat percentages that you're probably going to have leptin levels in the unhealthy range.

And so that doesn't mean you're doomed, you're going to get a heart attack and you're going to get all this stuff. It doesn't mean that at all. It means that you need to work a little bit harder in exercising and doing some of the nutritional protocols that we'll talk about towards the end of this discussion, Trudy.

So that's what I recommend. But people like data. If you're going to get your leptin levels tested make sure to test it first thing in the morning or at least be consistent when you're testing it. So like for example a lot of people come – one day they do their labs at 8:00 a.m. Then they retest at 4:00 p.m. They're going to be totally different because all the Circadian rhythm effects on how these different biomarkers and hormones are being released. So make sure that you're consistent in terms of the time of day. Make sure it's the same time of day and so forth when you retest.

And so what levels are high or low? You know leptin levels above 10 are starting to get into that pro-inflammatory range. So this is in a lot of people. And so I've seen this, I mean in some individuals with autoimmunity that we've worked with people have had leptin levels over 40, you know. So that's definitely like going back to that pizza man analogy. That's like opening the door and seeing 500 pizza men at your door. Like the hypothalamus is going, "No way Jose. You are not coming in.

We're ignoring your message leptin." So then we get all these deleterious effects with cortisol and inflammation.

Trudy Scott:

This is so interesting about the testing and I know I shouldn't be going down this pathway because as you say we can infer it from body fat percentage. But the fact that you're saying doing it at the same time: you talked earlier about the fact that between 10:00 a.m. and 2:00 p.m. we've got the lowest leptin levels and then it goes higher at midnight. So do they have ranges at certain times of the day like they do with cortisol levels? Like we want to see cortisol high in the morning and then low towards the end of the day. Do they have different leptin ranges depending on the time of the day?

Mike Mutzel:

No. We're not speaking about that. We're not there yet. Yeah, it's really I mean all – again the science is there. Harvard and MIT and German researchers, this is really teased out but the lab testing companies and – leptin is not really on their radar when it comes to that and the Circadian rhythms. And it oscillates just like cortisol. In fact it has, you know, a kind of a similar – actually not quite. Not quite on the same Circadian rhythm as cortisol. It's off a little bit. But, you know, the science clearly shows that it oscillates in a Circadian rhythm much like cortisol does. So that's a great insight Trudy.

Trudy Scott:

Okay. Good. Well hopefully we'll get there because I think people do like to see numbers and, you know, it may be a bit of an incentive to do something about it if you are seeing these numbers and you are seeing correlations with something like heart disease. But then I guess we could also infer from cortisol levels if we've got cortisol levels that are outside of the ranges that could infer that this is being caused by leptin resistance as well. Correct?

Mike Mutzel:

Cortisol and then just being mindful and trying to be more aware of your body. And that's what we encourage all of our clients that we work with to do is just, you know, we all know our bodies better than anyone, better than a lot of physicians will because we live with ourselves 24 hours, you know, a day, seven days a week, right.

And so but sometimes we lose touch with that. The bottom line is we're all very intuitive. I think in nature as humans we are. And so we just need to be aware of that. And so just think back like last night for example. Were you craving ice cream or cookies? Like did you feel satiated or hungry? Just kind of get in tune with your body. And then if you, okay, so that's one checkpoint.

Well what about am I hungry for lunch? A lot of people are not hungry and then this can get into the sleep issue. So poor sleep hygiene and/or loss of sleep totally perturbs leptin Circadian rhythms. And so that's another kind of wrinkle in this whole equation. It's not just leptin resistance that is an issue. Just like when it comes to cortisol and insulin resistance and so forth is when you have imbalanced Circadian rhythms – so when your biological clock is off from poor sleep hygiene, you're on the computer or the iPad, your iPhone at night, you know. You're getting up at different times of the day, going to bed at different times, partying on the weekends and all that stuff. That's going to affect your leptin pulsatile rhythm which is equally as problematic. And so that's going to cause more food cravings at the wrong time. Okay, so that can be an underlying root cause if you will for driving lifelong leptin resistance.

And so that's kind of another piece of this equation. And I'll just pause right here because I know I'll forget if I don't mention it now. You don't have to be overweight to have elevated levels of leptin. So as I mentioned about 69 percent of Americans are either overweight or obese, you know. So what about the other 30 percent? Are they totally healthy? Well we know that's not the case.

