Traumatized: How Severe and Traumatic Brain Injury Can Cause or Worsen Dementia Transcript

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Introduction and Speaker Credentials

So. Welcome back to the Reverse Alzheimer's Summit. I am your host, doctor Heather Sanderson, and I am thrilled to have doctor titties crazy in here today.

He is literally the author of the book, Why isn't My Brain Working? He's also a clinical research scientist, academic professor, and a functional medicine health care provider.

He's an associate clinical professor at Loma Linda University School of Medicine and a research fellow at Harvard Medical School, and a researcher at the Department of Neurology at Massachusetts General Hospital.

Doctor Crosland earned a PhD in health science with concentrations in immunology and toxicology and a Doctor of Health Science degree from Nova Western Southeastern University.

He completed his postdoctoral research training at Harvard Medical School and Massachusetts General Hospital. Doctor Karasik earned a master of science degree in human nutrition from the University of Bridgeport, a Doctor of Chiropractic degree from Southern California University of Health Sciences, and a master of Medical Sciences degree in clinical investigation from Harvard Medical School.

Doctor Crowson, you were a busy man. You have more degrees than anyone could count. And so much expertise having shared a couple of patients with you.

Your insights are so, so valuable. Thank you for joining us today. I. So I want to dive right into actually one of the things that I've seen you, where you've really shone a light for me in terms of helping support patients, which is TBI, is so traumatic.

Brain injuries can create inflammation in the brain. They can create, you know, poor vascular supply and perfusion. Lots of things can start going wrong if somebody gets in a motor vehicle accident or hit over the head with a baseball bat or has a football injury, you.

You have this really amazing individualized approach that you take. Where do you start? How do you create these individualized approaches? Sure. So you know the neurology when you do a physical examination and usually listen to patient's history.

So usually the areas of complaints patient has tells you what areas the brain may have been injured. And the interesting thing with brain injury is there's been a lot of research with it.

And what we're realizing is this phenomenon, they call it chronic traumatic encephalopathy. CTE really turns on the same protein messengers that lead to Alzheimer's disease, the top protein hyper phosphorylation, and, even the neurofibrillary tangles.

And there's really overlap between the path of physiology of Alzheimer's disease and a traumatic brain injury can then perpetuate that process or can contribute to that process overlap.

I'm going to say, but, you know, worry. So. So the key thing is where do we start as we try to look at what the patient's deficits are. And many times when instrument brain injury that's a factor.

The deficits don't happen directly after the brain injury. One of the, you know, basic thoughts in the past was, you know, you get a brain injury and go, well, how do you feel?

And then maybe for the first few days you feel a bit off and maybe after a week your normal and all the symptoms have gone away. But really, in fact, what's happening is there's an injury in the brain and in those cascades take place and sometimes 7 to 10 years, the clinical presentations show up.

So for example, if someone injures their frontal lobe, then we know they have issues down the road with focus, attention, concentration, being able to stay on task, executive functions like planning and fall into and stuff.

Some patients hit the back of their head into their cerebellum, and years later they start to have this dizziness and vertigo and instability. Some patients injure the parietal lobe to notice that you're falling more the tripping more on from the opposite side the most coordinated.

If they close their eyes, they may not be able to notice where their limbs are in place. Some people injured a temporal lobe where they'll have difficulty with hearing if there's any background noise, or to even get spontaneous, tinnitus or tinnitus.

People say, so really, a lot of time just kind of listening to the patient, just noticing what their deficits are.

Assessing TBI and Brain Injury Deficits

Now, unfortunately, the health care model, most people will just hear the deficits go, well, that's just you getting older. That's just your personality.

But it's not. So, you know, and these things happen slowly over time. So it could be your handwriting change can getting sloppier. It could be having a hard time remembering phone numbers and recall.

It could be totally dependent on the navigation system all of a sudden or not, it was said over a few years. So those are the first things we look at just for the history of kind of where the deficits are.

We don't associate any loss of function to personality. We don't try to label it as aging. So that's one of the first important things. And it's like when we do an exam and then when you do it on a logical exam, there are two types of findings.

One or what they call hard neurological science, and the other one they call soft neurological signs. So hard neurological signs would be like you close your eyes with a test called Rob, for example, where you check your balance and you fall over.

That's like a positive rhombus. And a soft version of that would be you don't fall over, but you just you made its way just to one side. And it's pretty consistent every single time.

