Introduction and Dr. Peter Kan's Background

Welcome back to the conversation. Today I have Dr. Peter Kan You're one of our fan favorites. We've done so many projects together. Welcome back. Thank you so much for having me, Laura.

I'm so excited to have you talk to us today. Let me introduce you to our audience. You are really a specialist in functional neurology and functional medicine.

You're a board certified in integrative medicine, functional medicine and a board certified chiropractic neurologist. Plus, you're the creator of the neuro metabolic integration, a science based virtual online coaching program that identifies the root cause of autoimmune and other chronic conditions.

And today I'm bringing you here because I really want you to unpack and talk about the impact of blood sugar regulation on the body, on the mitochondria, on the immune system, on the brain.

We'll talk about what happens when your blood sugar is high. What happens when your blood sugar is low, where the sweet spot is and how to solve those problems?

Sounds good. Let's do it. Yeah. This is an area I'm actually very, very passionate about, so thank you for giving me the opportunity. Yeah. Okay, so let's start because you are a brain special artist and you really talk a lot about the brain gut axis, the gut brain immune axis.

So let's start there and can you talk to our audience about why it's so important when we're thinking about improving our energy and solving chronic health conditions?

Why do we need to focus on this? What's the importance of Axis? Yeah, absolutely. You know, the brain is what we experience our lives through, right. And the brain also has top down control over virtually every bodily function.

And then the same token, it takes feedback from the body signal coming back up to the brain so that we can make a loop and be able to make decisions about what we want to do for, you know, food intake and behaviors and so forth.

And that brain function is very heavily driven by energy. Your brain is waste 2 to 3% of your body weight, but burns about 20 to 30% of your body's total caloric energy.

So it's very energy expensive, right? Metabolically speaking. So energy. I like that analogy. It's expensive. Your brain is expensive. When we think about energy, you know, ATP, like, you're like you're withdrawing money from a ATM machine.

Why the Brain-Gut-Immune Axis Matters

It's an expensive. Yeah, it's got a lot of upkeep. You know, you got to you got to keep going to maintain this machine because this machine is mission critical.

So so energy is really critical. This is why this topic of mitochondria is so important because obviously mitochondria produces ATP, but in order for your mitochondria to produce ATP, it needs to have substrates.

Right. And these have fuel source for your cells to produce ATP. Mm hmm. So. And that substrate the brings favorite sources of fuel is oxygen and glucose.

So oxygen obviously comes from the air that you breathe. Right. There's obviously nutritional impact on oxygen,

meaning that if you are iron deficient, you can become anemic, then you may not be able to, you know, taken as much oxygen because you're anemic.

But primarily oxygen from the air you breathe and then glucose from the food that you eat. Now, some people say like, well, I thought ketone is a brain's preferred source of fuel.

Yes. Ketone is an alternative fuel for the brain to access in times of low carbohydrate state and fasting state. But just remember, heat ketosis is not a state that you're normally going to encounter on a normal, everyday basis, so you.

Really have to work at it, right? I mean, to be in ketosis takes some serious dedication planning. I mean, it's very easy to come out of it. There's a time and place to do ketosis by just medical reasons or definitely, you know, things that people can can use that for a specific purpose.

But speaking of just regular people eating normal, healthy diet, usually there's some degree of carbohydrate to where ketosis is not going to be the normal state.

So in that state, which is much of human existence, is that we are our brain has evolution, you know, have come to the point where our brain is very dependent on glucose for our metabolic fuel.

So therefore any disruption in the way that we can deliver glucose to our brain is going to disrupt brain function. Just so you know, brain is super sensitive to these energy fluctuations because as I said earlier, it's it's very metabolic expensive to maintain brain function and because it use so much fuel that any fluctuation can cause fluctuations in your brain function.

Now, when we say brain function, I should clarify what I mean by that is neuronal function neurons, which means nerve cells and you any nerve cells in not just brain anywhere.