So there's people that are what's called skinny fat. So their metabolism is obese but they look to be of normal weight. And this is actually researchers call this kind of what's MONWI. So metabolically obese normal weight individuals can have a higher body fat percentage relative to their muscle mass, you know. So their body fat may be 20, 30, 35 percent but when you look at them they don't look visibly obese. And so that's the other thing too here. That's why I love body fat percentage is that just because you look to be healthy on the outside you could be metabolically imbalanced on the inside because of the lifestyle or food choices or environmental toxins that you're exposed to. So that's why I love body fat percentage and not just looking at your belly and saying, "Oh, I look healthy." People look at me and say, "What do you do, you know, you look so great." So it's great to like you said Trudy. So lab testing can be good for a lot of people too.

Trudy Scott:

This is good that you mentioned the skinny fat condition. I wasn't familiar with that until I started learning more about this. And it's interesting that even with people who are skinny fat you can use body fat percentage to determine that they may be leptin resistant.

Mike Mutzel: Exactly. A lot of traditional doctors use body mass index, BMI. And so it's just a simple equation, you know, height versus weight and it gives you this number. Unfortunately it's not the most accurate. So I definitely recommend body fat percentage. There's the Tanita unit. There's a lot of great units now that can look at underwater weighing. I mean there's all sorts of things. So I do like to look at, recommend that because the amount, these metabolically obese people – they look normal, they look healthy, they look fit. But inside their metabolism is that of an overweight person is about 16 percent of the whole population. And so it's a big number right. And I do recommend people kind of consider that particularly if they do have anxiety or restlessness or sleep issues or they feel tired, you know, things like that. Have food cravings. That's another thing to consider.

Trudy Scott: Okay, great. Going back to body fat percentage. You mentioned the Tanita unit. Do you find that the ones that you would use at home are accurate or do you need to go and then get it done professionally at a center or with a nutritionist or with someone who has a more professional unit?

Mike Mutzel: A wonderful question Trudy. I think you should work with a professional to make sure that there's some medical grade units. These ones that are pretty accurate, they look at the intracellular water and do all these other phasing. I mean there's some pretty cool units out there. They're about \$3,000, you know, because they're really accurate. So the people that have those are, you know, high end personal trainers, nutritionists, functional medicine practitioners. Some of these body fat percentage things you can buy on Amazon, I don't know. I mean personally maybe I'm just speaking from a point of being a little ignorant in the sense that I haven't used that and compared that.

I do love biometric data. I mean the glucometers that you can test, that you can buy right on Amazon for \$29 or at Walgreen's or at Rite-Aid. I love those. Those are awesome. And so that's, you know, we're talking about other ways to kind of assess your leptin sensitivity and how fit your metabolism is. Blood glucose testing is another great tool because we haven't really talked about it yet but here again leptin affects insulin release. And so there's, you know, if you're insulin resistant you're probably leptin resistant too because these hormones and their intracellular pathways cross talk and communicate. They're connected. You know they're both involved in energy regulation.

And so what we see is when one becomes imbalanced so does the other. And so that's why I love to get people testing their blood sugar at home. I mean it's really noninvasive. You just prick your finger with this really small like gauge needle. It doesn't even hurt. You get a little blood out, test your blood sugar to kind of see where things are at. And so if your blood sugar after you eat is like 170-180 or your fasting blood sugar is over 90, you know, 85-90 type range you probably, you know, have some both insulin and leptin resistance going on. So we need to look at okay, what's going on with your diet, with your toxin burdens, your sleep hygiene and also your exercises. So blood glucose testing in addition to the body fat percentage is another great tool.

Trudy Scott: Okay, excellent. So you're testing glucose and that is inferring issues with insulin if it's too high.

Mike Mutzel: Uh huh.

Trudy Scott: Got it. And then going back to the body fat percentage. What do you think about using calipers to measure body fat percentage?

Mike Mutzel: I think that's awesome. A great tool as long as you're working with someone that knows what they're doing. Like that trained by like Biosignature and Charles Poloquin. But I think the calipers are really accurate as well. So that's a great recommendation.

Trudy Scott: Okay, so go ahead and have that done as well. Okay, excellent. This is just fascinating. So we've talked about the inflammation effect and the effect on the immune system. Is there a connection to what's going on in the gut and how this affects leptin?

Mike Mutzel: Gosh, I'm so glad you asked that Trudy because I would have forgotten to talk about that and we would have dived into all the treatment stuff. But yes, very, very much so. So it's a little bit of a backstory. So if you just bear with me for about two minutes I would like to explain the role of endotoxin. I'm sure you talked about this and other guests have talked about it. But I just want to share with our listeners kind of the backstory in this.

So in our microbiome which everyone knows we have 100 trillion single cell bacteria. They weigh about three pounds. They add to the metabolic activity of our liver. They're doing a lot of stuff this microbiome. Well about five grams of those three pounds, okay, so about five grams of we have this material called endotoxin. So certain gram negative bacteria there's a way to categorize bacteria – gram positive, gram negative and so forth. The gram negative

bacteria have this appendage, it like a dog's tail. It's just wagging sitting there just like some dogs have short tails, some dogs have long bushy tails.

