Quench Your Brain's Chronic Inflammation Today Transcript

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Introduction to Brain Inflammation

This is Dr. Talks, real talk from real doctors on the issues that matter to you most. Welcome to the Conquering Chronic Inflammation Summit. I'm your host, Dr.

David Jockers, and today I am interviewing my friend, Dr. Peter Kahn, and we're doing a deep dive on brain inflammation. We're going to go through these symptoms, major symptoms of chronic brain inflammation, root cause factors.

We're going to talk about the relationship between the gut And when the gut is inflamed, how that how that affects the brain, we're going to talk about how brain inflammation leads to autoimmunity and the roadmap to reverse brain inflammation.

So a little bit about Dr. Peter Khan. He is a boar. He's board certified in integrative medicine, functional medicine, and as a chiropractic neurologist.

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

You can find him at askdoctorcon.com. Askdoctorcon.com. He's got some great programs, great information. Always enjoy my conversations with him. You guys are gonna learn a lot here.

So without further ado, let's go into the episode. Dr. Peter Kahn, one of the most brilliant minds in the functional health space, somebody that I always enjoy my conversations with.

Today we're talking about brain inflammation, huge topic, something that you deal with a lot of individuals that are suffering from the consequences of brain inflammation.

So let's start by talking about really what brain inflammation is, what are the common signs and symptoms that people may experience if they have brain inflammation.

Well, David, always great to be on your show. Thank you for having me. And yeah, brain inflammation is a really common problem. And you know, a lot of people don't realize the symptoms that they have is actually attributed to brain inflammation.

Now, realize that brain inflammation can be a mechanism for why someone has the symptom that they're having.

Symptoms of Brain Inflammation

And in the most basic sense, brain inflammation simply means that the neurons in your brain or the structure in your brain Are inflamed now to further clarify that inflammation is not a dirty word is not a four letter word inflammation is a natural response.

It's a immune response that your body used to either try to get rid of a pathogen or try to clear up cellular debris. So when you have inflammation in your brain or anywhere for that matter, the question is asked, what's driving the inflammation, right?

Is there some kind of damage or injury or infection or some kind of process driving inflammation? So, so inflammation in the brain then can cause symptoms.

Now there's two categories of symptoms of brain inflammation there. There's a general systemic symptom that kind

of covers the entire brain. And there could be a localized symptom that can be related to brain inflammation.

So the overarching, the systemic, if you will, of brain inflammation symptom will be your fatigue. Now, a lot of people think, well, fatigue, isn't that an energy problem?

One of the first thing I do is I educate people that fatigue is a brain symptom, right? Like when you experience fatigue, you're not experiencing it in your bicep muscle, right?

Because if you have weakness in your bicep muscle where you can't lift, that's a muscular weakness. Now that can be caused by a nerve pinch, C5, innervated biceps.

So if you have C5 disc herniation causing motor symptoms, you can have a weakness of the bicep muscle. But even if you have weakness of the bicep muscle, even if you have paralysis of the bicep muscle, that does not necessarily mean that you are fatigued.

So therefore you understand fatigue is going to be a separate problem from say a muscular weakness. So therefore fatigue is really something you experienced in your brain.

So if you have fatigue, you can just go and say, yep, I got a brain symptom because that's what it is. And understanding that's important because it helps you to sort of target the right place to address the problem.

So fatigue is a common brain inflammation symptom. So is brain fog. Brain fog is a sensation that you have this you know, veil over your eye. Like if things are foggy, hazy, your thoughts are hazy, right?

Not necessarily your vision, although some people can just feel like it's difficult to keep their eyes open. They have a hard time concentrating, focusing.

People who have brain fog, they immediately like, oh yeah, that's what I got. You know, people who never have brain fog is like, what's that? So brain fog is a very common symptom.

Now brain fog can be a symptom of brain inflammation. The reason is because when you have brain inflammation, the nerve conduction between neurons to neurons, right, for you to carry on synaptic activity, that process can be clouded or impeded by inflammatory process of the brain.