And we're here talking about vagus nerve. We're here talking about the enteric nervous system. Those neurons. We're talking about neurons to intervene, individual muscles to help you to move, to exercise.

Any neuron, sensory neurons in your hands and feet, if it's not working right, can cause neuropathy and the neuron requires proper fuel and activation for them to survive.

So nothing is more important to brain cells and neurons than energy and blood sugar is a big piece of that. Huge piece of it. Okay, so you unpack the importance of that.

Now, can we go into, you know, we will let you decide. I want to talk about high blood sugar and what that means to us. And I want to talk about low blood sugar and what that means to us.

So whatever order makes sense for you to unpack that and talk about why it's important to have a sweet spot and what happens to us when it's too high or too low?

Yeah, absolutely. So normally when you when you eat right, the food that you eat gets broken down into a different type of macronutrient foodstuff that's going to be your carbohydrate, fat and protein.

And within the carbohydrate, you have complex carbs, you have simple carbs. Eventually, all carbohydrates gets broken down into sugar. And and that sugar is going to be glucose.

High Blood Sugar, Insulin, and Brain Damage

So glucose is a source source of fuel that you need when you eat a food that's very high in carbohydrate or simple carbohydrate or very processed carbohydrate like simple sugars that's devoid of any fiber or any other mineral cofactors that sugar gets uptake and very get into your system very fast.

Real quick, let's tell people what foods, simple sugars would be. And because I think a lot of people think, oh, well, I avoid sweet things. So I'm good but simple sugars are in other foods, too.

So tell us which which ones to avoid. Well, you know, you can have sugar in fruits, which is can contain fructose and, you know, glucose and sucrose and so forth.

You can have sugar that's, you know, in a form of just simple carbohydrate, like, you know, bread, which is white bread and just break down into simple glucose really fast.

In fact, the pairing of fiber and sugar is really important. Without the fiber, the glucose gets uptake and really fast into your bloodstream. And what that means, it's going to create a blood sugar spike.

So your blood sugar normally just runs along steady and you eat a very sugary meal. Then you get this high blood sugar episode which causes these hormone regulatory effects.

A real quick sugary meal could mean a plate of pasta with. Oh, absolutely. Yeah. So so when we say sugary, it doesn't necessarily have to be sweet. And I think this is really important for people to distinguish and understand in our minds.

We call it sugary because we know that all simple carbohydrates get turned into glucose for use for energy in the body. But that's sugar to us. We interchange glucose and sugar.

The source of glucose may have come from something savory or sweet. So I just want to unpack that for people because I think that that is confusing. So, okay, keep going.

That's a really good point because people think like, I don't drink soda, so I'm fine, but they eat, they eat tons of bread. So here we're talking about the effect of food on your blood sugar and simple carbohydrates, like pasta and bread can also spike your blood sugar.

So the effect of high blood sugar is that you're going to release hormones like insulin to get that blood sugar level down to bond. That response. And one of the reason to to have insulin is not just to get that glucose in your blood down, because what you're doing there, you're basically delivering that glucose into your cell for energy.

It also takes that glucose, excess glucose that you don't need because you're too much of it into fat storage. So this is why people gain weight. But really what the insulin does is it lowers the glucose so that you're not becoming neurotoxic.

High glucose is such a toxic environment for your brain cells that one of the function of insulin is that is to lower that blood sugar response so you don't just kill off brain cells.

I mean, if you eat just tons of tons of tons of sugar, you're not going to just like die right then and there. But the effect of that high blood sugar, if it's left on, you know, on compensating for it, it literally kills off your neurons just like that.

So insulin part of this job evolutionarily is to protect us against that. So there's a ceiling to which, you know, you can go go about and really do some major damage.

So it's important to underscore that when you have high blood sugar, you're going to really cause a lot of damage. And neurons are very sensitive to that.

They're sensitive to the glycated damage. They sensitive to the effect, the metabolic effect of all that sugar. And you're basically going to develop neuroinflammation from that.