Well gram negative bacteria have this little tail type thing called an endotoxin also known as lipopolysaccharide. Well it turns out that this is a very pro inflammatory substance. Our body has receptors because it's been a real problem, you know, endotoxin is in dust. Endotoxin is in beef believe it or not. For some of you eating a paleo diet we'll talk about some things you should be eating to mitigate some of these effects of beef. And also endotoxin tends to be increased or absorbed more readily when we have damage to our gut barrier.

So people are familiar with the term leaky gut, intestinal permeability this is a very real topic, very real condition. Stress, anxiety, poor sleep, alcohol use, taking antibiotics, taking proton pump inhibitors for digestive issues all increase the permeability or the ability for our gut to absorb things, particularly this endotoxin material. And it's very, very pro inflammatory.

So basically when we absorb this stuff it basically puts the gas pedal on our body's inflammatory signaling pathways. So things that make us anxious and depressed and affect our sleep like interleukin 6, TNF alpha, interferon gamma. These are all cytokines. These are messengers of the immune system that really drive insulin resistance and guess what? Leptin resistance. So it gets a little complex but there's a lot of great research showing that when you are exposed to endotoxin it triggers leptin resistance. So that's a really profound idea, a profound notion.

So, you know, we see a lot of people with intestinal permeability. I mean there's a lot of folks with the same condition. So it's asthma, allergies, autoimmunity, depression, obesity, heart disease and all these things. We know that even diabetes, we know that these conditions thanks to modern research is linked with gut imbalances and also poor gut integrity, okay. And also higher blood levels of endotoxin is linked with all these different conditions. And guess what? Endotoxin causes leptin resistance.

So it's another piece of the puzzle that I think is kind of missing in terms of the mechanisms – I know your listeners love to geek out on the science so this is another mechanism through which poor gut health and gut imbalances and gut permeability causes metabolic and immune shifts. So just to refresh everyone we talked about those T regulatory cells. So a natural process if we do

have gut permeability we would want those Treg cells to come in and help clean things up, help repair the damage.

You know the immune system is a great way – that’s how our body repairs damage, you know, through the immune system. But again if the Treg cells are imbalanced because of leptin is too high then the damage can’t be repaired. That interleukin 6 that makes you depressed and anxious and the TNF alpha, those inflammatory methylation pathways they’re going to – their levels are going to rise because those Treg cells are not there. And again why are they not there? Because leptin suppresses them.

So it’s this big vicious cycle, you know. So gut health - again Trudy I’m grateful that you had that question because it’s a huge piece of the puzzle, you know. It’s not just about burning fat, getting all the fat off your body so that you reduce your leptin levels. We have to really look at gut health from a new perspective.

Trudy Scott:

Great. And we hear so much about gut health and not too much about this connection to leptin. So it’s really interesting to make this connection and put all these little pieces together. I’m really enjoying it. I hope everyone is enjoying it as much as I am. It’s so fascinating Mike. You know it’s so interesting that we’re talking about obesity and individuals having leptin resistance. But I actually came across a paper that talked about maternal obesity and how this can actually affect offspring. And they talked about how when the mom is obese and she’s got high levels of leptin and insulin and she’s got high C-reactive protein and interleukin and cravings and addictions and mood problems that her offspring can then have hyperactivity, impairments in social behavior, increased anxiety and depressive behaviors just as a result of being exposed to these imbalances before they’re even born. And I think that is just so interesting.

Mike Mutzel:

Yeah, you know, that is really interesting. You reminded me of something and there’s a hormone that’s increased during pregnancy called HCG, human chorionic gonadotropin hormone I think. I always botch that but HCG. And interestingly HCG has been used with, you know, varying degrees of success for weight loss. And so I’ve always been intrigued by that. You know how does HCG work because it’s just kind of like this smoke and mirrors that some guy from Europe said it was good back in the fifties and created this diet. And interestingly HCG has been used with varying degrees of success for weight loss. So long story short I was pretty intrigued when I found out that HCG affects the T regulatory cells. It’s an immune modulator.

