Introduction to the Brain-Immune-Gut Axis

Welcome to the Fasting and Longevity Summit. I'm your host, Doctor David Jokers, and today I'm excited to interview Doctor Peter Kohn. We're going to talk about the brain immune gut connection and how that relates to inflame aging and longevity.

Very powerful topic. A little bit about Doctor Khan. Doctor Khan is board certified in integrative medicine, functional medicine and chiropractic neurology.

He's a creator of neuro metabolic integration, which is a science based program that identifies the root cause of autoimmune and other chronic conditions.

Over 6000 patients from across the country have come to seek out his holistic approach that's changing the lives of those suffering from chronic conditions.

He was born in Taiwan and he immigrated to America at the age of 13. And Doctor Khan has a deep appreciation of the eastern wisdom and Western advances in natural health care.

He believes in the God given ability of the body to heal and regulate itself. You can find him at Ask Doctor khan.com. This is a really powerful interview.

We go through a lot of really great connections between how the brain communicates the immune system and communicates the gut, and how when there's dysfunction in any of those communication pathways, it's going to contribute to inflammation or really inflammation, which ages us and, breaks down our our ability to live long and healthy.

So I know you guys are going to get a lot out of this. And please share it with anybody that you know and that you care about. And without further ado, let's go into the interview.

Well, Doctor Khan, I always enjoy our conversations. You're one of the leading minds when it comes to functional medicine. And, you know, you really you really break down this idea of the brain, immune gut so.

Well, you know, you call it the big idea. So let's go into that and how the brain immune system and gut and that connection really, really plays a role with how well we age.

Yeah. Thank you so much, David, for having me. And, this topic is, is really if you look at the literature and we look at aging, we look at insulin aging, which is the concept of aging as a consequence of inflammation.

We start to see that the connection between the brain immune gut becomes very, very clear. And this brain immune gut axis is the connection between the brain, the immune system and the gut.

And of course, you know, many people have heard about the brain gut connection or the gut brain connection. The gut is the second brain, like all the stuff has been out for, you know, close to two decades now.

It's very, very clear to us that there's a brain gut connection. But I think the immune system is actually like the language that's being spoken between the brain and the gut.

And that language that's spoken through the immune system, through the cytokines and the various interactions between T helper one, T helper two, T helper 17 and all these helpers immune cells is what's coordinated action, coordinating action between the brain in the gut.

Inflammation, Aging, and Root Causes

And if this brain naming gut axis start to falter, you start to get this cascade and downstream domino effect of inflammation that begets more inflammation.

And pretty soon we have a chronic inflammatory condition on our hands that can really speed the degeneration of our brain, of our gut, and really overall, our immune system as well, meaning it can cause this accelerated senescence of our immune system and lead to a decrease ability of our body to fight off infections.

And remember, elderly people, as we age, the elderly population are the one that are more immune compromised, right? So if they get pneumonia, you know, is worse off for them, they get Covid is worse off for them because this is already age related immune senescence, where the immune system doesn't work as well.

And if you add inflammation on top of that, it's going to further degrade the immune system's ability to fight off infections. And remember, infections in and of itself is inflammatory, right?

So then the more the more your immune system can fight things off, the more inflamed you get. So what we see is that when any one of these brain, immune, gut access fails or starts to become dysfunctional, the other two area dysfunctions as well.

So there's a connection. So this is why sometimes it's kind of hard to see chicken or the egg. Is it the gut that starts the dysfunction. Is that the brain that starts to dysfunction?

Is that immune system? I think for different people it can be different, right. For some people, they had a concussion and the problem started in the brain.

And then start to get a gut dysfunction and inflammation as a result of that concussion for other people it is immune system. Maybe they had some kind of severe infection or acute infection.

And then that kind of started this inflammatory issue. Maybe this underlying cytokine storm that they just can't put out. And that started to degrade the gut in the brain.

And then yet for another person, it may have started with the gut due to chronic dysbiosis from poor diets and or American diet or whatever other reason, and that sort of cascade of brain issue and immune system problem.

So I think understanding that affords us the opportunity to kind of step back and look at the big picture. Thank you very much. And of the brain and you got access and and be able to start to kind of pull out different information from there and say, okay, where can we start to apply the intervention that will give that person the best chance to recover?

Yeah, that makes a lot of sense. You know, a lot of times people are dealing with inflammation and we think, okay, well we'll just throw anti-inflammatory whether it's anti-inflammatory medications or anti-inflammatory supplements like tumeric or proteolytic enzymes or something like that, because they're dealing with with inflammation or, you know, obviously a lot of people turn to taking Tylenol, ibuprofen, aspirin, but not really getting to the root cause or treating it downstream.

