Season 1, Episode 23: Acetylcholine and Your Vagus Nerve with Diana Driscoll, OD

Jodi: Hi. I'm Jodi Cohen, your host for the Parasympathetic Summit. And it is such an honor to welcome my friend, Diana Driscoll, a former POTS and CFS/ME patient who is known worldwide for her research involving the vagus nerve and the parasympathetic nervous system with two patents to date.

She continues to work as president of Genetic Disease Investigators and the clinical director of POTS Care, the only clinic dedicated to locating and treating the underlying medical causes of POTS. Welcome, Diana. Thank you for joining us.

Diana: Thank you, Jodi. It's an honor to be here. It really is. I appreciate that.

Jodi: So, I know you were a POTS patient out. Some people might not know what that diagnosis means. If you can just kind of explain that a little bit and how it relates to the vagus nerve.

Diana: Of course, and POTS is a symptom, and it took me years to actually get to that understanding because when you first hear it, it stands for postural orthostatic tachycardia syndrome. And you think that sounds like a medical condition. And there should be treatments for that. We should understand what that is. No one understood it.

And ultimately, when my kids also became sick, my son was completely disabled by it. I was in clinical trials at Mayo Clinic the whole bit. I was getting sicker every year. Eventually, I came to understand that, oh, this isn't a condition per se, this is a symptom, and it's a symptom of something else.

So, in order to figure out what's driving that, we need to find out medical causes. And no one was interested in that at the time, but the vagus nerve and digging into that and the parasympathetic nervous system was just part of the research I did, but it was a necessary layer for the recovery of my children and I.

Jodi: Can you share a little bit more about your story, like your symptoms and how you figured it out that the vagus nerve was correlated with what you were experiencing?

Diana: Yeah. It was really interesting because I think it took me having to get every symptom known to man in order to get answers. I mean, it evolved over time. It was changing constantly. There were times I just felt like I couldn't breathe, my head hurt, my neck hurt. I was weak, tremulous.

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Diana: My digestion just started to basically shut down. Food sat in my stomach forever. Then eventually, my bowel movements were abnormal. Constipation was pretty consistent that it was punctuated by episodic diarrhea, which I was relieved for.

They found out my gallbladder stopped working. They wanted that removed, but even more, frightening, my son was wasting away. He wasn't just not growing. He started losing weight. We took shorts that he had. He was 12 years old at the time. I took shorts that he had when he was eight years old, and I was wrapping the waistband around him and pinning them on him.

He developed severe osteoporosis, broke his bone just putting on a good coat, throwing a ball. He broke his arm, and no one had any answers for us. My sleep was wonky. I felt like, to some degree, I was possessed. I felt like I was being electrocuted and poisoned at the same time. It was just horrible.

And to reduce it to POTS really forced a lack of validation with the doctors. They didn't understand how sick we were. If all it was fast heart rate upon standing, which is what it implies, then we should just sit down. We should feel okay.

We were sick in any position. But when ultimately it got to the point where my constipation got so bad, it went to full-blown gastroparesis. Nothing was moving. I could not have a bowel movement.

And I went everywhere. I went to my doctor in about 11 days or so. I'd already tried everything I knew of. And she said I can't really add anything to that. I went to the emergency room.

They tried prokinetics, nothing budged. Ultimately, I was sent to a urologist to make sure — I was having some twingy pain in the lower right-hand quadrant — just to make sure I didn't have a kidney stone.

And honestly, I just don't think the doctor knew what else to do. So, she sent me there, and he gave me some dye to drink and imaged for a stone. There was no stone. He sent me to a surgeon to see if he could help with the gastroparesis because I had a suspicion some of that lower right-hand quadrant pain may have been the valve between the large and small intestine.

Maybe it wasn't opening, the ileocecal valve. And I was starting to think prior to that, that maybe I had a problem with the vagus nerve that maybe that's one manifestation of it.

Jodi: Right. Which controls motility, so that would correlate.