And the reason why it increases during pregnancy is to prevent mommy's immune system from attacking the fetus, the growing fetus. So it's a way to suppress the immune system and kind of prevent abortion. Well it turns out that's really interesting and it kind of works in the opposite way that leptin does, right. And so there's some interesting correlations there. So it kind of makes sense like with what you're saying that elevated levels of leptin during pregnancy would really counterbalance HCG. And so these higher levels of inflammation are again going to help in a negative way and they're going to affect the neural endocrine development of the fetus. So higher levels of the interleukin 6 and all that sort of stuff can have epigenetic effects. We know that kids that are born into stress, you know, born during times of famine literally have epigenetic effects. Their genome stays the same but the way that it's kind of shaped and structured is different. And that in turn affects how people perceive the world, how stressful they see things and so forth. So it's really interesting. I just kind of wanted to throw that tidbit on HCG.

And so how does that tie into this discussion in terms of weight loss? Well what happens is because elevated levels of leptin again suppressed the T regulatory cells. Well we see this fat tissue on fire and so that's why we see a lot of the inflammation. So HCG may cause weight loss in some people, not in all because it reduces kind of the inflammatory burden on the fat cells which helps the body then to kind of burn fat more efficiently and so forth. So it's kind of interesting this whole connection of this neuroendocrine immune influence on metabolism.

Trudy Scott: Really interesting and I'm glad you brought up HCG and I have to quickly ask you this. I want to come back to the whole mom discussion as well but the HCG diet that a lot of people get on with the really, really low calories. I'd love to just get your thoughts on that.

Mike Mutzel: Yeah, you know, I'm not a huge fan of dieting in any way, shape or form because it's really just a short term fix and this is one of the things that caused me to write the book *Belly Fat Effect* because, you know, a lot of the clients that I would work with in kind of a functional medicine, integrative medicine practice were overweight. They always wanted to go on a diet and they would try a diet and they would lose some weight but they would end up rebounding and gaining all the weight that they lost plus some.

And so I came across this paper in 2011 published in the New England Journal of Medicine, a very traditional medical journal out of Boston and Harvard and all that sort of stuff. And long story short they showed when overweight people embark on a low calorie diet, an 1,100 calorie per day diet – so pretty restrictive for 12 weeks they have a long term suppression in all their metabolic hormones. And really this is a whole other bag of worms Trudy but the gut hormones, these are a huge area of metabolic interest right now in the type 2 diabetes world. And even when it comes to bariatric surgery and gastric bypass surgery the way that gastric bypass surgery causes such rapid weight loss has really nothing to do with how much the stomach is shrunk and how much food people can eat.

But the procedure led to a dramatic increase in these gut hormones. They're called incretin hormones. Things like GLP 1 and CCK. These are all things that are released from our GI tract when we eat mindfully and chew our food. Again going back to the HCG diet it's very restrictive, it's very limiting and that New England Journal of Medicine study showed that a year and a half after just a ten week low calorie diet those protective gut hormones were still suppressed.

And so I saw on Facebook yesterday. The Biggest Loser, you know, a nationally televised weight loss program where it's really just all about fat loss. Like how much fat can you lose how quickly. That's kind of the bottom line. Well these people are rebounding and they're regaining the weight they lost plus some. So you really affect your body's set point. And so I guess we can kind of transition a little bit now towards the treatment.

So how do you improve leptin sensitivity? Well you have a lot of leptin receptors on your muscle tissue. So it turns out when you do the proper exercise, things like yoga, interval sprint, hiking, weight training you make your body naturally more leptin sensitive. So again which over time, going back to the pizza man thing, right. So the leptin resistant state – you order pizza and 300 pizza men are standing outside. Well if you continue to do these exercises you open the door and there's maybe 250 pizza men, 200, 100. Pretty soon you open the door and there's only one, right. So then that hypothalamus is getting the message, the proper message. So the body can restore its function of the T regulatory cells. Leptin can then start to re-regulate cortisol and suppress cortisol release so that people can adjust to life's stressors more effectively and cope and manage things.

So basically to kind of get back to your question I don't like the HCG diet because it's so restrictive. You've got that low calorie diet that's going to totally trash the gut hormones and it's catabolic. When you restrict calories for a long period of time you start to break down not only fat tissue but muscle tissue. And muscles are where insulin binds to. It's where leptin binds to. It's where we burn fat, you know. The more muscle you have, the higher your resting metabolic rate is. So the whole mission of the podcast, you know, that I do and stuff like that is just to get people to reframe how they look at weight loss. And weight loss in general is more I think just a bad term. I think people should really focus on muscle building and muscle health. Not that you want to be a body builder. I'm not trying to get anyone to look like Arnold Schwarzenegger but just to have healthy muscle tissue.

Because if you have healthy muscle, I mean – let me just pause. A lot of people have marbled meat, you know. If you go to like Sam's Club or Safeway and you look at that yucky meat – that's their muscle tissue. If you were to biopsy it. And it can't burn fat effectively. It can't, you know, muscle is a leptin sponge. It's an insulin sponge. It's where all your mitochondria are and all that.