So what you're saying is let's find out where the root cause is. It is is it, you know, this immune senescence where you've got kind of these age dysfunctional immune cells that have built up that are just putting out, you know, inflammatory, cytokines creating kind of like this low level stealth inflammation in the system.

Is it an issue with brain? Right. Is a brain not firing? Well, because you mentioned trauma, concussion, something along those lines, or is it something going on with maybe a gut infection, low stomach acid levels.

Right. A lot of these these factors down there with the gut and and actually going upstream, that's obviously why, you know, you've been so successful helping people is you're not just throwing, you know, a medication or a

supplement at a symptom downstream, but you're going upstream to get to the root cause.

Though we're looking at mechanisms. Exactly. Yeah. And I think that's so important where people are looking to improve their longevity.

Fuel Delivery: Oxygen and Blood Sugar

Perhaps they have, you know, an autoimmune condition or maybe neurodegeneration in their family. You know, and they want to make sure that that doesn't happen to them.

Clearly. You know, we've talked I've talked about this. All I talk about it all the time is we got to get inflammation under control. And that's so important.

As people age, there's this condition of inflammation, aging, right where it's like this low level inflammation that's accelerating the aging process.

So we've got to address that. But most people are wondering where do I really start with that? That is a great question. Where do you start with that?

And I think this is the reason why the brain immune gut axis can be a framework to help people to understand where they might want to start with that and to to kind of go a step further.

I think there's also a roadmap that people can adopt in in deciding where to start. And we usually where I have people start is start with the things that affect the metabolism, that what I call the neural metabolic function and neuro metabolic function means how the metabolism of your body is impacted by brain function and how brain functions impacted by metabolism.

So this all comes down to fuel delivery, which means the ability of our body to deliver fuel so we can make energy from that. And fuel delivery is determined by two factors.

Number one is oxygen, right. We have to have proper oxygenation to our tissue so that our mitochondria can actually turn that oxygen into energy. And then secondly, we need proper blood glucose delivery.

So we break down food from our nutrient and then eventually ends up in it's glucose. Obviously we have alternative source of fuels like ketones. We can also burn protein and fat.

But glucose primarily speaking in a fat state, right. Unless you're in a famine situation, typically in a fat state, your body is going to prefer glucose.

So oxygen and glucose is like the currency in the body. That's the fuel that your body need in order for your brain cells to thrive. In order for your muscle cells to thrive, in order for everything to thrive.

And many people or it's very common for people to have either oxygen delivery issues or blood sugar delivery issues. So the way that may look like clinically and the oxygen issue, maybe someone has anemia, right?

And anemia is defined as having low red blood cell hemoglobin or hematocrit. These are regular cell markers. That indicates how well you better able to deliver oxygen to your tissue.

Having anemia would deprive your body of ability to deliver oxygen to your tissues through the blood. Now, there's many different causes of anemia. Not all anemia is due to iron deficiency, although iron deficiency is one of the most common type of anemia.

But there are many different ways you can be anemic, not the least of which is the anemia of chronic disease. This is literally an actual condition called anemia chronic disease.

Or we can call it anemia of inflammation because you're inflamed and that inflammation is literally damaging your red blood cell, causing the loss of red blood cells.

So you appear anemic. But but because the red blood cells being destroyed or damaged by the inflammation itself. So there's many reason for anemia. We need to identify the true reason, which can be even low stomach acid, as you alluded to earlier, which can be absorption issues, could be H.

Pylori, could be parasites, could be a lot of reasons. So we need to identify that. But anemia is a big, big deal. And another reason for people to have low oxygen is if they have low blood pressure.

High blood pressure can do it too, actually, because when you have really high blood pressure, you have a lot of vessel construction. And if you constrict that blood vessel so much, it's kind of like putting your thumb at the end of our nose.

You're going to have a lot of pressure in a hose, but the amount of volume of fluid coming out of that hole is going to be less than if you just open it up the garden hose.

So people with very high pressure or with low pressure, both are going to have decreased perfusion to their tissue, which can again affect oxygen delivery, which then again affect their ability to make energy.

So that's on the oxygen side. Then on the blood sugar side then this is something that you talk about a lot. Obviously an expert in this area and this is something I talk about a lot too, because intimately affects people's brain function, their mood and just their overall health, which is blood sugar needs to be optimal, right?

The body's pretty obsessed with keeping blood sugar and the optimal level that it has multiple hormones that are all monitoring this. And so in people who have low blood sugar and or insulin resistance results in high blood sugar and or both with your blood sugars up and down like a roller coaster, they're not going to do very well because they don't have steady fuel delivery.