And those are soft signs. So we're trying to do primate validation. We're trying to look for all these different soft signs. So when people get things like chronic traumatic injury or some degree of early neurodegeneration or late neurodegeneration.

They don't completely lose all function, but they start to lose some function. And those soft signs are typically ignored when people do neurological exam because, the emphasis is to really look for these hard, clear, pathological signs.

And that's not really how the brain works. The brain doesn't just go from white to black. You know, there's shades of gray. So we try to find the areas of the brain where they're shades of gray, and then we try to activate it.

So when neurons are injured, for neurons injured, and this neuron is healthy, the neurons activate, it can branch over the injury, which is called plasticity.

And we try to create a diet and lifestyle environment where they where plasticity can be optimized. And then we have to activate those pathways with exercises.

And if you don't know what kind of exercises, you know, to do, if you're just listening to this and basically whatever you can't do, it's what you do.

So if you're bad with numbers, then you do numbers. If you're Palantir's band, then you focus on your balance. So that's a simplified version of it. But that's, that's the what we call a functional neurology rehabilitation approach to support the brain.

So a lot of patients that come to me, they've been to a neurologist, and the neurologist says, you know, there's really not much we can do as your brain ages, as you mentioned, this is expected you should have less and less function.

And our expectation is that that just progresses. And sorry, there's not you know, good luck with that. What you're seeing is very, very different. It's this concept of neuroplasticity.

So what how can we change our brains in positive ways as we age? How can we take control of this process? Right. Yeah. And I just want to mention up things, you know, every every practitioner is going to have their bias based on their training at least what they're seeing.

So for example, if you went to a physical therapist that works with traumatic brain injury all the time, they're going to be like crushing the plasticity.

Of course, you can set things to change versus if you go to a person who's only looking at serious lesions and dealing with just diagnosing and that really working with the rehabilitation part of it.

So that's important to know if you're suffering from a brain issue too, because, each each practitioner has bias. And sometimes you would think, well, maybe the head of neurology at this department would be the expert in this.

But if they realize they're, they're seeing only one part of the big picture. So when it comes to diet, nutrition impacting the brain and when it comes to rehabilitation to take the brain, you really should talk to people that are that are doing that.

And they have a different perspective because they live in a different world. But so what can you do? Well, there's lots of things you can do. And, you know, the great thing about the brain is what's so fascinating is even if neurons get injured, even if neurons degenerate, the concept of plasticity is neurons scratch over it.

So in a clinical setting, whenever we see someone, for example, has traumatic brain injury or neurodegenerative disease, you know, we try to identify what things are promoting in.

And of course, and there's lots of notice in the world published factors. Some can be modifiable, not on the patient's compliance, that issue, but the controlling blood sugar levels, controlling insulin resistance, avoiding pre-diabetes, getting physical activity and, optimizing vascular health and blood pressure and blood flow, increasing antioxidant status, reducing, mechanisms.

Political brain inflammation, your inflammation, increasing antioxidant status. Taking compounds and increased blood flow. There's a lot of there's a lot of variations and, there isn't like a, you know, you can say some general concepts about them.

That's why I wrote my book. Was my brain working with each section like, goes into a different mechanism. What is a blood sugar? What's on brain inflammation, on essential fatty acids.

And, you know, you you can really have to kind of combine those, for the, for the person. But it definitely requires an active patient. Like your brain is not going to get better on your own.

Your your brain is certainly not gonna get better by taking any medication. And your brain is going to get better just by taking the supplements, really a complete diet lifestyle and then activation approach that really makes the

biggest difference.

That's consistent with what we've seen both at Marama and for me, clinically, that there are a lot of patients we can help and the ones that aren't getting better, there's usually something we're missing.

There's some part that they don't feel confident in, whether it's the diet or, you know, they don't like to swallow pills or they have a big stressor in their life or nobody's looked at their thyroid.

There's usually a component missing. And when we get as comprehensive as possible, the, my confidence certainly goes way up in what in the results we see.

Yeah, it's one of those things too, is sometimes, well, compliance is absolutely necessary that, when you look at brain rehabilitation and brain optimization, it definitely requires the active participant from the patient.

And the higher their level of motivation, the better that you can get. But the the scary thing about it is sometimes, like, for example, the frontal lobe will degenerate to the point they don't have any more motivation, drive or executive function, so they really can't do it.