And therefore the speed at which you transmit signal from one neuron to another slows down and that feels like you have slower mental processing. And because the brain works by making decisions or processing through networks, if the speed at which you pass the information from one neuron to another slows down, then the speed at which you retrieve information from different brain network will slow down.

Therefore, it becomes hard to retrieve information. So a lot of times we'll say they have brain fog. They also mean to say that they have short-term memory issues.

You walk into a room, you forget why you walk in there in the first place, you misplace things, you put the keys down. Next thing you know, you're looking for it.

You know, where's my glasses? And it's on top of your head. So these are very common symptoms of brain fog, short-term memory, and then fatigue. Those are the systemic type of problem.

Another systemic type of problem that's associated with brain inflammation is depression. is very clear in the scientific literature now that depression is not just a neurochemical imbalance where you don't have enough serotonin, therefore you have Prozac deficiency.

Depression is very clear in the literature that it's an inflammatory condition of the brain. And when your brain's inflamed, again, you cannot carry on synaptic activity, and therefore you can't retrieve information, you can't process, and depression becomes a symptom or the end result of brain inflammation.

So again, it's important to know that because if you understand that depression can be caused by brain inflammation, then the way you will address that if it's in fact caused by brain inflammation is you want to address the root cause of brain inflammation instead of taking SSRI or something that manipulate the chemicals in the brain.

Now, those are general symptoms. And then there could be specific brain symptoms. What do I mean by that? Well, you have different lobes of the brain and different specific cortex and different regions in the brain that process very specific information.

For example, your frontal lobe is a part of brain that is primarily dealt with executives decision, as well as processing of certain emotion. and also the primary motor strip is part of frontal lobe that handles movement.

Common Root Causes

So if you have inflammation in the frontal lobe more specifically, and it can give it even more detail as far as specific area of the frontal lobe, you can have something that can be very characteristic.

For example, some people with frontal lobe dysfunction may experience inability to dampen their impulses because frontal lobe help you to make executive decision loss of frontal lobe function can make someone become less inhibited.

So they may be doing socially inappropriate things, right? You blurred out in public or, you know, you know, sexually inappropriate behaviors. So these can be frontal lobe issues.

And then if you have temporal lobe issue, depends on what part of the temporal lobe, the temporal lobe is a part of the brain. That's the auditory cortex.

It's also where the olfactory center is. So smell and sound, as well as short-term memory formation, certain part of the, the language formation. So it depends on what part of the temporal lobes effect that you may have trouble with those specific functions.

So in someone with a very specific inflammation in a specific region, the temporal lobe, and this inflammation could be caused by concussion or head trauma.

It can be caused by some type of stroke. or circulatory problem, blood supply to the brain, then that can cause very specific deficit in that particular region of the brain versus if your whole brain's inflamed, then you're going to have just very general fatigue, depression, and brain fog.

Yeah, great analysis there. And I know like, for example, when somebody drinks too much alcohol, they oftentimes the cerebellum, the little brain is kind of the most, that's some area of the brain that tends to be affected first by alcohol.

And so all the different kind of DUI tests are actually testing like cerebellum has to do with balance and posture and coordinated motion. So they're doing the finger to nose and things like that.

Absolutely. Yeah. Cerebellum is an area of the brain that can very easily become inflamed and reason because the cerebellum is an area that bring the process vestibular information, which is like balance and coordination, coordinating that with eye movement and neck movement.

So very processing intensive. In fact, there are more neurons in the cerebellum than there are in the cerebral cortex combined. That just tells you that smaller volume is more densely packed with neurons than the entire cortex.

So that's just how mission critical that is. And because it's so packed in with neurons, the energy demand for it is very high. And And therefore also oxidative stress, you know, the ability to build up oxidative stress becomes high.

So you've got to have good antioxidant protection. So that part of your brain can become very easily damaged through toxins like alcohol and otherwise.

And we also know that certain food like gluten is very commonly can cross react with cerebellum tissue, cause cerebellum autoimmunity. Yeah, so those are some of the root causes.