You're going to develop fatigue. And, you know, post-meal postprandial fatigue where you feel after a big pasta or carby meal, you feel sleepy, drowsy, you know, you just want to like take a nap, right of the Thanksgiving meal.

Coma is what people are experiencing because it's not because of turkey. It's really just too much carbs that people are eating. My favorite meal of the year.

Oh, my gosh. That is the one time of year that I just let myself go. Crazy truth. Truth moment here. Thanksgiving family recipes. That's the one time I'm going to have my glucose coma.

Okay, Laura, focus. Focus. Now, Skip. I want Thanksgiving right now. Right? So so a lot of people just go for it, you know? And there's a lot of reasons for that because glucose, your brain's actually trying to get goal after glucose.

And this is why it's so hard for people to turn it down. There's their sweet cravings and they see cravings mediated by three different things. Number one, taste receptors in your tongue that are like tuned to sweet.

And then you have actually it's a tumor gut brain access. Your gut actually have these specialized cells called the entero endocrine cells or neural pot cells, these specialized cells in your gut, actually, our sensory receptor that actually can detect sugar like glucose, amino acid, fatty acid.

And this specific type of these cells, neuropathy cells that sends is sweet and that actually makes a synapse with a vagus nerve in your gut and sends a signal to your brain to say, hey, we actually not only taste this, we we actually metabolize and absorbing sweets in our intestine.

Low Blood Sugar and Reactive Hypoglycemia

And then thirdly, in your brain, when your brain gets hit with all this glucose, it has a reinforcing loop of dopamine to make you feel like, oh, wow, I just got this hit, this reward displeasure.

So it makes you like, want to go go for more of it, because glucose is a very fast acting, very quick sources fuel. It's also the preferred source of fuel for the brain.

So we have develop ways for us to when we get that glucose to go one more because it gives us more of that hit. And this is why people become addicted to sweets and it's very hard for them to not use sweets. Yeah. Been there.

I mean, I've had sugar addictions on and off and definitely this is so this is so easy for people to understand. So thank you for sharing this in such a simple way.

Now, can you tell us we've you really covered really well how we spike blood sugar from food and what happens, how it's neurotoxic for our brain cells.

Can you talk about other things that can spike blood sugar? Because I know we're living in a fast paced, stressful world and that causes a problem with blood sugar regulation as well.

So can you tell us the cycle of what happens there and why people struggle? Yeah, absolutely. So besides dietary reasons, right? You can eat things that contains too much carbohydrate.

They eventually convert into glucose, which then raises your blood sugar, which causes damage. Not just the brain cells, by the way, also damages the mitochondria, but other things that can raise blood sugar are things like inflammation.

So if you are exposed to things that cause inflammation in the body, your body will release cortisol, which is an inside inflammatory hormone. And that cortisol, in the effort of dampening inflammation, also is a group called Gluconeogenesis.

A hormone basically causes glucose release into your bloodstream. So having high levels of cortisol, either from inflammation or from having stress, is going to cause an increase in blood sugar level.

So then you have people who, oh, I eat perfect, but I can't lose way. My blood sugar is always running high,

perhaps because they are inflamed or their stress causing cortisol release and this is causing that chronic high glucose level.

So then the cortisol, high cortisol is leading to insulin resistance that's leading to the high blood sugar state, which causes all sorts of problems.

All sorts of problems. Okay. So now go to the other side of the spectrum and talk to us about low blood sugar and the effect that that has on our brain gut mitochondria immune system.

Wherever you feel like going with that, let's talk about that. Right. So blood sugar, the primary thing you want to know about blood sugar is that you want it to be stable, right?

You want your blood sugar to kind of stay like this all day long. You eat a meal, it goes up a little bit, but not much and just stays kind of like this.

People who have poor blood sugar regulation, they'll have blood are going to spike up and it'll crash down like a rollercoaster. So many times people experience hypoglycemia.