The analogy of this might be a car that has fuel injection, right? So you got to get the gas into the engine block so you can have steady gasoline delivery to the burn.

If you don't have a good fuel injection system where the gas goes into the engine block sometimes, but not other times, then the engine's going to sputter and, you know, jerk and it's not going to work very smoothly.

A lot of people have unstable blood sugar to the point where the energy level is just up, down, up, down all day and the mood goes with it. And then really the metabolism goes with it.

And that's sort of drag down the hormone function, their immune function. So blood sugar is another key pillar here. So the question is where do people start?

I always have people start with looking at oxygen problems and blood sugar problems. So that's a great place to start. Yeah it's really really good in-depth answer right there.

So addressing those things is super key here. Now we start to look at how people age. You know in our society we have an epidemic of neurodegenerative conditions, cognitive decline.

Alzheimer's disease is on the rise. And so what is what is actually happening in these individuals brains as they're aging compared to somebody that's aging successfully?

Neurodegeneration and Brain Aging

Right. That's aging. Well, what is the difference? What's actually happening there? Yeah. What we see in people with neurodegenerative diseases such as Alzheimer's disease or Parkinson's disease or various different types of dementia, is that typically is typified by the buildup of these neurofibrillary tangles or tau proteins, or we'll call it

tower disease, where you have these protein aggregates that start to build up.

Now, these protein build up, these misfolded proteins that build up in the brain, do not in and ever solve a problem, because that's a normal process of your brain trying to, you know, wall off something or get rid of something that doesn't want.

So it's an essentially kind of like inflammation, right? Inflammation is not good or bad, right? We kind of say inflammation is all cause of all disease.

No, inflammation is not the cause of all disease. Chronic inflammation is the cause of heart disease. Inflammation is just something that our body naturally has as a way to help us to fight off infections.

So these misfolded proteins in our brain are a natural process of your brain trying to maintain itself. But when you have excess amount of these misfolded protein buildup, then that can start to impair circulation or neuroplasticity, synaptic transmissions.

Then we start to get these degenerative issues. Now, the question is what what will cause these misfolded proteins to even show up in the first place?

Well, a big driver is, as we talked about earlier, these fuel delivery problems, right? When you have fuel delivery problems, what happens is your mitochondria cannot do energy efficiently.

And mitochondria have within themselves these mitochondrial quality control mechanisms right through autophagy and through, my genesis or mitochondria biogenesis.

So mitochondria has a way to maintain its own function because mitochondria DNA doesn't have the capacity to repair itself like regular cellular DNA does.

So it does these processes to maintain this out. And when you don't have proper energy production due to fuel delivery problems, mitochondrial function start to degrade.

And with that it comes with decreased energy production but also increased oxidative stress and oxidative stress causes, you know, this this damage that happens, that's part of aging.

In fact, the reason we age is because we're oxygen breathing animals, right? By aerobic respiration. The fact that we burn oxygen for energy, what comes out of that as a byproduct is oxidative stress is oxidation.

So it's normal. But it builds up over time. And that oxidative stress basically causes our cells to age over time. This is why we age. And this is why, you know, eventually everything shuts down.

And this is why eventually we all die, right? There's nobody that escapes us. Only one person did. But other than that, in history, nobody else has. So the the, the if you delivery problem can causes mitochondria issue which leads to that.

And then secondly inflammation itself is also another thing that's typified in people with neurodegenerative disease because the inflammation can also cause mitochondrial problems.

So in essence, if you can't make energy your brain cells are going to suffer because of your brain is very sensitive to energy demand. And it also, if you're inflamed your brain cells doesn't work very well because these brain cells can degenerate faster in the presence of an energy deficit or inflammation, which causes microglial activation, which causes this widespread brain degeneration.

Yeah, it's powerful stuff right there. And so how does you know? You talked about oxygen. You talked about, blood sugar stability. How does that play a role in neurodegenerative conditions.

So when people have let's start with blood sugar. It's very well known that if you have blood sugar issues such as insulin resistance and the result of that, you may have higher levels of hemoglobin A1, C, which is a blood test marker that indicates this glycation damage from higher blood sugar.

Basically, when you have high blood sugar, the the the sugar molecule causes this damage to your cells. And that damage can be measured through hemoglobin A1.

C researchers have shown very conclusively that high hemoglobin A1 C is associated with an increased risk for Alzheimer's disease. And the number that we'd like to see is, you know, below five point, you know, five, five or below to begin with.

But even lower numbers like five 2 or 5 one or even 5.0 may maybe even more optimal. So that's where the blood sugar issue can relate to neurodegenerative disease simply through the mechanism of insulin resistance.