Even so, there's a point of like almost no, there's a point where they need assistance, when it gets really bad. But also at that point the prognosis is really poor.

Sometimes they can't swallow because there they go. Pathways are impaired and they feel like they as well, which is a red flag. Anytime someone can swallow their brain to get access to start to degenerate.

So, you know, that's the unfortunate thing there is, there is a period of time. So if you're suffering from a brain related, site, if you like, start to have mild cognitive impairment and you notice it and things just really start to change for you, you know, time is of the essence.

You really need to jump on top of it. There could be a point where you get enough degeneration, where you pass this, there's a threshold that you just once you pass it, it's really hard to get some kind of change.

And right before you reach it, it can be a tremendous change where you can kind of stay where you are or even improve and then really delay the time it takes to to get to that degenerative change.

And that is probably the most important principle for most people to know about and understand. Yeah, that the sooner we can act, the better. And in fact, what we should be doing is preventing this from ever happening at all.

And with TBIs, I'm curious what your thoughts are. You know, sometimes we're seeing patients where it was decades ago that they had an injury, and sometimes it's just been days.

So if you can intervene within days, does the treatment plan change? Yeah. So we should like first off a visit to brain injury. So we know within the first six months things like hyperbaric oxygen therapy can make a huge impact for them.

But once they get past that six month window like a year later, we don't see the same degree of change. Studies have shown in the acute stages of brain injury.

For example, progesterone has been shown to be very protective, and even hormones through the early stages can really dampen the inflammation. And, there's been multiple studies now published on, survival outcomes and function in emergency rooms after TBIs when they use hormones.

And that's testosterone. A pedestrian being really very powerful, because they have a very powerful anti-inflammatory effect in the acute pain stage, and they help with setting the stage for healing.

So those are, you know, immediate protocols that there's some evidence for when someone gets an acute brain

injury. And then once, once the out of there, out of the acute phase, you know, things change.

Now, one of the phenomenons that take place with brain injury is this. This concept called microglial priming. So neurons, actually change that was the baseline there.

But microglia there's two separate cells in the brain neurons in microglia after traumatic brain injury. These microglial cells, they change their shape into a, what they call opioid shape.

And they start moving and circulating and they stay in that one area and they're very hyperactive to inflammation. So at that point, the person, wherever the brain injury is, that area of the brain becomes extremely sensitive to inflammation.

Neuroplasticity and Functional Rehabilitation

So when you look at inflammatory mechanisms, even if when you look at, not just the TBI word, but the Alzheimer's disease world air pollution that impacts the pulmonary brain axis, the microbiome, the great the the gut brain axis, inflammatory diets, the breaches, the blood brain barrier, infections, environmental chemical load.

Those things can then amplify and add fuel to the fire. And if you have areas of the brain where there's a traumatic brain injury, those microorganisms that have been traumatized from the injury are just there.

And they're very reactive and inflammatory responses. And that perpetuates the degeneration in that area at a faster rate than any other regions of the brain.

Because of that initial, trauma. So that's certainly a traumatic brain injury is a type of trauma. Stress is also a type of trauma like psychological or emotional stress.

How does that impact the brain, and how is that different from a physical trauma. Right. And research that has linked psychological insult as trauma to that.

And they have this priming effect as well. So there's, you know, the different explanations for it. Some of the secondary, I'll just explain from a stress model where when you get stressed out, your cortisol levels go up, your stress hormones go up.

That that tends to activate an immune pathway called IL 1617, which activates is glial cells that promotes inflammation. And in the world of neuro immunology, there's there's a concept called neurogenic inflammation for, the brain itself can promote inflammation throughout the body.

That inflammation throughout the body can then trigger inflammatory responses. So high stress environments, activates this neurogenic inflammatory response.

So, you know, the combination of, traumatic brain injury and stress is really big deal, but just want to point out a traumatic brain injury, traumatic brain injuries.

But they don't have to be you don't have to lose consciousness. I mean, a past car accident catches up with you, playing an active contact sport for many years and having cup blows.

They can be a factor. And the other major, key thing to understand about brain injuries. It's not how hard you hit your head. It's how. How what they call primed your glial cells before, before the injury.

So your immune cells have a certain degree of inflammation at any given time. But if you take, let's say, two people person, one person, they should be.