So anyway I just want to reframe the whole discussion about weight loss and pivot it towards instead of restricting things and burning fat and all that. Just focus on maintaining healthy muscle and that comes through exercise. It comes through getting sleep. It comes through, you know, doing meditation and HeartMath. Eating healthy protein. Eating phytonutrients and color rich vegetables. And all these things are really supportive of helping the body rebuild muscle. And by having healthy muscle the fat will just go away over time. So that's kind of a long winded way of answering your question.

Trudy Scott:

That was great. And I'm just so glad that you quoted that study and I'll make sure that we include that study on the speaker blog that goes with this because I think it's important to be aware of that certainly but also the focus on how to lose weight which is to build muscle which I think is fabulous. And it's so interesting because we hear about how beneficial exercise is for alleviating anxiety and depression. And now I'm putting the little dots together and thinking well it's affecting leptin levels which is thereby affecting insulin levels and thereby it's affecting the immune system and it's affecting inflammation. And it's helping and, you know, we're just putting all these little puzzle pieces together. It's fascinating.

Mike Mutzel:

Yeah it's really fun.

Trudy Scott: It really is. Really great. Now I had a quick question for you. Anything else on ways that we can decrease leptin levels and increase our leptin sensitivity?

Mike Mutzel: I gave a little overview. I can talk about some specifics to give people some really practical ways to kind of take home, to effect this right. So basically, you know, we're just being honest with ourselves. Look at our body fat percentage. Work with a functional medicine practitioner. Again if women's body fat percentage is over 25. For men if it's over 20. Okay, it's not a 100 percent guarantee that you're going to have leptin issues but it might – it's looking that way, you know. It's looking slightly ominous if we're to kind of look up at the sky and see the weather shifting, right. The weather shifting in your body so what do you do?

Well fasted sprints in the morning can be really good. So I like to encourage all my clients to go out first thing in the morning. I love people to do meditation or HeartMath if they can for 10 to 20 minutes, okay. I know that's not for everyone but HeartMath is great because it's a little biometric device and it provide feedback. So for people with a real kind of racy mind and hard to quiet down that's a good tool.

And then right after that have a little bit of coffee or green tea. Why the coffee or green tea? Well if you do this before you exercise it helps to preserve muscle and burn fat which is kind of cool. And it helps people to have a better perception about exercise, you know. So the benefits of exercise come when you're feeling that burn. And for some people that can be uncomfortable because they're not used to it. If you have fibromyalgia or chronic fatigue or pain issues that can be really hard. So I like a little bit of caffeine because it helps to kind of really block pain receptors in the brain at a low level, right. And so it makes your workouts a little bit better.

But I like people to find a hill in their neighborhood where they can walk up briskly. So this doesn't have to be a full on sprint, you know, because I want this to be applicable to all age groups. But find a hill. Walk up quickly and then walk around the block and then go up a hill quickly again. Do that about four times. Now if you don't have a hill in your neighborhood try to find an inexpensive treadmill on Craigslist for about \$100 nowadays or an exercise bike. So the idea here is we want to do a fasted interval, okay. And so why fasted? This is what the research shows is really great at improving leptin sensitivity. I don't know why or how all the mechanisms but data shows that.

And so you can do like maybe ten minutes of total exercise and four 45 second intervals in that period. And so an interval doesn't have to be all that like where you're hustling and like can barely breathe. But you need to have it be hard enough so that if I was doing the interval right now I would be talking like that. Like it's kind of hard to talk to your spouse or your workout partner. That shortness of breath means that you're creating a little bit of oxygen debt in your body and that's where the magic happens with oxygen debt.

If you're exercising and you can freely have a conversation like I am right now it's not hard enough, okay. And so maybe – that's the idea. And so a lot of people get hung up with heart rate monitors and, you know, Fit bits and all this. And if you're into data, cool. But really just focus on your breath and by being more in tune with your breath you can help drop cortisol as an aside by the way anyway. So that's kind of a beneficial aspect of exercise.

Yoga's been shown to be really beneficial. And again I don't know all the mechanisms how but this is just some of the research studies have shown that yoga, things like power yoga, hatha yoga, vinyasa have been shown to reduce leptin signaling. I personally think it has to do with affecting through kind of like the HPA axis through kind of the top down approaches. Like how it affects the brain signaling and the perception of the world. Then that will affect the leptin sensitivity but I'm not sure of all the mechanisms. But the bottom line is yoga's great.