And this advanced glycation end product, on oxygen side, if you have oxygen issues, this can show up.

How Gut Dysfunction Drives Brain Decline

I mean, one way to show up is people with, dementia that's of the, ischemic type, right? As they make dementia. So what that means is they have lack of, they have mini strokes in the past, little blood vessels that pop off, and so they don't deliver blood to brain tissue anymore.

And these things develop over time. And so that brain cells get starved of blood flow, therefore oxygen. And that's a mechanism of people developing dementia as a result.

Now lack of oxygen in and of itself is inflammatory. When cells undergo hypoxia or low oxygen states, it triggers all of this inflammatory cascade. And basically you get inflammation directly from a hypoxic state.

So chronic hypoxia is very damaging to the brain. And we already know that. You know, most people know that if you go without oxygen for five minutes, your brain cells, you know, they're they're gone, they're dead.

And you don't get those back. This is why if you drown or you don't have oxygen for five minutes, that's it is irreversible. So that just tells you how sensitive your brain is to oxygen deprivation.

Even if my mile low grade, low oxygen stays chronically, that can still be an issue. Yeah. So important. And and then how does the gut like if there's issues going on with the gut, let's say gut dysbiosis, leaky gut issues like that.

How does that actually contribute to cognitive decline in neurodegeneration. Neurodegeneration as well. Yeah. This is a huge area in research, at this time where we're looking at the how the gut impacts the brain.

And in just a couple of different ways, you you talked about leaky gut and dysbiosis. So the starting with this bias is when you have dysbiosis. That means the ratio of various bacterial populations has been altered.

Right. So we kind of have a set point. Each of us kind of have a fingerprint of what are the ratio of the different bacteria. I don't like to use the words bad bacteria or good bacteria because they're all kind of there right now unless you get like, you know, acute, you know, travelers diarrhea, gastroenteritis because you got food poisoning.

Unless it's that situation in a regular situation, we all have bacteria in our gut. So I don't want to call them good or bad because they're all there for a reason.

But if the ratio of them are offset, where some bacteria are growing too much and others not growing up, that's the definition of dysbiosis. So there are location wide two, right. If they're in there.

Just absolutely in the ratio of them, and what they're doing and because of dysbiosis then you start to produce metabolites. Right. Chemical byproduct of these bacteria that are also in the wrong ratio compared to when those

bacteria a different ratio.

And these metabolites sometimes can be a problem. And these metabolites literally can crawl up to the intéret nurses and through the vagus nerve up to the brain.

And if this metabolite is a type of metabolite that's can be toxic or can trigger inflammation, then you're going to have this chemical or even misfolded protein that we talked about earlier that can start in the second brain, in a gut, in a enteric nervous system.

Crawl up the vagus nerve into the brain and then cause neurodegeneration. So that's the dis biotic side. On a leaky gut side, we know that the intestinal barrier, the of structure of the intestinal barrier is very similar to the side or structure of the blood vessel that supply blood to the brain or the blood brain barrier.

And so when you get leaky gut, that means that you're going to develop antibodies to various tight junction proteins like vanillin and actin and including and turns out in the blood brain barrier, you have the same exact societal structure. Zombieland, a cloud and a gluten.

So the antibody to those structure in the gut, it's going to circulate in the blood. And when to see those same structure in the blood, the blood brain barrier is going to launch an immune attack on that.

So then this is the reason why we say leaky gut causes leaky brain got on fire. Brain on fire. It's because the similarity of structure and when you have leaky gut, oftentimes when going to to develop a leaky blood brain barrier, which means that chemicals that normally it doesn't get through to the brain now can get into the brain.

And we're going to sort of trigger this neuro inflammatory process, micro glue activation and even neuro autoimmunity. And that all spells inflammation, which causes accelerate and neurodegeneration.

Yeah, it's all interconnected in are combined. And that's why you have brain immune gut and how it's all connected and so so important that people understand that.

Now doctor Khan what are some of the best strategies like what are things that you're doing on a regular basis that you recommend for your patients to do to make sure that they keep this brain immune gut connection functioning as well as possible, and keep inflammation under control so they can age successfully.

Thank you for that question. I think there's two main ways to look at it. One is what are some things that people universally everybody should be doing, whether you're sick or not, healthy or not, everybody should be doing.

Practical Strategies for Longevity

And on the other hand, there's maybe something that's more specific to people with certain type of pathologies or conditions that they need to be more specific with a diagnosis or assessment or intervention.

So let's start with the the stuff that everybody can do. The stuff that everybody can do relates to kind of what I said earlier, fuel delivery. Right. So we can all can improve fuel delivery.