Diana: It does. That's right. Well, ultimately, what happened, Jodi, it was just one of those God things. What can we say? The surgeon said I'm not going to touch you, which I think turned out to work in my favor. But a few days later, I still had not had a bowel movement. I didn't have a kidney stone when I went to the doctor, but I got a kidney stone three days later.

How does that happen? And I called the doctor, and I said, I know I didn't have a kidney stone when I saw you. I respect that, but I have one now. And it was my first one ever. But you can't mistake when you have one of those. The pain's so unusual.

So, he met me at the hospital. He removed my stone. And when I woke up, he said, "Diana, you're right. It's your ileocecal valve. That dye we gave you to drink three days ago is all in you, but it's right up against that valve." So I asked him, confirmation. This is great. What do we do?

He said, "I don't know. I'm here to take your stone out." So, I was just left on my own with no help, no medicine, no doctor I could think of to go to, Jodi. And that's when I decided, well, let's just stay in the science. Let's assume I'm right. Let's assume something happened to my biggest nerve. What could I do?

And I thought through the problem where I assumed my preganglionic vagus nerve, the nerve going from the brain down the neck into the chest and abdomen, had to be deformed for some reason.

But I knew from school, in optometry school, that we learn there's the preganglionic nerve. Then there's a little gap or synapse, and then there's a tiny postganglionic nerve.

I should still have that one. How can I stimulate that nerve? And I remember thinking, well, the neurotransmitter for that is acetylcholine, but that's not a drug. So, I can't use that. I need an agonist for acetylcholine.

And this is where having a medical background, being a doctor, it really did help. I will tell you because it was like I was in school yesterday. I didn't know it had been 30-plus years before thinking I remember the teacher saying the postganglionic nerve is so small. It's almost a part of the organ itself.

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Diana: And the vagus nerve is the only nicotinic acetylcholine or tic nerve in the body. We say that because the agonist for acetylcholine or imitator is nicotine. So, I called my husband at his office and said, honey, on the way home from work, can you swing by the drug store and get a nicotine patch? And he was like, what are you up to?

But I put it in the lower right-hand quadrant area. I didn't know if it mattered, but by golly, in an hour or so, Jodi, I had a normal bowel movement. I used it again.

Jodi: So transdermal, the patch went through your skin, then nicotine triggered the vagus nerve to trigger––

Diana: The postganglionic is the biggest vagus nerve.

Jodi: Which is an important point. I'd love to explain it. If you trigger the vagus nerve at any point, it activates the whole nerve, which is really important. Can you speak to that a little bit?

Diana: Yeah. Well, the vagus nerve, as you know, is the longest cranial nerve in the body. It's very prone to damage. But the key to me figuring this out was remembering it has two parts. So, if the preganglionic nerve is damaged, it doesn't mean you don't have a chance. You have a second opportunity with the postganglionic nerve or with the receptor itself.

And that's what I was utilizing. And although nicotine worked for that, it activates inflammation. It was horrible after a few days. And I had to instead think of another way to do the same thing, but also to think more globally, think in terms of could this vagus nerve problem actually be a neurotransmitter problem in which case are other symptoms, for example, dry eyes, large pupils. Those are not vagus nerve problems, but they're symptoms of low acetylcholine release. And I had quite a few of those.

Jodi: And for those people who don't know, can you help connect the dots between acetylcholine and the vagus nerve?

Diana: Yes. Acetylcholine is the neurotransmitter needed by the vagus nerve. It's also used by other nerves. But that's the way nerves communicate with an organ. There isn't a direct connection.

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Diana: There's a little gap, and they spill out a chemical, a neurotransmitter, and that chemical lands on a receptor, and that stimulates the organ to work. So, I was using nicotine as a substitute for that chemical to try to land on the postganglionic receptor to trigger it to work.

Jodi: Which is brilliant.

Diana: Thank you.

Jodi: No, it's very clever. I love people that are willing to–– It's kind of like we have an issue, and we'd figure out what works on us and then––

Diana: That's right. I had to do it. I didn't have a choice.