And so the mistake person here is, they're a smoker. They're a diabetic. These are interesting information. It's really bad diet. They really don't eat any kind of healthy anti-oxidants foods.

And all these things increase the inflammatory load. And let's say this person is not those things and they're they have decreased inflammatory triggers.

Well, they may both get the same impact to their brain, but this one with the greater degree already preexisting inflammation, it's going to have far reaching effects down the road.

So that's the other key thing is you know how it's not that hard. You eat your head. Sometimes very trivial impacts can cause a devastating impact. That's the same effects in the long term down the brain based on how much information the brain had before the injury.

I'm curious. Another summit guests had mentioned that it's not just the brain either, that also spinal cord injuries can have a similar effect on, on cognition and on and of course physical function and create this.

Michael Glial activation that can set you up for, you know, poor cognition later ten decades down the road. And so I'm curious your insights about, you know, we think of them as TBI, traumatic brain injuries.

But what if it's another part of the central nervous system. Yeah. And so so anything so there's a constant I think presynaptic to the neuron. Can caused caused by offices in the postsynaptic pool which is neurology term for basically meaning you have a receptor.

So it's first of all the first concept is this neuron has to fire to this neuron to keep it healthy. And this neuron has to fire to next to it to keep it healthy.

So neurons are like muscles. They have to constantly activate each other. They activate each other. There's a process that takes place. There's single mitochondria that's formed.

The energy production becomes active and they basically function. So if this neuron no longer fires this neuron, which set fire to the other one like a domino effect, then you start to have a degenerative change that takes place.

So you could have someone who has a spinal cord injury, and the motor pathways that impact the frontal lobe can get impacted. The cerebellum, they have cognitive issues.

You can have someone who ends up, you know, injuring that hearing because they're listening loud music their whole life and they're a roadie at concert or something.

And all of a sudden their temple of to generate much, much faster. So any, any type of receptor site degeneration leads to lack of activation of neurons downstream over a period of time.

Those those pathways just kind of the generator when the when the way to some degree. So they call that, you know, intricate degenerative changes that take place going moving forward.

So it does happen. So the injury could be anywhere. And then the effects are downstream many times somewhere else. So in the in the world of the physical examination and functional allergy model, we can know where the injury is and then kind of start looking at entire pathway postsynaptic and kind of see what's happening.

But that is really kind of another thing that seems to exacerbate dementia and memory loss is when people lose their hearing. So when they're not or there's a there's vision as well.

So they're not getting those inputs into the brain. Is that another sort of a way that this is happening where you're getting degeneration because you're not getting those that the nervous system is at firing, those neurons aren't firing because you're not getting the inputs.

I mean, it depends also on the age, too. If you, for example, lose your hearing or your vision at a certain age, then you're you have this ability for synaptic connectivity with the synaptic pruning and you kind of sneak up for it.

That happens later in life. You don't have the same output. So, it happens later in life. You don't get to have a re figurations and connections and, and then that area of the brain is no longer getting stimulated.

And then again, it does start to generate, just like if you tied your arm up and never moved it for six months because arm is going to be totally atrophied, right?

So same thing with the brain. If they're not getting input and activation, those proteins also don't get activated and they start to degenerate. You mentioned young brains.

So what can we do early on? You know, for like a developing brain a child say to help prevent Alzheimer's from happening in their lives? Yeah. And I can tell you have a daughter and, you know, for me, I'm I'm all my goals in Alzheimer's prevention is how do I optimize my daughter's brain to take over the world, you know, but what are the strategies? So there's a lot of things I wanted to do.

My wife wouldn't let me do one on my daughter and oxygen and do therapy and issues and stuff, but I was able to do some other things. But. But the point is, what can you do?

Well, I think, first of all, activation brain's really important. It's very important for kids to have physical exercise activity with as much coordination and reflexive movement as possible.

So that's critical for developing motor development. And motor helps cognitive development. So a sport, especially a sport that requires a lot of movement, coordination, timing, planning is ideal for brain development.

They have to learn language. So basically it's sports language and music in multiple languages. Would you recommend that? Yeah. Even better. But yet activate language centers. The brain.

So the process of going to learning languages, the process of, listening music, playing a music instrument is important. So I think every, every kid should be, focused on learning a language.