Somebody might have a food sensitivity, whether it's gluten or dairy or really almost any food. Obviously, there are certain culprits that tend to be more common than others, but food sensitivities are a factor, toxins are a factor.

What are some of the other root cause things? I know you talked about a brain trauma, concussion. What are the big things you got to rule out when you're looking at root causes?

Yeah. So again, as we talked about earlier, brain inflammation, right? The word there, the operative word is inflammation and inflammation is not a dirty word.

It's just something that happens because your body is responding to something. So what can cause inflammation in the brain? We talk about concussion, which is an injury to the brain, right?

If you hit your head hard enough, the brain tissue inside the skull gets kind of squished around too much, can create a shearing force. can create concussive force, coup contra coup, whiplash injury, which can all cause your brain to get injured and then that creates swelling.

And then once your brain experiences a concussive or traumatic brain injury, is another word for it, is that your brain cells that are injured will go through what's called neuro-excital toxicity, because injured brain cells are not able to use energy as efficiently, because they're injured, right?

Their capacity to produce energy and utilize energy becomes deficient, and they go through neuro-excital toxicity, which is a process where the neurons literally die off from over-excitability.

See, the way neurons work is that as they go through degeneration, before they completely die off, they go through a period of over-excitability. The over-excitability literally is the pre-death of a neuron, and injured neurons tend to experience more neuro-excito toxicity.

Now, the clinical application of this is that when you go through neuro-excito toxicity, this pre-death of the neuron, neurons will sort of fire more rapidly.

That's why it's called neuro-excito toxicity. Excito means they're firing more spontaneously, more rapidly. And this can result in unstable neuron function, meaning it's firing when it shouldn't be firing, right?

So it's kind of like it's always on when you want to be able to turn on and off your brain cells, but you can't turn it off. It's always on. And then that causes the neurons to basically burn themselves out.

So in that process, people may experience unstable neuron functions. They may become light and sound sensitive. If those part of the neuron that process light and sound are going through degeneration and they're firing excessively, it may be very difficult for you to process light and sound information.

Gut-Brain Connection

People with cerebellum issues, they may go through periods where they can handle some vestibular emotion stimuli, but then if it's too much, then they'll start to, you know, wig out and they'll start to have symptoms, you know, nauseous balance problems, maybe even action tremors that are associated with cerebellum issue from overusing that part of the brain.

So people with, you know, brain injury tend to have weakness or low mental endurance. especially in that part of the brain that's injured. So those are the things that we look for.

That could be a root cause concussion or injury. Now, other things besides that you already mentioned could be food sensitivity. Now we talk about gluten because gluten is a known neurotoxin.

It's known to create neurological problems. In fact, many of the symptoms of gluten reaction is actually extra intestinal manifestations, which means that the reaction and the symptom caused by gluten reaction is outside of the intestine most of the time.

In fact, in the scientific literature, gluten reactions often associated with neurological manifestation. That's actually the most common manifestation of gluten.

They call that non-celiac gluten sensitivity. Exactly. Somebody who's not developing, you know, the gut's not being massively inflamed and destroyed like an individual who's dealing with celiac, but other areas of the body are reacting to the gluten.

And like you said, neurologically, the neurons in different parts of the brain, different parts of the nervous system are the most commonly area that's affected outside of the gut.

But keep in mind, besides gluten, there are other foods that can cause problem within the brain itself that can cross-react. For example, dairy has a potential to cross-react with brain tissue.

Egg has been found to have the potential to cross-react with cerebellum tissue. So the key takeaway here is that Food sensitivity is something you need to be aware of.

You need to track. Some people have very obvious symptoms where every time they eat certain food, they get brain symptoms. And other people, it's more subtle and it's not as clear.

So a detailed workup and history is necessary to uncover these food reactions if they're indeed the cause of brain inflammation for some people. So we talked about trauma.

We talked about food issues. Now, Infection is another category here. There are many infections that can either directly or indirectly cause brain inflammation.

We know many of the viruses like herpy family viruses can actually literally crawl up through the vagus nerve and across the blood brain barrier, get into the brain and cause brain inflammation.