Jodi: Especially for your child.

Diana: Right. And that was the hardest part of the journey was thinking someone else has already figured this out. They know what's going on, but no one has really picked it apart like that.

Jodi: Well, and when you're in it, you know immediately, like if something helps you have a bowel movement, like a piece of reverse engineering, I did something right. Do that again.

Diana: Absolutely. And I did it over and over. And then I called about three or four friends with this condition who had gastroparesis. And I remember just saying, am I going crazy? You want to try something? And again, that worked great.

We knew then this wasn't likely an autoimmune condition. All the research to that point on this was presuming we all had autoimmune conditions that were affecting the receptor, ultimately leading to poor organ function, gastroparesis, et cetera. No, the receptors worked great.

Jodi: It was damage to the vagus nerve and low levels of acetylcholine. Can you speak to how that might happen? How people might have vagus nerve damage?

Diana: Yes. And to this day, you don't necessarily have to have vagus nerve damage. I don't think my vagus nerve is actually damaged, but there are other things that can mimic it. And this is where it's so important that we figure out, is it a vagus nerve problem, or is it a neurotransmitter problem?

And the way I figured this out was, one, I looked at my own body. Always donate your body first. But then I sent questionnaires out to chronic fatigue syndrome patients, POTS patients, PTSD. Interestingly, they end up with autonomic dysfunction often and fibromyalgia.

And in those symptoms, we had like 150 or so. There were tucked away 35 symptoms of anticholinergic poisoning. Basically, some of the symptoms can occur if we ingested drug that breaks down acetylcholine. Now, we haven't been poisoned, at least most of us.

Jodi: For those people that don't know, what basically anticholinergic poisoning is means that your ability to produce the neurotransmitter acetylcholine has been damaged

Diana: Or there are anticholinergic drugs that will break it down.

Jodi: Got it. Oh, it will dissipate from your system.

Diana: Exactly. And that's what poisoning does. So, it just breaks down the acetylcholine. You get some dramatic symptoms, but if you look at those symptoms, kind of turn it down a knot, the vast majority of chronic fatigue syndrome, fibromyalgia, PTSD, POTS, all those invisible illnesses, if you will, they showed the majority of symptoms of anticholinergic poisoning, but they would kind of come and go.

So, it's not like we were going into coma, seizures, and death like you would with poisoning. But it wasn't recognized because there's no blood tests for this. So, we look beyond the digestion to is there brain fog? Like, is it affecting acetylcholine to the brain? Is there dry eyes, large pupils, dry mouth, flushing, mood changes, that sort of thing?

Those are all symptoms of low-level anticholinergic poisoning. And that helped me take it to the next level to think, okay, is there a way we can put this back while we're figuring this out, cover for any genetic defects in the pathway of making acetylcholine and have it do what nicotine did without activating inflammation to get the organs working again, digestion working, and could it cross the blood-brain barrier to support acetylcholine for the brain.

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Jodi: And I would love for you to elaborate a little bit more. Most people know that acetylcholine is your anti-inflammatory neurotransmitter. Can you speak to some of the benefits and the roles it plays on the body?

Diana: Absolutely. Yeah. Well, specifically, with the vagus nerve specifically, the vagus nerve is the anti-inflammatory nerve, and that's not my work. Dr. Kevin Tracey of the Feinstein Institute of Medicine figured that out. But a good example, I think, is one cell called a macrophage. There is a site on the macrophages, the alpha-7 nicotinic acetylcholine receptor. Okay.

And when acetylcholine lands on that receptor, it keeps that cell from being too inflammatory. It keeps it from releasing too many inflammatory cytokines. Sometimes the release is important to kill germs, et cetera, but you don't want chronic release of that.

So, the vagus nerve helps calm that cell down, keep that macrophage from shifting into a chronic inflammatory cell. When the vagus nerve is not working well for any reason, including a problem with acetylcholine, then we can't control some inflammation properly. We can't regulate it well. So that's significant.