So what are all the benefits of yoga? Well a new study actually shows that yoga increased telomere length. So these are these enzymes that have a real antiaging property at the cellular level in our body. And most importantly for me yoga increases blood flow to the GI tract. So it makes the GI tract more fluid, more supple. We tend to get these adhesions and sticky points in our gut that affect motility and all this. So yoga does a lot of great things for the GI tract. And we know that the gut is the root cause of all imbalances. So if we can improve gut health and increase vascularity and motility it's great in my book. So I think yoga's awesome.

And then good old weight training. Studies have shown that people that do squats and dead lifts and some of these old school almost body building like movements actually have greater leptin sensitivity and lower fasting leptin levels and lower post meal leptin levels. So do a combination of these things, these sprints. A little bit of yoga. Get in the weight room periodically. You don't have to exercise for hours every day. You know 10 to 20 minutes,

five to seven days a week. I mean it can be short and sweet and just make sure that you're kind of feeling that burn. That you have a shortness of breath periodically, not the whole time. That means you're working harder and that's a great way to kind of summarize some of the exercise tips.

Trudy Scott: Great. I've got a few follow on questions for you. The first question is I just want to make sure that I understand you said fasted interval training. So that means fasting i.e. it means before you've had anything to eat.

Mike Mutzel: Yeah. So ideally first thing in the morning.

Trudy Scott: First thing in the morning. Got it.

Mike Mutzel: Yeah.

Trudy Scott: Okay. And then you said you would do 10 minutes. I'm just going to recap here just so everyone's clear and make sure I've got it right. Say you would do 10 minutes total and then of that 10 minutes you would have four 45 second intervals meaning you would do that where you would go up the hill quickly or you would speed up on the exercise bike or the treadmill if that's what you were using. And then the question I had about the coffee that was interesting. Now a lot of people with anxiety can't tolerate any caffeine. I'm certainly one of them. Do you have any other ideas or options instead of the coffee or the green tea or would you just skip that if you are sensitive to the caffeine?

Mike Mutzel: Yeah, that's a really great point. I would just skip it if you're sensitive but you could also look at things like carnitine. So carnitine can help to shuttle fat into the mitochondria which are kind of like where we burn fat at the cell level. But green tea is an option but don't steep it for very long. So just steep it for like 30 seconds. So the longer you steep it the more caffeine that's going to come out. Or you could do green tea in like a cold brew. So you put, you know, the green – just like you make cold brew coffee. You can just go into YouTube and figure out how to do this. But you can do a cold brew green tea.

And again just very low dose. And so if you're sensitive and you have jitters and don't do this but these are for people that can tolerate a little bit of coffee first thing in the morning. And so yeah, I think that's a reasonable alternative.

Trudy Scott: Okay, great. And glad you mentioned the connection to yoga. I thought that was very interesting. And the fact that it increases

blood flow to the GI tract really, really great. And then there was one other thing I was going to ask you about and that was HeartMath. Just explain what that is for people who may not know because I think it's a wonderful tool and a lot of people say oh my gosh, I can't even imagine meditating. But you've got to find something that's going to work for you and for a lot of my clients the HeartMath is wonderful.

Mike Mutzel:

It's huge Trudy. I mean it's I think, yeah, I've been experimenting with all kind of different things with nutrition and fitness and functional medicine for – I mean it's been my job for ten years. And so but HeartMath and meditation, I mean if I could just pick one thing out of all the supplements I've taken, all the lab tests, all the stuff it's definitely HeartMath and meditation are the most powerful.

And, you know, for me we haven't really talked about my story but I've had anxiety and depression and seasonal affective disorder my entire life. And the one thing that really helped me cope with the world and do interviews like this and get on a stage and speak in front of a hundred people. I mean in high school I would like almost faint in front of, you know, I had this crazy fear of public speaking. And now when I speak people never know that. I mean I'm still kind of terrified on the inside but it goes away after like two minutes of talking. So again I mean this is just and of one. This is my personal experience.

But for people listening I think they have an interest in anxiety and depression and so it can be challenging to sit there and just meditate. Because you're like okay, am I doing this right? It's not like when you have a personal trainer watching you do pushups and telling you your form is good and you're doing it the right way. It's just you and your mind. And if you have a, you know, your ability to adjust and cope to stressors is not good anyway then you might think that you're a bad meditator.

So that's why I like HeartMath because it's like a – I don't want to call it this but I can't think of a better word. It's like a poor man's way to meditate. You get all the benefits of meditation but you have the biofeedback tool right there. And so now I can meditate unassisted with HeartMath or there's another device called a Muse app. It's a quantitative EEG device that's also cool that we can talk about. But after doing HeartMath for several years I figured out how to meditate and it's totally changed my life, my relationships, my profession, you know, my relationship with my daughter, everything. It's been huge. And it has nothing to do

with math anyway. It's just this little thing that you clip on your earlobe. It doesn't hurt at all. It measures your heart rate variability and it's a direct marker, direct feedback of your stress response. So that's a cool device.