And we also know that there are many other infections like bacteria. This is what meningitis is, right? They can cause infection of the meninges and therefore cause inflammation in the brain, encephalitis and so forth.

So there are, and mycotoxin from mold, mold exposure can also cause issues. So we know that infections can drive inflammation in the brain. And then the next category will be things like your environmental toxins, like heavy metal toxins, or any number of things that would get exposed on a daily basis.

can get deposited in the brain. And once in the brain can create oxidative stress, which causes tissue damage. And then you're going to have inflammation as a result of that.

Right. So those are the major root cause factors. Now, what is the relationship between gut, the gut health, right? And the gut microbiome and perhaps intestinal permeability and gut inflammation.

And how does that correlate with neurological symptoms and brain inflammation? Yeah. And then, you know, many people are familiar and may have heard of, you know, this brain-gut connection or the gut-brain connection, depends on who you talk to.

You know, people who are more focused on the gut, they'll say the gut-brain connection, putting the gut first. And other people who are focused more on the brain will say brain-gut connection, putting the brain first.

But really it's a bi-directional connection. communication, both hardwired through neurological pathway and lymphatic system pathways, as well as chemically through different neural peptides and cytokines.

So the brain and the gut are intimately involved in each other's function. And the reason is because the brain is mission critical. And it's constantly trying to communicate to the gut what is happening within the brain.

And so back and forth, the gut is also communicating with the brain what's happening in the gut. So in a gut, we have what's called the second brain. And these are the enteric nervous system, which is this network of neurons that innervate the gut.

And some people say that the enteric nervous system have more neurons than the entire spinal cord combined, right? So your spinal cord is all neurons that transmit information from your, from the body up and down through the, through the rest of the body to the, to the brain, but your enteric nervous system has more neurons than the spinal cord.

So that just tells you how densely populated it is. And what happens is through a process called leaky gut, which is intestinal permeability, you're going to develop this double whammy of malabsorption and inflammation.

When you have leaky gut, the intestinal tight junction starts to become disintegrated and becomes more permeable. And microbial content, dietary protein, and whatnot starts to leak in and out of the intestinal lumen into the systemic circulation that drives an inflammatory immune response.

This inflammatory immune response is actually not happening just in the gut. Remember, once you have leaky gut, this process is an immune response that starts at the gut, spills into your systemic circulation.

But once it's in the blood, you have all these cytokines and chemicals that are signaling, hey, we got damage here. We got something we got to kill. That inflammation chemical is just in your blood, sloshing around, and it gets to your blood-brain barrier, which are just simply blood vessels that supply blood to the brain.

And if they and when they cross the blood brain barrier, it's going to signal to the microglial cells in your brain, which are specialized white blood cells in the brain to say, Hey, we are on alert.

Make sure you guys, you know, get geared up for war here. So the microglial cells in the brain will start to become more sensitized.

Brain Inflammation and Autoimmunity

They can trigger more inflammation than normal. And then that can be an impetus for. brain inflammation as well. So gut problem can definitely lead to brain symptoms and brain inflammation and vice versa.

Brain inflammation can also lead to gut inflammation. Famous study, they induce brain injury in animal studies, like in rat studies. And when they lesion the rat's brain within hours, they started to see the intestinal lining started to disintegrate, meaning leaky gut.

So this process can happen really rapidly and clinically we see this play out too. People with concussions, they tend to develop more gut issues, they get a leaky gut, and that can later on develop into systemic inflammation and even lead to autoimmunity.

Yeah, it's fascinating that relationship. Now let's talk about brain inflammation related to autoimmunity and how those are linked. Yeah, so autoimmune disease obviously is a condition where the immune system attack the body.

Now, you can have autoimmune attack any tissue in the body, right? It could be thyroid organ, could be the pancreas, could be the small intestinal villi, could be the liver, could be your joints, could be your cartilage, but could be the brain itself.

Now, when you have autoimmune disease, what happens is your immune system is basically lost tolerance to self-tissue. So there's certain degree of loss of self-tolerance, and even certain degree of loss of oral tolerance.