But the vagus nerve controls everything from proper peristalsis or swallowing. When the food goes down the throat, it tells the stomach to produce stomach acid, the pyloric valve at the base of the stomach to open, to let the food exit, peristalsis, and movement of the stool throughout the GI tract. It tells the gallbladder, time to spit out some bile. We've got some digesting to do of fats here.

It partially controls the pancreas and tells the pancreas when to spit out digestive enzymes. So, when that is not working well, all of it doesn't work well to the point where you can develop rather dramatic malabsorption syndrome. And that's what happened to my son and I, so that's just the vagus nerve aspect, but you look at the lacrimal nerve for tear production.

The pupil size is also controlled by acetylcholine. Flushing is often a response of poor autonomic control. Dry mouth because saliva production is also parasympathetic.

There are other symptoms, too, if it's of a more global problem. And it's important to know because, like in my case and the case of so many others, if it had been approached as a vagus nerve problem, and we kept trying to stimulate the nerve, nothing would work.

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Diana: And as a patient, I could have felt like I'm just doing something wrong. What am I? I'm not meditating properly or whatever. It wasn't my fault. It wasn't my son's fault.

What was happening was some inflammatory cytokines blocked the release of acetylcholine at the site of those nerves. And you can stimulate those nerves all day long, nothing happens. So, the distinction is really important for the patient to understand.

Jodi: And you've come up with a very clever way to kind of trigger the natural release of acetylcholine. Can you speak to that a little bit?

Diana: Thank you. Yes, Jodi. This took me forever to figure it out, but imagine me. I mean, I guess you could tell, a total nerd. Sitting in the kitchen, trying to cover for genetic defects, crossing the blood-brain barrier, yet I wanted to see that vagus nerve respond with a bowel movement trying to put together an oral compound that would come in the body basically all at once and trigger that nerve and such a challenge.

But I was patient zero, and my son was patient one. And I remember giving it to him just praying we were getting this right. I knew I got it right if we got a bowel movement. Okay.

What was really amazing was to see–– It took about four to six weeks that then the malabsorption started to turn around. I saved my gallbladder. My gallbladder works great. And then the dry eyes were going away. Brain fog was going away.

Jodi: Yeah. And that's really important. I know once women hit a certain age, it's almost like they think getting their gallbladder is like getting a manicure. It's no big deal, but it is quite important. And people don't realize that is correlated.

Diana: Yes, absolutely. And as an eye doctor, too, we see patients with chronic dry eyes that we start to think, are they just not being compliant with their drops or medication because the eyes are still dry. And as an eye doctor, I never thought about the autonomic nervous system with dry eyes. That just wasn't a thing, but that's one reason I've received two patents for this.

No one has ever thought to try an oral combination to replace that acetylcholine sufficiently, where the dry eyes will go away, the pupil size normalizes actually pretty quickly, the brain receives the acetylcholine, the vagus nerve starts to normalize. It can do everything.

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Diana: So, trying to figure that out, I ultimately ended up naming it Parasym Plus, and have that out, which has just been great. Just so validating for me to see so many patients respond to that.

Jodi: Well, and I mean, my goodness to go from the state where you were wasting away to just being able to take a supplement and feeling like yourself again, can you speak to some of the ingredients and how you formulated it and how it actually activates the release of acetylcholine?

Diana: Yeah. This is interesting because it doesn't honestly actually activate the release of acetylcholine. My thinking was I wanted to supply the patient with everything needed that the body could put it all together. Okay.

Jodi: You are giving it all the raw materials.

Diana: Basically, but beyond that, because I did have to study. First, I thought this has got to be a genetic issue. What are the chances that I would develop this condition, my son and daughter would develop this condition, and there's no genetic component?

I thought that was probably pretty slim. So, I studied genetic issues in the acetylcholine pathway first and had to figure out workarounds. And this was harder than it sounds because the amounts mattered. If I had too much of one ingredient over another, they would end up canceling each other out.