Multiple languages is great. Playing a physical sport, that requires most intense motor coordination, if possible. If they enjoy that sport and then obviously how to play musical instrument, then outside of that, it's basically keeping inflammation down, making sure they're eating healthy diet, making sure they're getting a lot of healthy fats in their diet, making sure they're not eating the standard American diet, which is all processed fats and processed.

And if that's making sure that gut microbiome are really, really healthy, you know, so like my daughter, like she starts every morning up and she takes resveratrol and and turmeric and fish oils and they stuff her microbiome.

And you know, she has a little drink we make her has like we blend up like 30 different fibers, in a food processor. Give a couple scoops of that. And that's just been her retention.

She was a she was a little kid, and she keeps her brain really active. And she learn the language and plays instrument. And, what's your instrument? She plays piano.

And she also likes to sing. So she kind of is combination of those things. And that's that's been great for her. And so would you recommend the same things on the other end of the spectrum is that the foundation. Let's.

Yeah that's finished. But here's the thing. Whatever you don't like to do when you get older is what you have to do. So you can have a tendency to not want to do it.

Like if you're bad at math, you don't want to do math. So when we work with patients, I get neurodegeneration. Really? Yeah, I know you're 50, but you're going to have to open up the fourth grade math app and go over your multiplication tables and divisions.

And now they have all these games where they play games and they, you know, it's like math and so forth, or you get to do a word recall or word matching or image matching, you know.

So we try to use a lot of apps to help them.

Acute Brain Injury Treatment and Inflammation

And then also, you know, a lot of the online platforms like luminosity and different cognitive, tools are very helpful for people and stuff to do on a daily basis.

Or at least 2 or 3 times a week, and they can keep a score. But that's been a nice trend to see that the commercial environment has gotten to where they have these, you know, subscriptions where they can start doing some cognitive tasks.

But contests are really important. And in the also, like a physical movement, if you don't have physical movement, your brain has no chance. Sedentary lifestyle sets you up stage with very little chance of improving your brain.

And, you know, you say, well, just go for a walk. You know it's not enough. You need some more, you know? And just like they say with diabetes, if you just walk, you people should child care.

But just statistically significant, statistically significant. We should study, but not really quickly with relevant, you know, so you really want to, you know, move as much as you can play, play as much, you can dance.

Dancing is phenomenal for the brain. And, so, so motion and movement, even even trying to learn a new language you may like, never learn it. You might want to say, hey, I want to learn German and I'm French.

You may never get to the point where you can actually speak it fluently. It doesn't matter. It helps your brain stay healthy. It helps your brain develop, so it does apply to to adults.

And maybe as an adult, you go, hey, I want to learn how to play a guitar. It doesn't even matter if you're good at it. The task of doing it is very therapeutic for the brain, and I think we tend to think of like, what's my end goal?

Well, if I'm never going to speak French, I'm never going to play the guitar. Then I shouldn't do it. You know, I'm not going to compete in the dance contest.

Doesn't really matter. So those things can be social and they can be really important. But sedentary lifestyle with lack of activation, like vegging out on Netflix or watching TV all day or just gossiping all day, is not going to help the brain we've seen that is that people move into Merano.

A lot of times they're addicted to TV. It's almost like a sugar addiction. They're asking every day, all day long, oh, can we turn the TV on? I really want to see the news there.

And I've walked into other care facilities where, you know, there's a TV on each on each wall and ones that the news on another one's blaring advertisements the other side of sports game.

And my brain doesn't work when it's under that much inundated by that much auditory stimuli. And so I can just imagine if you were searching for a word or if you're, you know, trying to remember someone's name, that that would really throw your brain off track and be hard.

Yeah. Certainly not only hard to to hit, which is hard to function once you realize when people go into some of these retirement homes, they're really designed for the staff to not deal with the patient.

They're putting a place where they're sedated and watch all this be entertained in the salon. And that really creates environment for brain degeneration and brain aging.

So, you know, so be aware that if you're using taking family members somewhere, you really want to be in a place where it activation and learning installation and have healthy food.

Yeah. I mean, I've been to visited retirement homes where exactly that like there is no stimulation for the people there. It's very little involvement, it's voluntary. And of course the brains are tired, fatigued, want to volunteer to do anything.

And then the food is horrific, like the worst things for the brain. Processed food, microwave food? No, no. Nutrient quantity, quality. And of course, of course that's going to create the stage for accelerated neurodegeneration.