Oral tolerance is how well you tolerate things you put into your mouth. That means how well can you tolerate the food that you eat? And people with loss of oral tolerance typically have more sensitivities, food sensitivities.

And people with loss of oral tolerance, typically this is associated with leaky gut as well. So it indicates that leaky gut has a big role to play in autoimmunity.

And when you have autoimmune conditions and you have usually leaky gut associated with it, and what happens is your entire immune system becomes essentially more sensitized because you're constantly reacting to something that's constantly in your body, which means self tissue.

For example, if you have autoimmune to thyroid tissue, You're constantly going to react to thyroid tissue. The thyroid tissue is always there. If you have rheumatoid arthritis, you're constantly reacting to your cartilage and your joint because your joint is always there.

So it's kind of like almost like you are constantly having an infection and your immune system is constantly trying to kill an infection. But instead of the infection is constantly attacking your joint, attacking your thyroid, attacking whatever tissue you have autoimmune.

So therefore, the inflammation at baseline for someone with autoimmune, it's always going to be greater than inflammation at baseline for someone who doesn't have any autoimmune.

The question is, how much can we turn that volume dial down to dampen that immune response so then the person can experience remission and improve quality of life?

Now, the connection here between autoimmune and brain is that once you develop autoimmunity, again, your immune system is more on high alert. You're going to have this intestinal permeability, you're going to have cytokines, and all this can get to the blood brain barrier.

Many of these cytokines can simply cross the blood brain barrier without even the blood brain barrier being damaged. We used to think that, oh, the brain is an immune privileged site, which means that the brain with the blood brain barrier is kind of like a fort that protects the brain against peripheral immune responses.

So that if you're fighting virus, bacteria in the body, your brain kind of just being left alone. But we now know that the blood brain barrier has many different mechanisms through active transport, passive transport, meaning things can just get transported through the blood brain barrier, up passively or actively with energy pumps without having blood brain barrier breach.

So you don't have to have blood brain barrier compromise to have these cytokines cross and trigger some type of brain inflammation. And once that brain inflammation starts, what happens is anytime when you have inflammation that's out of control or more excessive than your body needs, then that inflammation is going to cause tissue damage.

In the brain, when you have too much inflammation, it causes tissue damage to brain tissue. When you have tissue damage to brain tissue, you're going to have brain cellular fragments of brain floating around.

And what happens is your immune system is going to start to pick up those cellular fragments of your brain, and it's going to start to make antibody to it.

Now, this is worse when you do have a blood brain barrier breach. Because then antibodies and B cells from the periphery from outside the brain can cross into the brain.

And these B cell will start to be able to make antibody to brain tissue. And that's going to promote brain

autoimmunity. So this can actually become the onset of neurological autoimmunity.

And this could be against any neurological tissue. It doesn't have to be just a region of the brain. It could be against a specific protein. It could be against a specific receptor like dopamine receptor antibody.

could be any protein really, any tissue in the brain. And this can become a problem because once you develop autoimmune to neurological tissue, even if it's not an autoimmune disease yet, because autoimmune disease come in stages, in the early stages, it simply just causes tissue destruction and inflammation.

And that's where you get the brain inflammation symptom of fatigue, brain fog, depression, short-term memory issue that we talked about earlier. So this could be just this diffuse pattern and kicking common go wax and wing because that's the nature of autoimmunity.

So periods, you're fine periods. You're not fine. Sometimes you eat something. It makes it worse. And other times you're just worse just because your immune system just flares up because you're stressed or you have blood sugar spikes.

So this can become very difficult for someone to identify, diagnose until you realize this mechanism and you can start to make that connection between gut issues, inflammation, brain symptoms.

Right, and if it doesn't get corrected down the road, you're damaging all this brain tissue that leads to neurodegenerative conditions, dementia, plays a role in Alzheimer's, plays a role in Parkinson's, ALS, right?

All of these types of issues. Yeah, even if you currently say you have this inflammatory response and you have some type of autoimmunity and that's starting to create these neurological autoimmune reaction, but it's not a disease yet.