This is a new thing I've been playing around with as well. It's an app called HRV4 Training. It's in the app store. So this is a way to get your baseline heart rate variability first thing in the morning in bed. And so put your fingertip on the light or the camera part of your iPhone. Start the app and it does a one minute heart rate and heart rate variability. And this gives you a great baseline into how is your sleep. How is your sleep hygiene and how recovered are you for that day. And so that will – I use that feedback to say okay, today I need more yoga, you know. Yesterday I really pushed it. My heart rate variability this morning is really low. Low heart rate variability is going to suggest that my sympathetic tone is really too high. My stress response is going to be high. So today is going to be yoga day, you know.

So I don't like go for a very long hike. I'm not going to do a lot of weight training. So we get into a way to kind of personalize your workouts. I really like people to do this, to customize and personalize both their nutrition and their workouts to kind of balance their life. Because things change over time, right. Your exercise needs and your nutrition needs change over time. And instead of relying upon some expert to tell you exactly what to do there's different tools like that HRV4 training that can give you some feedback. And so those are some of the things that I really like.

But, you know, just to summarize that really emphasize learning heart rate variability or meditation because if you have anxiety or depression it can be a huge, huge boost in how you perceive the world.

Trudy Scott:

Wonderful. Thank you and thanks for sharing that cool tool. I'm dying to look it up and I'll make sure we share that as well so everyone can start to use it. This has been really fantastic Mike. I could go on and on and on with many more questions but this is a great start and I know you've got a leptin blueprint video that we can share with folks. Tell us a little bit more about that.

Mike Mutzel:

Sure. Yeah, you know, so I've been studying this pretty intensely since 2011 and kind of interviewing various experts on leptin and all that. So I summarize this in a video. It's about an hour long and it goes into some of the things that we talked about today. But,

you know, for people that want to geek out a little bit or if they feel like, you know what. I like what I heard but I want to listen again or kind of look at some of those studies and have some images that go along with that. They can take a deep dive and want the link, you know, below this chat so people can check it out.

Trudy Scott:

Okay. Excellent. And then I'll make sure to share the information about the *Autism Intensive* which was really, really fantastic. Do you want to just give a little summary on some highlights from that just so folks know a little bit more about what you did in that great series of interviews. Similar to this at the summit where you interviewed a lot of really great experts. I remember hearing Julie Matthews' interview and Dr. Anju Usman talked about the zinc-copper connection which I found fascinating and is really relevant to anxiety. And before you give a little recap there I just want to say that a lot of people might say well why would I be interested in autism. But there's a lot of overlaps between some of the underlying factors that we see with autism and certainly with mood disorders. So just listening to some of these experts is just so valuable I think.

Mike Mutzel:

Yeah I'm really glad Trudy that you kind of reframed autism in that sense. And so that was like my conclusion about a year and a half ago or so when I met now a great friend Norm Schwartz. And he's been a functional medicine practitioner and has known Jeff Bland and all this since the nineties. He's been treating autism forever and, you know, I just feel grateful that I have a healthy child because I was exposed to this whole industry. And so did all the sauna, all detoxification. We got rid of flame returns in the house. Like we did everything right because I was lucky enough and one of the persons that we interviewed, Paul Thomas, who is an integrative pediatrician. He gave me his alternative vaccine schedule. So I had all these things and I have this happy, healthy kid. And I just felt this inner sense of guilt.

I mean I'm grateful obviously but like there's so many parents out there who are working in different industries that haven't been exposed to all this stuff Trudy that you and I do. And, you know, their life has just been turned upside down and they're going from therapist to therapist and specialist because they have this child that unfortunately, you know, was exposed to different things in the environment because the parents didn't know about it.

So the whole goal of the summit, you know, we talk about autism but also allergies and autoimmunity and depression. I mean, you know, autism is one manifestation of an imbalanced immune

system, of an imbalanced – you mentioned Anju Usman and methylation pathways, imbalance detoxification. And most importantly gut health.

And so we teased out all those different kind of conversations and topics that are pertinent to yeah autism but also mood disorders and cognitive disorders in general. So, you know, it was a really fascinating series of interviews. I personally learned a ton and that's kind of why we do these things Trudy. I mean we love learning just as much as we love sharing the information. So I learned a lot. I think people can really gain a lot of information from that.

Trudy Scott: Great. Well thanks very much for doing it and you did an amazing job. It was really, really great. And then you've got a podcast as well.