So what role does, diet play a neurotransmitter balance? I'd love to dive into neurotransmitters. It's through choline, of course. Dopamine, Gaba, serotonin all of these have a lot to do with mood, cognition and diet, of course, is the building blocks so that we can produce those neurotransmitters.

So the ideal diet how do you feel about keto. Well, yeah. Ketogenic diet is, without question multiple studies very effective for reducing brain inflammation, improving feel to the brain.

And for someone who's starting to notice cognitive declines, it's really a phenomenal way to make a big change, a game changer. If you know what you're going to ketosis in in new studies have shown that you know the theory of ketosis.

You get into, you start using fats for energy. And fatter ketones are a better fuel source for the brain. So it's so it's easier to to function with a better fuel source.

But ketones are actually anti-inflammatory and they actually prevent inflammation, which is one of the key mechanisms of all neurodegenerative diseases.

Whether it's traumatic brain injury causing regeneration or Parkinson's disease or Alzheimer's disease. So ketogenic diet are really, really important.

We use it all the time with patients that are suffering from brain injuries, in the recovery phase. And for people that are sort of get cognitive declines, it's a key thing.

And obviously it's important to take a break from it. You know, like it's, you know, like every month or so they take a few days off and then and some patients don't, they're like, I don't, I don't if I go off it, I'm going to feel awful for days and I want to feel that way.

So and then others are like, well, I can last three weeks, I can't do a month. And then I need like a couple of days off. Okay, fine, whatever works for you. But if you can have, zombie time in ketosis, that can be very, very beneficial.

So ketosis is very important. And then, you know, when you look at neurotransmitters, you know, there is research that shows things like taking amino acids, like five hydroxy tryptophan or, you know, different precursors can, can help support some neurotransmitter activity.

And as that has an effect that's short term. But the bigger changes would be physiological factors like blood sugar control. So insulin surges in blood sugar spikes can really disrupt all neurotransmitters, and neurotransmitter signaling pathways and neurotransmitter transport proteins.

There's a very important one called layered love neutral media acid transfer that's completely dysregulated with insulin surges, insulin spikes. A lot of research continues to show the microbiome has a huge impact on neurotransmitter activity.

And, things like lipid polysaccharides and various bacteria produce. What are called post biotics or different versions of polysaccharides, which have an impact on brain so and neurotransmitter function.

Stress, Microglial Priming, and Sensory Loss

So we don't really are just starting to understand it, but we definitely know having a really healthy microbiome and a diverse microbiome is critical.

And and ketosis is really critical. So we, we use something we call a keto microbiome diet where they're in ketosis, but we don't let them have like their diet, pure saturated fat and fried food all the time.

And we actually removed dairy. Dairy since be very inflammatory. So we do a ketogenic diet. And we we encourage a lot of diverse and fermented vegetables that are low glycemic.

So they can stay in ketosis. The combination of really helping the microbiome stay healthy and then get into ketosis, that seems to work really well. That's amazing.

So the integrity of the gut, that is also a factor in brain function, right? Leaky brain, leaky gut, they usually come together. So it is the ketogenic diet help with that.

Or what's your approach to healing a leaky gut or leaky brain? It's a, there. So there's a clinical mechanism and what's been published. So there's differences in those as well.

But, first of all, I would say that studies show that when you have intestinal permeability, there's, there's some there's a higher chance that you have, blood brain barrier probability.

We published a study in 2020, international journal Molecular Science, where we took patients that had inflammatory bowel disease also using Crohn's. And we measured of the blood brain barrier permeability proteins.

That's 120 different markers like liquid barrier. And we found like a linear relationship. If you had leaky gut, you had perfect barrier and measure something called an R-value, which is we, you know, the exact fluid statistics that are listening.

It's a way to to measure that association. And it was like the highest you can have is 1 to 1. And it was almost it was pretty high close to what one and and, or the other papers to see if that connection existed.

And it was very, very prominent. Other restriction, similar things. So typically when you have a leaky gut, leaky blood brain barrier, and that just sets up the stage for inflammation happening in the gut and information the gut is sure to activate inflammation brain, to multiple pathways.

And then inflammation in the brain is really going to accelerate all, all types of neurodegeneration and disrupt neurotransmitter signaling. So both both report what do you do with basically ultimately you know, you kill the gut.

You you approve their diet. You get rid of inflammatory foods. Certainly ketogenic diet can be helpful because you immediately stop insulin, surges from going up.