Even if you're not diagnosed with any kind of brain autoimmune disease. But that damage is still occurring. And over time, it's going to lead to, as you say, David, neurodegeneration.

Because neurodegeneration simply means you're losing neurons. Now, we're all losing neurons every single day. Just from having this conversation, we lost a few thousand neurons just from normal processing, normal aging.

But the key question here is that, are we losing neurons before its time? Are we losing at a faster pace than what we can compensate with neuroplasticity?

If we're losing neurons at a faster pace, then neuroplasticity can compensate for it, then we're going to have loss of function. And that's neurodegenerative condition where people start to, you know, they get lost, they forget what they are, forget names.

This can become very severe. Yeah, for sure. And you use that term neuroplasticity. Let's tell the audience, explain a little bit more about that neuroplasticity.

Neuroplasticity and Brain Repair

And then let's go into the roadmap of things we can do to help support brain tissue and dampen down the inflammation. Neuroplasticity is a process where neurons can make new connections to other neurons.

So the way the brain works the brain functions, I should say, is not by growing more brain cells. In fact, on the day that you're born, you were born with the most number of neurons.

And every day that goes by, you're losing neuron, losing neuron every single day. Now you say like, so how can everybody have any brain function left by the time they're 70 or 80? Because obviously 80 years later, you'll have a lot less number of neurons or brain cells than the day you're born because you're losing them every day.

the thing that makes up for it is the fact that we can develop neuroplasticity. And neuroplasticity is your ability of your brain cell to connect with another brain cell and therefore make a network or develop a learning pattern so you can do things more efficiently.

So babies You know, they can't really do taxes. They can't program your VCR. Oh my gosh, I just dated myself. So, you know, babies can't do very much.

They can't even walk, but through time they get the brain cells, the brain gets myelinated, but then they also develop plasticity in doing the things that they do all the time, right?

Anything you do with repeated practice gets better. You get more skilled at it because you're literally developing more plasticity by having brain cells connect with each other that help you to perform that particular task.

So developing neuroplasticity is actually the other half of the equation. Yeah. You know, compared to, you know, nutrition, right? We talk about nutrition a lot, blood sugar stability.

Like one of the main costs of brain inflammation is actually blood sugar, which I failed to mention earlier, but, but, you know, all of these things that we talk about can be fixed by nutrition.

But the other side of that is plasticity in, in functional neurology, you know, we say the neurons are kept alive by fuel and activation. Fuel comes from the food that you eat.

Activation comes from doing stuff with your brain. That could be physical activity, that could be thinking, that could be doing things with your brain.

So the activation part is just important as a nutrition part. Quick note on that too is Einstein, they actually studied his brain at Stanford and they wanted to see, did he have more neurons?

Was his brain larger than the average individual, the same body size? Found, you know, basically brain size, exact same as somebody else of his age and, you know, and body size.

But he had twice as many synapses, these little gaps that create that connectivity and connect different areas of the brain that allow for more creative thoughts and, you know, in-depth thinking.

And so that was kind of proof of this idea of neuroplasticity and how big a role it plays in our overall health, quality of life, and just our ability to, you know, obviously Einstein came up with ideas that revolutionized the world.

Well, I would say there's nature versus nurture, right? So some of, some of this is genetic, right? How much, how much neurons you're born with, how much, you know, your capacity to make synapses, but there's also nurture, right?

Your environment. And I bet Einstein probably did a lot of exercise with his brain. right? By thinking through different models, thinking through math equations, you know, theories and like this constant abstract high level thought thinking probably is like exercise for his brain that helped to build that plasticity.

What's interesting too is he actually did a cerebellum exercise. I don't think he knew anything about it, but he would they say he would pace back and forth and almost like do like almost like a heel-to-toe walk, right?

Like he would pace and sometimes he'll close his eyes and just kind of visualize when he was really trying to—trying to solve something. So he was actually working certain areas of the brain associated with balance, you know, and so movement in general, right?

Helps rev up the brain, stimulate BDNF, brain-derived neurotrophic factor, and he would do that while he was thinking. A lot of people say, you know, I get my best thoughts Right?