Really what they experience is what's called reactive hypoglycemia. What that means is they spike the blood sugar from eating something that's too carby or too much calories, and then they follow by a crash that the crash happens because your body's compensating by releasing so much insulin that you have a overreaction.

So then blood sugar drops low, so you feel hypoglycemic afterwards. So then that hypoglycemia will result in decrease glucose response in your blood. Therefore, you have decreased glucose delivery to your cells, every working cell and tissue, including your brain cell.

So this is where people feel, you know, from a brain level. They feel, you know, lightheaded, shaky, irritable people call a hangry. And then as soon as they eat something, then then they're relieved that because you just jam more glucose in there, jam more food in there, and therefore the blood sugar, instead of being low, comes back up.

So you feel this relief. So the cardinal signs of hypoglycemia is that you feel worse brain and energy wise when you don't eat and soon as you eat something, that feeling is relieved.

That's a pretty darn good sign that you have some degree of hypoglycemia. Again, hypoglycemia doesn't mean it's low all the time. It can be reactive, it can be episodic.

But any time when your blood sugar sugar goes high and low, that spells trouble. That instability of the blood sugar is really what causes most of the damage.

So it's not that you just have high blood. Oh, I'm not diabetic, so I don't have a problem with this. Diabetic just means that your blood sugar is running high all the time.

But just by having insulin and glucose surges and drops like a rollercoaster all day, that alone will cause insulin resistance and metabolic dysfunction already.

So you don't have to be a diabetic to have blood sugar dysfunction. In fact, this is one of the things that I help people with all the time because it's like the first step, right?

If you can't deliver fuel to your tissue, to your brain, then nothing's going to work. Okay. So that's really important to underscore that hypoglycemia is just as bad as hypoglycemia.

It's just in different ways. It's going to impact brain function all the same. Okay, so how do you help people if you get some quick pearls for people to take away? Because I'm sure people are listening right now thinking, oh, my gosh, that's me.

So what would you have people do? You said this is one of the first things that you help people. Correct. What are some of the ways that they can correct this?

Yeah, the way we correct it is from two different perspective. One is what's causing this blood sugar swing in the first place. Because like I said earlier, it could be diet, but it could be non dietary contributions from inflammation, from cortisol, spikes from stress and so forth.

And then the other way we look at it is, okay, what are the practical things? Regardless what's causing it? Are there things you can do to kind of make the blood sugar more stable?

It turns out that blood sugar is one of those things that respond to lifestyle changes very quickly. So it's kind of like a low hanging fruit. That's why we go after it.

And it has tremendous benefit for mitochondrial function and energy production and cellular function. So the things that we do for people with hyperglycemia is we have them eat more frequently.

That kind of makes sense, right? You're hypoglycemic, you don't eat, you feel terrible, you eat, you relieve it more than eat more frequently. At least eat before you experience hypoglycemia so you don't get that hypoglycemic crashes.

And that really helps them to stabilize their energy, stabilize their mood.

How to Stabilize Blood Sugar

A lot of times people have like chronic anxiety and they like they stabilize their blood sugars, like, oh, I don't feel so anxious. I feel more calm. Well, yeah, one in a symptom of hypoglycemia, as they call a hangry, right.

Anxiousness. They feel jittery because you literally, your body have such low glucose. It may be compensating by releasing epinephrine or adrenaline, which also raises blood sugar.

So let me ask you. So, you know, a lot of our speakers on this summit are talking about intermittent fasting as a way to improve mitochondria function.

So what I'm hearing is for some people, that might actually be a bit detrimental. It might if they have blood sugar dysregulation and they tend to get hypoglycemic.

Intermittent fasting might actually complicate things for them. In people with broken blood sugar metabolism, they may not be able to intermittent fasting because their blood sugar regulation is so broken.