Mike Mutzel: Yeah, so the High Intensity Health in iTunes. We also do all of the discussions are video based too so if you like to watch videos we're over on YouTube, High Intensity Health. Or over in iTunes if you just type in iTunes or Stitcher. So yeah I think we're at I think episode number 140 or so and have a wide range of topics and discussions from functional medicine practitioners to scientists to professional athletes. And we try to cover a bunch of different topics to give people some insights that they're not going to get from their general physician or practitioner.

Trudy Scott: Okay, great. And then of course your book *The Belly Fat Effect: The Real Secret About How Your Diet, Intestinal Health and Gut Bacteria Help You Burn Fat*. And I think there's going to be a lot more awareness of why this book would be useful to read after today's interview because there's just so many things that we don't know about and connecting all the dots I think has just been fascinating.

Mike Mutzel: Yeah, I agree Trudy. Well this has been a lot of fun. I love chatting with you. You have great questions and great discussion topic points. So I appreciate the opportunity to come on and share this message. I hope people found it valuable.

Trudy Scott: Yes. Any final words of wisdom for everyone?

Mike Mutzel: Final words. Yeah I mean I would just say again the meditation and the HeartMath. I mean we can nerd out on leptin and that's so important but, you know, I really have found that to be, to affect this whole, you know, neuroendocrine immune wind up to be very

powerful. And then just get moving, you know. Even if you don't have time to do all the intervals like we talked about first thing in the morning just park a little bit further away from your office and take the stairs. At the end of every hour I encourage people just for 30 seconds just get up and move, you know. Go sprint to the bathroom. Sometimes if you ever see me in an airport I'm running, I'm sprinting to my flight. Not because I'm late but because people will actually get out of the way because they think you're late and I'm going to sit for three or four hours. So just finding time to do these small little movements can really affect your body in a good way.

Trudy Scott: Excellent. I love that sprinting in the airport because when we're flying we're spending so much time sitting and that's a great thing to do. Well thank you Mike. This has been just fantastic and a wealth of information and I'm so glad I had you come on and talk about this. I've learned a ton and I'm excited to learn more. Thanks very much.

Mike Mutzel: My pleasure. Thank you.

Trudy Scott: Okay. Thanks everyone for joining us on another fabulous interview on season four of the Anxiety Summit. Be sure to tune in to other great interviews. This is Trudy Scott signing off.

Speaker Blog: <http://www.everywomanover29.com/blog/leptin-obesity-anxiety-connection>

Mike Mutzel, MS, author of *Belly Fat Effect*



Mike Mutzel, MS, has a BS degree in cellular biology from Western Washington University and an MS in nutrition from the University of Bridgeport, Connecticut. He has completed the Applying Functional Medicine in Clinical Practice (AFMCP) course and all six of the Advanced Practice Modules (APMs) at the Institute for Functional Medicine. Since 2008, Mike has broadcast hundreds of webinars and video interviews on the latest integrative health developments and regularly speaks at seminars throughout the

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Trudy Scott, CN, host of The Anxiety Summit, Food Mood expert and author of *The Antianxiety Food Solution*



Food Mood Expert Trudy Scott is a certified nutritionist on a mission to educate and empower anxious individuals worldwide about natural solutions for anxiety, stress and emotional eating. Trudy serves as a catalyst in bringing about life enhancing transformations that start with the healing powers of eating real whole food, using individually targeted supplementation and making simple lifestyle changes. She works primarily with women but the information she offers works equally well for men and children.

Trudy also presents nationally to nutrition and mental health professionals on food and mood, sharing all the recent research and how-to steps so they too can educate and empower their clients and patients.

Trudy is past president of the National Association of Nutrition Professionals. She was recipient of the 2012 Impact Award and currently serves as a Special Advisor to the Board of Directors. Trudy is a member of Alliance for Addiction Solutions and Anxiety and Depression Association of America. She was a nominee for the 2015 Scattergood Innovation Award and is a faculty advisor at Hawthorn University.

Trudy is the author of *The Antianxiety Food Solution: How the Foods You Eat Can Help You Calm Your Anxious Mind, Improve Your Mood and End Cravings* (New Harbinger 2011). She is also the host of the wildly popular *Anxiety Summit*, a virtual event where she interviews experts on nutritional solutions for anxiety.

Trudy is passionate about sharing the powerful food mood connection because she experienced the results first-hand, finding complete resolution of her anxiety and panic attacks.

The information provided in The Anxiety Summit via the interviews, the blog posts, the website, the audio files and transcripts, the comments and all other means is for informational and educational purposes only and is not intended as a substitute for advice from your physician or other health care professional. You should consult with a healthcare professional before starting any diet, exercise, or supplementation

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