When I go take a walk, right? Or something along those lines. And so, so it's interesting, you know, and you know, I don't think he knew anything about real brain physiology, but he found that that helped him think and come up with breakthroughs.

Yeah, movement is life. And it's not surprising that that really helps him. Yeah, absolutely. Well, let's go into the roadmap now. Strategies people can take to reduce brain inflammation and support neuroplasticity.

Right. And then the roadmap really is taking from just some of the things that we talked about, right? The first step to the roadmap is understanding what's causing the problem.

You know, have a high level understanding of some of the mechanisms and what are some of the causes so that we can work our way backwards. But in the way that I help people and educate the public is that there are certain Priorities, right?

Certain things are more important on the roadmap or should be done first compared to some other aspects. So for example, one of the big things that I talk about is blood sugar stability, which is something that you talk about quite a bit to metabolism.

I think that is so key for brain cells. Most people. I think obviously we need to focus on the micro as well, the micronutrients, but the macronutrients just as important.

Roadmap to Reduce Brain Inflammation

I think sometimes we're so focused on some exotic herbs and some exotic vitamins, we're forgetting to just get our protein right, get our blood sugar right, get our fatty acid right, intake of fat, protein and carbs, and just getting the right amount of calorie for us or the timing of the calorie.

I think that's really important. So for brain function, blood sugar is really one of the most important things. And so therefore, if you have hypoglycemia, you got to fix that because your brain cannot function on low blood sugar.

It's going to go through neuro excitotoxicity. In fact, the symptom of hypoglycemia where you get a hangry is literally neuro excitotoxicity. And so, so, you know, when you get hypoglycemic, you can't just say, Oh, I just get a little hangry.

It's kind of funny. I act kind of funny when I get hypoglycemic. I don't think it's funny at all. Cause you know, you just said bye bye to some neurons and you're not getting those back when you get hypoglycemic.

It's almost like you got head trauma. Yep. That's how serious I will put that. Right. And then the other side of that alone that I put at unequal importance as blood sugar is oxygenation to the brain.

Right. And we all know how important oxygen is to the brain. Your brain can't function very long without oxygen. And it's not going to function very well with sub optimal oxygen.

An oxygen problem can come in the form of anemia, can come in the form of poor circulation, can come in the form of low blood pressure or too much blood pressure.

High blood pressure is just as bad as low blood pressure. They both can cause perfusion problem. because when you have high blood pressure, you're basically choking off the blood vessel because they're constricted so much.

You have less blood flow, therefore higher pressure, low blood pressure. Same thing. Low pressure. Both means that you don't get enough blood supply to your tissue and that's the brain.

Then your brain is going to suffer. So those are the two things that I look at first. I got to make sure those things are working right before I do anything else with somebody.

You know, people always jump right into heavy metal detox. I say, you know what, let's get your blood sugar right and make sure you're getting blood flow to your brain.

If we can do that right, then you might have better luck with heavy metal detox. So those are the two primary. And then the next thing is obviously work on digestion.

Now, when I say digestion, meaning your ability to break down nutrients, because if you can break down nutrient, then you're going to have a chance to absorb them better.

And, and after digestion, of course it's absorption. So really we want to work on digestion in a sequence way, right? Starting from mastication, even vagus nerve, we want to go above mastication brain function.

drive digestion, mastication, and then, you know, stomach acid, pancreas, gallbladder, intestine on down. So those three things we can get right for most people, it's going to produce a lot of improvement.

I would say though, those are kind of the foundation thing. So an outlier will be if you hit your head, if you have a concussion. Well, those three things still matter because if you already have blood sugar problem, you already have oxygenation problem, you already have digestion problem, and then you hit your head, you're the one that's going to have more complications from that head trauma than somebody who's got all those things right.

Again, it's always about doing the right things on a lifestyle, keeping everything at baseline good so that you're more resilient against head trauma or COVID or illness or whatever life might throw at you.

Yeah, that's really good. And then I know why this isn't as personalized, but what are some of the top supplements that you have found that help reduce brain inflammation in the body?