Right. Because blood sugar, it's for for you to be able to fast and not experience crashes and feel terrible. It means that multiple different hormones have to all work in synchrony to help you to maintain your blood sugar without eating food.

Some people can't do that because their blood sugar regulation is busted, so we have to get them to stabilize that because they don't yield. We risk losing neurons because without glucose you brain cell don't run and your function goes down.

So we have to protect against that. Right? So this is kind of like this is what we do first and then eventually we fix the why they have the blood sugar problem in the first place, which could be, hey, they're just not knowing how to eat properly.

They're not exercising enough. They're inflamed. Do they have too much stress and adrenal glands not working because they have a viral infection? Whatever it might be, then not only do we teach them to stabilize their blood sugar short term, but we also fix the underlying reason why the blood sugar is dysfunctional.

And then we get them to the point where they can intervene fast and actually benefit from that. So it's not been fast, it's not good. It just sometimes people are just not ready for it.

And that's the mic drop of this interview right now because people are hearing all over this summit like intermittent fasting and first intermittent fasting.

And if, like you mentioned, your blood sugar regulation is broken, you can't do that yet. Not you can't do it just not yet. So you mentioned that there's a lot of underlying reasons that people can have dysregulated blood sugar.

So we talked about more frequent eating. What else would help them resolve this? Yeah. So so it's also isn't the timing right? Eating more the frequency of how often they eat.

They're hypoglycemic, right? One time a low blood sugar episode so they can be more frequent. Also, the pairing of the food, right? It's what you eat as well.

So this is a common mistake. People think that low blood sugar means you got to eat some sugar to bring the sugar up. Now, that advice works for diabetics and diabetic medication on insulin, for example.

Right. If people are on diabetic medication, their blood sugar is being kept at a certain level kind of app normally because they're taking a drug, right.

The drug is causing the blood sugar to go lower than normal. And if they get into a situation where they don't eat or they get in low blood sugar, they can get into diabetic coma because the blood sugars get can get even lower because the insulin medication is going to push you low.

So in those people, they're told to like, oh, when you have low blood sugar, eat an aura in your drink, a juice box to bring it back up. That's for people with diabetes on medication.

That's a different type of advice for people who are not diabetic, are not taking diabetic medication. When you have hypoglycemia, usually it's due to some again, one of those reasons where your blood sugar is dysregulated.

And then so eating frequently is important, but then also pairing it with the rifle. So that's fiber fats and protein typically will blunt that blood sugar response.

So you eat the food, but you don't get the blood sugar spike. You just get your blusher to come back up to normal because your goal is get it from low to normal.

Your goal is not go from low to like sky high. It's that that the very Asian that we want to minimize. So then you pairing of the food is important and then, you know, doing specific types of exercise can be very helpful.

People with hypoglycemia, they may. If they also have a common and low adrenal function, they may not be able to tolerate very high intensity exercise or CrossFit or, you know, heavy weightlifting in the beginning.

Those are things we aspire to, to get them to right when they get better. That's what they will be able to do. But in the beginning, they're too fragile to do it.

If they have blood sugar problem, blood pressure problem and adrenal issue, then we want to heal them to the point where they can do those things. So in the beginning, the exercise they might do maybe just purely aerobic activity, they just stay in anaerobic zone.

So then the not, you know, getting into the anaerobic metabolism. And then other thing we might do is again, look at the underlying reason of do you have a chronic Epstein-Barr virus is causing adrenal gland to just constantly being suppressed.

If so, then you got to deal with the virus. Do you have, you know, chronic stress in your life? Then we got to teach

you how to manage that stress. So those things that we do for people with hypoglycemic and people with diabetics or high blood sugar or insulin resistance, they may still need to eat small frequent meal in the beginning, especially if they have that blood sugar instability, because by eating frequently in the right foods, pairing it properly, then the blood sugar kind of becomes more stable.

And then once they get better, if they actually have insulin resistance or pre-diabetic tendencies or are actually diabetic, then maybe we walk them to the point of able to do ketogenic diet or intermittent fasting.