Jodi: No, people don't realize that with blends. It's very subtle. And sometimes things work differently when they're combined with other things.

Diana: That's right. I knew I wanted acetylcholinesterase inhibitor, meaning once the acetylcholine was produced, I wanted to try to push back the enzyme that breaks it down for a while. Just hold on for a minute. Give me a little bit of a chance here, but you can't go too high on the amount, or else the receptors basically start to become numb.

They just need more and more of it. So, I didn't want adaptation to take place so that patients would find, okay, that worked, and now I need more. And now I need more. Now I need more. So that was really tricky. So, it should have everything in there.

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Diana: People do not have to know their genes for this to work. And it crosses the blood-brain barrier. It's so rewarding. At POTS Care, we can see if someone's just struggling to stay away, they just can't concentrate, you can just see that in their face if any of that is from the low acetylcholine, you start to see their face come back to life in 15, 20 minutes.

The alertness comes right back. My first day figuring this out, I had gotten so bad, Jodi. I was so far beyond fatigue. I was awake about an hour and a half in the morning. I slept all day. I was awake an hour and a half or so in the evening. And I was struggling to stay awake during those times. And my neurologist presumed I had a neurodegenerative condition.

He just couldn't figure out the diagnosis, but I was getting worse every day. And I remember asking someone, do we just snuff out? Is it inevitable? That's it? What am I running out of? But I needed five doses my first day because my mind came right back. I could stay awake, and then I could feel it start to wear off. And I took some more. I became awake again. It was so strange. I don't know that I could have gotten any worse.

Jodi: I'm grateful you didn't.

Diana: Well, me too. Thank you.

Jodi: And can you share some of the ingredients?

Diana: There is Alpha GPC, Acetyl-L-carnitine, Huperzine, and vitamin B1. Vitamin B1 is interesting because it's in the pathway of making acetylcholine. And a lot of us, if the vagus nerve is not working well and we develop malabsorption, we can get some severe deficiencies. And I got some severe deficiencies, including B1. So, we put in what is necessary too, but again, math mattered.

Jodi: And I've noticed that the people that are always supplementing with B vitamins or D vitamins, and they still have ridged nails, it's not that they don't have the right raw materials. It's that they're not absorbing them.

Diana: That's exactly right. And I don't know why that was such a puzzle for so long to my doctors. I had every symptom known to man. I got so bad, Jodi. I was hallucinating sometime. I had every neurological symptom there was. And then my son wasting away. It wasn't that we weren't eating. We were eating just fine.

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Diana: My diet had always been very good. It wasn't like I ate junk food or anything. But it was almost like this invisible malabsorption syndrome, but as was the acetylcholine for the brain, the dry eyes, the whole bit, it was just a mystery to everyone.

Jodi: Well, thank you. This was so amazing. I'm so grateful. Is there anything else you wanted to share about acetylcholine and kind of helping people restore their levels so their vagus nerve functions properly?

Diana: Yeah. I think if there is any take-home message from what I went through, it was that supporting the vagus nervous is so important, and deep breathing, meditation, gargling, whatever, that's great.

But if you have, for example, something breaking down acetylcholine, a genetic defect in the acetylcholine pathway, or an inflammatory cytokine blocking its release, those methods won't work, and it's not your fault.

It's not like you're doing something wrong. We have to put that back, and that's what Parasym Plus is patented for. And it does it beautifully. And there's always hope.

I guess let's always end with that because I didn't think there would be answers. I was on disability over ten years and to be on the other side of such dramatic illness is an amazing process, and no one is immune to the possibility of getting answers. So, please don't ever give up.

Jodi: Yes. Thank you. Thank you so much.

Diana: You are so welcome. Thank you, Jodi. It was delightful to talk to you. I appreciate the opportunity.

Jodi: This was great. Thank you.

Diana: Thank you. Take care.

Jodi: You too.