Yeah. So when we have brain inflammation, remember what's happening here is that your immune system, your brain is upregulated, right? Specifically, the primary cells here that are at play is microglial cells.

These microglial cells outnumber your neurons by about 10 to 1. So there's more microglial cell than you have neurons. And these used to be thought of structural cells.

just kind of scaffolding. But now we know that they're actually immune organs. They may have some endocrine function. They do a lot. And these microglia cells, they can have an M1 or M2 phenotype, which means that they can be in an inflammatory state or they can be an anti-inflammatory state.

Same white blood cell. Microglia cells are simply macrophages. They're macrophages in the brain, but they can take on two different shape and function depending on whether you irritate the heck out of it or not.

So we want to do things that will promote these microglue cells to take on the anti-inflammatory phenotype. And the way you do that is through nutrition, is through proper exercise, through proper sleep, managing stress, healthy gut, minimize inflammatory responses, and having less toxic burden.

So really the foundations of functional medicine is what we're talking about here. But specifically, What can help dampen microglial activation from a supplement?

Right? What we add a lot of time, we help people by taking away, taking away gluten, taking away too much glucose, right? Taking away stress. But as far as supplementing, what will we add in?

I think, you know, that your basic. Fish oil is like one of the most important things. The reason because your brain is very highly high composition of structural fat, right?

And the cell membrane is structural fat and myelin sheath is structural fats. Your brain is like 70% fat by composition. So getting fat into your brain is going to help with the general structure.

Also, when you have brain injury and brain inflammation, your brain will literally sacrifice or take out the omega-3 fatty acid like DHA from cell membrane to help dampen inflammation.

So you want a supplement with omega-3 DHA, which are specific omega-3 fatty acid that are used by neurons to kind of provide its own structural integrity.

So fatty acid can be really important to help dampen some inflammatory response. I think glutathione is hugely important. That's one of my favorite supplements because it serves so many function.

You know, some people have trouble tolerate glutathione or NAC or sulfur compounds, but you know, for most people, this is something that's just so critical.

And glutathione it being an antioxidant can help dampen that oxidative stress. And when you hit your head with brain trauma or you get inflammation in your brain or otherwise that you're going to have more oxidative stress happening.

So dampening oxidation is always helpful. And glutathione is going to be a key player there. Vitamin D can be important here because vitamin D can modulate dendritic cells.

and other immune response and upregulate Treg cells so that we can have less of an over-exaggerated immune response can be really helpful in people with autoimmunity.

So those are the top three that comes to mind. And then as far as dampening inflammatory response due to NF-kappa B response, turmeric, resveratrol are very helpful here, oftentimes used in combination.

And these are kind of addressing inflammation and the common denominator, the final common pathway where all inflammatory signal eventually comes into the nucleus of the cell.

And then that triggers this N of kappa B self-implifying loop. So if we can block it at that step, then we kind of dampen many of the other downstream inflammatory response.

Yeah, that's a great summary right there. Really good stuff. Dr. Khan, this has been a great interview. We can go in so much detail on this, but that's all we got for today.

Great topic. And obviously, people can reach out to you at askdrkhan.com. And any last words of inspiration here for our audience? Yeah. I mean, I think for brain function, most people should really focus on the foundations, right?

The foundations being blood sugar, right? Metabolism. Dr. Jockers talks a lot about fasting and ketone diet, and those are really helpful. I think for most people, exercise is a underutilized tool.

stimulate blood flow to help keep the brain function and bring healthy through movement and also through blood flow. I think those are the two biggest ones.

And then obviously we got to mind the environmental exposure to toxins and, you know, processed foods or too much sugar, but it's actually It's actually not that difficult, right?

It's simple. It's not always easy, but it's simple. Once you can distill it down to the foundation basics and do the basics really well, and then we can work our way up the chain to do the more complicated stuff.

Yeah, really good stuff. And there is hope because your brain can rewire itself. It can heal and rebuild. You can create neuroplasticity no matter how far degenerated your brain has become.

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