Exercise is always going to be a key here for metabolic health or mitochondria health. And then there are also supplements that you might take, specifically vanadium.

Chromium tend to be minerals, very important for blood sugar stability. B Vitamins are important for blood sugar. Herbal compounds like Jemima Berberine can also be very helpful in people with insulin resistance.

So this is where we get into a little bit more customization depending on do they have a low blood sugar? High blood sugar, or a mixed pattern of both low and high at the same time, which means that the blood sugar is not very stable.

This is so good. I know people are taking notes like crazy right now, so all right. So we talked about high blood sugar. Low blood sugar. We talked about what's needed for mitochondria to function.

So now let's land this plane and bring it back to how might how to support mitochondrial dysfunction as it relates to affecting the brain immune gut axis.

I know this is your superpower right here. So this whole dysregulation of that system is at the crux of a lot of people's problems. So can you share with us how the mitochondria comes into that and how to support it?

Yeah, absolutely. So as I said earlier, mitochondria function relies on substrate, right?

Mitochondria, Inflammation, and the Brain-Gut Loop

You only make energy because you're eating food, right? It's kind of like the law of thermodynamic works here, you know, with some calorie ends so you can burn some calories out.

So you can function. So it's not like there's some magical mitochondrial supplement. Or if you just take this and you can to produce energy of a thin air, it really comes down to like energy usage and energy intake, right?

You got to eat food, eat the right food to feed yourself properly, the right amount of calorie. Right. Something people that are starving themselves. So no reason fasting by the way, is not starving.

Right. When you're fasting, you're not eating anything for a few days, you know, or you do have intermittent fasting. But then on a days that you do eat, you might be eating normal amount of calorie.

So overall, your caloric intake will be whatever your goals are. If you're trying to lose weight, you might try to achieve a calorie deficit. If you're trying to gain weight, you might try to get at caloric surplus.

We're trying to maintain, but fasting is not the same as starving. I think a lot of people, they start themselves, so they're not getting of calories. They gain of nutrients.

So then the mitochondria don't work. Well, duh, of course. Right. So so we got to eat feed properly. But I think the biggest thing with mitochondria is that inflammation is one of those things that can decouple the mitochondria, literally the mitochondria break apart when you have inflammation.

So we want our more mitochondria healthy ability to make energy is what you feed yourself, right? But it's also whether you have inflammation that's blocking that process from happening.

So this is where we have to really look. Now, interestingly, in a brain, you mean got access where the brain, the immune system in a gut communicate in a three way triangle, there's ways for you to impact your ability to actually have good metabolic function.

Let's take, for example, brain. If you have brain inflammation now that brain inflammation can be caused by some type of infection, some kind of toxicity like heavy metals, that that brain inflammation can be caused by concussion.

Ah, you bring your head, you have brain injury, let's just use a case of brain injury. You, you can cut your brain. Now that your brains injure and is in flame, it's going to have a greater glucose demand in the neurons that are not injured because has to compensate for the parts of the brain that's injured.

Right. So just like if you if you injury your right ankle or your left, your left leg will have the brunt more of the force as you're hobbling around on your right ankle because you can't put all your weight on the right.

So your left leg got to work harder. Same thing. We have a brain injury. That region of the brain that's injure will have decreased, you know, metabolic uptake because it's injure, but the other parts of brain will have to work harder.

So in a sense, your glucose demand may actually increase. You'll burn through more glucose in your brain. So then now you start to create metabolic dysfunction from a brain injury or brain inflammation.

You're burning up more glucose. So this person may experience hypoglycemia, which further exacerbate brain function because brain requires optimal levels of glucose.

So you have an injury causing, you know, increased glucosamine using up all your glucose sources now causing hypoglycemia, further causing brain dysfunction.

This person gets in a psychologist worse and worse brain function as your brain functions start to decline because of this brain inflammation, it's going to decrease its output.