So insulin is very inflammatory. It activates something called the rage called receptor advanced glycation end product reaction they call rage for short instant triggers that and then once that rage reaction is triggered, you're going to have significant neuroinflammation.

And it's been directly linked to a risk factor for Alzheimer's. So the advantage of ketosis is you you you know, ketone insulin levels sometimes drop by 50%, in people to at least 25 to 50%.

So that immediately dampens inflammation to help stop the blood brain barrier heal helps to get here. Get heal. And obviously these lots of nutraceuticals you can take to support those pathways, which are mostly antioxidants, anti-inflammatories and things like that.

We talk about them in my book in great detail. But yeah, you know, I'm curious about your brain book. You published this in 2013 and here we are. It's 2021.

You know, it hasn't even been a decade. But yeah, the research has just exploded. I mean, there is so much that well, I'm wondering I guess it's my question what's changed and what's been the same?

What would you add to that book if you were writing it today? I would just add a chapter on ketosis and urban fasting. That is. More and more research has come out, but I find that, you know, like, you know, like liberation protocol quite popular.

Like, yeah, we were doing that 20 years ago for the medicine community. I know it's like now a new thing, but it's like, yeah, every single step you're talking about in that program we, we did 20 years ago and we actually published it, at least in that book, you know, ten years ago.

So for us, it's not new for us to treat information and brain, is it? I think it was I think, you know, Doctor Brenner said who I really admire, is it's been a phenomenal molecular Alzheimer's disease researcher.

He was able to show some key studies where these things change. And for people who've never seen it, they're like, oh, my God, you can actually change, can't decline.

And we're like, yeah, every day I, I think for you and I, it's not shocking, right, that these things work. What we're doing is very common sense, right?

We're we're creating an environment where every cell functions better. So of course the brain is going to work better. And if you take away all of the crap that doesn't allow it to work, well, then of course it's going to work better.

And that's really what you detail. And I think in just preparing for this conversation and, and chatting with you over the past couple of years, you know, when I've gone back to that book, I've been kind of surprised, like, wait, he's been doing this for decades.

Like, this is not brand new. And really, right now, I think what our job is, is to tell everyone because they're still getting that message from neurology.

It's like, here, try some namenda and good luck with that. It doesn't work great. But yeah, it's what we thought. And to give credit. And then honestly, I think we are in the world of, preventive medicine left on this and we are lacking clinical trials.

So that's one of the. So I do have, some understanding why convention neurology is not so open minded to it because, you know, the world of research, you have to have some degree of evidence and and to sway things.

And, you know, we don't have a like, for example, any, any really good clinical trials that have been published. So all we have are these little case studies and clinical trials and, and that really requires an extensive amount of time, energy and money to incorporate.

But one of the things that's become very clear is that, treatment for the brain and things like Alzheimer's, dementia, it's a multivariate model. Multivariate model means you can't just take one single thing and then expect an outcome.

So when you design a clinical trial, the typical approach is you get two groups. You randomize them so their age and weight and height and everything is equal between those two groups.

And that accounts for like all confounders or things that can change. And they give one person to the treatment and one person to intervene in placebo.

And they just want to over time that like an endpoint at the endpoint, maybe we're going to check your Montreal cognitive assessment form or check a memory recall or whatever it is.

That's how they do it. And every single drug that's been used as a treatment for Alzheimer's has really failed in that

model. For the most part. And the part of the clinical trial is that a multivariate model with potential lots of various confounders, they can't be they can't be just accounted for by randomization, makes it hard.

So when are you looking at improving the brain? You know, for some people priming the brain would be you really have to control the blood sugar in the prediabetes.

And really improve the vascular health and get them to move for someone else. That's an athlete who's overtraining and has too much oxidative stress. And they have like, mycotoxins exposures all over their house, and they're really getting sick and they have respiratory disease and they're not getting blood flow to the brain.

It's totally different set of variables. So when you put them in a clinical trial, you can't really match for them. And it's not enough randomization.

So the difficulty is and so again for credit if you if you're looking at clinical trials for the level of evidence we don't have them. So it's understandable why a lot of really hardcore research based neurologists in major departments would be like, I'm not convinced yet.

And they're not because we don't because that hasn't been done. So so that's why we're looking at it right out right now at my clinic, we are still recruiting for a clinical trial, and it's an observational trial.