That's where we can start. And oxygen, how can we improve oxygen? Well, that's where exercise comes in, right. If you don't have anemia or you don't have any malabsorption issue that's causing you to have oxygen issue, if everything's good, what can you do to improve longevity and help you help yourself?

That's where exercise really comes in. Right now there's many different forms of exercise. We have closed it low intensity, steady state cardio. We have high intensity interval training.

We have resistance training. Even, you know, flexibility, balance training. So there's different dimensions to fitness, right? Just like there's different dimensions to our health, mental health, physical health.

So fitness is is a big topic. But I think for in general though, most people need to improve their cardiovascular fitness, aerobic fitness, which means they can start with low intensity, steady state aerobics, which means literally going for a brisk walk, maintaining that intensity for long periods of time, however long that person's conditioning can.

So you know you want to get up to 30 45 minutes a day. I mean, you can do that every single day because it's low intensity. Therefore it doesn't stress out your adrenal, doesn't stress how you doing so and of course have different people.

If you're more in shape that low intensity, maybe a higher level than somebody who's just beginning to exercise. So you need to find out what that is for you.

But that's really important. And then resistance training is going to be really important because there's an age related sarcopenia. We tend to lose muscle mass.

As we lose muscle mass, we lose one of the biggest source of glucose disposal. Right. Because glucose burns the muscle. You store glycogen there. So having good muscle mass is important for a quality of life for, actively daily living, but also metabolic health as well.

So I say resistance training and cardiovascular. That's where everybody on a blood sugar side, it's really about a lot of what Doctor Jacobs has been teaching everybody, which is you know, using, a lower carbohydrate diet.

Right. Not every not everyone needs to be doing keto all the time. Some people, it's just not a thing for them because they have, you know, trouble with fats or they just don't need to go to that extreme.

But I think we all can be watching our processed sugar intake, our refined carbohydrate intake. We can reduce them, increasing more protein, especially as you start to exercise.

Of course, exercise also help with the blood sugar too. But on the dietary side, intermittent fasting can be a great thing to kind of reset that blood sugar.

In people who can handle it, they can do longer fasting, which is great for many, many reasons that, you know, many of the others we could talk about in the summit.

So from a dietary perspective, make it simple, right? Don't make it too complicated. You have to follow all these rules. The rule is don't spike it sugar.

And you can just simply do that by having good quality protein, good healthy fat, lots of fiber. And then carbohydrate depends on what your needs are.

Some people can do more, some people do less. So that's everybody. And then for people who have specific conditions, then this is where a roadmap can help.

Now I say roadmap. It just means a way of approaching the problem. So you're not getting confused that you think you have 20 things wrong with you, even if you have 20 symptoms and may only have a few root causes.

So we can go more upstream then and do it in a specific sequence. It might be easier for people because they'll be doing things in a specific way that's not going to cause them to, you know, take like 100 different supplements because then they're just kind of guessing, right, so that the roadmap is address the physiological priorities first.

So again, that comes down to fuel delivery. And then the next step I would address is digestion. All right. The next step I will address then will be inflammation and walk on down the road.

But you know if people would just get fuel delivery right get the digestion right, get the inflammation down. You know you already cover 80% of it, right.

And then the rest of it detox. Or if you have an underlying infection, it'll be easier to address those things if you got the first three steps correct because your body's in position.

Yeah. So key. And just to tag on with exercise even just just walking just going out for a walk I mean you stimulate stimulate your lymphatic system. You also help activate Bdnf brain derived neurotrophic factor.

And and especially if you're building muscle, if you're doing some resistance training, you're releasing a lot of myo kinds. And these myo kinds really help upregulate, different nerve growth factors that create more plasticity in the brain, strengthen and enhance the health of your neurons.

And so really good for preserving your brain exercise. One of the best things you could be doing. So powerful stuff. Well, Doctor Khan, I know this has been great.

This information has been awesome. I know our audience really loved it. What? Where can people find out more about the roadmap, the brain immune gut roadmap that you have put together and how they can go down that path if they've got some sort of chronic disorder.

Yeah. Thank you. David. The best place to find information about that is just at our website at Ask Doctor Carl Incom. And also, they can find me just on the internet, by just googling my name.

Doctor Peter Kohn, I have a YouTube presence. There is social media where there's free videos and they can find information about that. Great. Thanks so much, Doctor Khan.

You're a wealth of knowledge and you always provide great insight and really break down the physiology and the connections between the brain, the immune system and the gut so well.

So appreciate your time and guys. We'll see you all on a future interview. Be blessed everybody.