Right. Brain job is that taking signal, but also generally output to tell you where to move. Right, what to say, what to do, part of that or a majority of that output.

In fact, 90% of the brain's output goes to the parasympathetic. So the vagus nerve. So if you just think about decreased brain output because of brain injury or brain inflammation from any type, now you have a decreased output through the vagus nerve.

And what does the vagus nerve go? Well, your heart, your lung, you're swallowing muscles all throughout your digestive tract. And so now you have decreased vagal function, which might impact your ability to have good GI motility, pancreatic secretions, gallbladder secretions, gastric secretions.

So they now you don't digest food. Well, blood flow to the gut is compromised because in the fight or flight situation, blood is diverted to the skeletal muscle for fight or flight.

So less blood going to your core so you don't have enough blood going to your gut. So then your gut lining might degenerate faster, so you get leaky gut more likely, and then now by the way, also the vagus nerve inhibits inflammation and dampens macrophage activation within the spleen, liver and small intestinal lining.

So the vagus nerve actually directly impacts your inflammation level. So without bagels nerve function, you're likely to be more inflamed. So this is all just came from brain inflammation like a concussion.

Something happened to your brain, your brain gets inflamed. So now you have this downstream effect of brain gut, right. And immune because vagus nerve dampen inflammation.

So now you have this cycle that sort of feed into more dysfunction and then mitochondria, it's like it's in every single

cell in your body, your neurons have mitochondria.

So, so as these systems start to go, your mitochondria efficiency are producing energy not just in the site of injury, but really systemically it's going to start to be impacted.

So now you have energy, lower energy states and everything just perpetuate itself. So it seems like a very difficult cycle to break. And it is. And this is why people get stuck in chronic illness, because you have these multiple vicious cycle that reinforces each other.

So the way you break it is by minding the most important things first, right? Substrate feel. How can we get fuel delivery so your body can make energy?

Your body doesn't make energy through thin air. And we just say that again. It makes energy out of the food that you eat. And you also you actually you get more efficient at making energy as you exercise more.

Don't want to forget the exercise piece. A lot of times people just take supplements to focus really on a diet, but they're not doing any exercise at all.

The missing like half of the benefit that can be had by, you know, doing more exercise. Of course, you have to exercise to your tolerance and people sometimes, you know, very fragile state may not be able to do very much.

But either way, you have to start somewhere, right? You have to break that cycle somewhere. So this is how we kind of strategically look at, okay, what's the thing that's going to have the biggest impact on the body and fuel delivery as far as oxygen and glucose?

It's going to play a huge part in metabolism, mitochondria function and therefore helping the whole brain even got access. This is so good. I mean, I work with so many people that have had traumatic brain injury that ended up with massive gut and digestive problems and leaky gut and just opens the door for microbes to set up shop and cause all kinds of other problems that you just illustrated so beautifully.

Where to Find Dr. Peter Kan

How important it is to support brain health, to support parasympathetic nervous system health, to support gut health, to support blood sugar. I mean, you wrapped it all in this perfect, perfect package for us.

So thank you. Tell us tell our audience where they can find you. Dr. Kohn. Thank you for letting me share. Yeah. So they can find more information about our teachings and messages on YouTube, actually.

So I have a YouTube channel just type in Peter Carne DC, you'll find a bullhead, a Chinese guy pretty easy to find on YouTube land. And then also our website is asked to contact. Com.

So those are probably two, two places that you can find a lot of information. Oh, that's so good. That's so good. I really encourage everyone to check out Dr.

Khan. He is so generous with his knowledge. He's a huge supporter in the functional medicine space and a wonderful collaborator in all areas. And I just want to acknowledge you for the work that you do.

You are helping so many people and so thank you for being here again to share your wisdom. And thank you for everything you do outside of this project as well.

It's just incredible. It's always a pleasure to work with you, Laura. Thank you for having me. You take care. Bye.