We're not doing it. We're not setting them into two groups because I think that's where we are at the stage in the research. What we need to do is add more, you know, we'll take a cohort through which hasn't been published quite yet.

Hopefully by the time this goes live, Doctor Peterson's group of 30 will have gone through that and that will be published. But we'll add another 25 to that.

And then the next step is probably these these controlled trials where you have two arms and you can compare what happens if you don't do these individualized treatments.

This is when you do put together a comprehensive, integrative, individualized approach. And I mean, I don't think you would I will be surprised by what pops up there.

Childhood Brain Development and Cognitive Training

But you you really can't blind it, right? In what the conclusion that you come to is that, well, it's not humans that can't do this. It's that the model, that the scientific model and that that kind of inquiry doesn't match the complexity of the brain in the human system.

Yeah, this this is a really good point. The study design limitations of not being able to do a placebo and, and then and having multivariate and lots of different confounders.

They're not going to be able to be completely satisfied accurately with a clinical trial, which is what makes it really hard. So this is where we have the disconnected gap between people that are not really poor in this type of diet because they don't have the evidence they want.

But the truth is, don't understand. You can't really create the best study design for that. Now. We definitely in the field can be more like, great, you're doing studies now that people are doing studies as well, so that'll be great.

But then I can be satisfied unless there's a multi thousand multicenter trial with two arms and placebo controlled, which was going to be very, very difficult to organize properly and right.

And at the end, because of so many different types of confounders, in order to get to reach statistical significance, you're gonna need to have such a high number, which makes it cost prohibitive.

So that's that's the frustration. The frustration is practitioners and people that work with lead really should see changes every day. It's like not even a surprise to them.

It's almost expected when they see. Yeah. Oh and from in my practice if somebody is not getting better I go what am I missing like this definitely affected that you get better.

So like let's let's dig deeper. Let's figure it out. Let's find out what we're missing. Because it's not that you can't get better. That is not the answer. Right.

So so that's one that's one side right. And the other side is like I don't see this lower dose. So I can't. But you know, it's I, I think you're saying is anecdotal and that's in the patients.

And between the I don't know what to do because I talked to this very prestigious person at this department and, and these people I really trust in, they're experts in the field.

But they're telling me and I went to this alternative person and they told me, you can do all these things. And, you know, I don't want any snake salesman stuff.

And they're kind of frustrated. They're not sure at the trust. And but at the end of the day, you know, nothing's going to happen if you improve your diet and nutrition and lifestyle and move and optimize your brain function, you know, it's not like it's going to hurt you.

And it may actually have a huge impact on your health. So why not? Well, and billions of dollars and decades of time have been spent studying these medications.

And oftentimes what they discover is that when you remove the beta amyloid plaques, when you remove the tau proteins, you can be successful at that using the medications, but you actually get an increase in cognitive decline.

So you get a worsening of the symptoms. So you know, it does. The model is broken right. The the model that we're using. And at some point patients are going they just won't put up with it.

Right. Like they're going to continue to ask for solutions. And and hopefully we will have the studies soon enough before the baby boomers kind of hit this.

You know, there's so many people. There are millions and millions of people that are expected to be diagnosed with Alzheimer's over the next ten, 15, 20 years.

And I think these kids are clamoring for solutions. Yeah, it is very true, is very true. And also, you know, with, Alzheimer's disease, the plaques may also have a protective role.

It may be that the information we published, the journal we published, studied from Alzheimer's disease, 2017, where we were looking at the different pathogens that cross react and how actually the plaques themselves are protected.

They reduced the inflammatory cascade all over the place. There's obviously things that then trigger the abnormal apolipoprotein expression, which is pathogenic, but it's not just always bad.

And it's a model of a single agent, a, you know, not a multivariate, but just one variable that's involved. And then you want generalizability for the entire disease process.

And that's why that's why I think people are confused because you can't you can't answer some of the questions that people want on one side and that people are observing and they're frustrated because if I'm, why aren't these people jumping on board?

And it's not like these people are caring and want all the same things. They just they have a different way of

thinking in a different standard for how they accept things.

This group is just like, well, what's going to matter if we just, you know, change your diet and from the lifestyle and then this you just giving false hope.

And this just gives like you're not doing whatever. And the patients in between. That's the environment. It's not going to change anytime soon. Like it's going to change in the next 1020 years.

How are we going to do more and more research is going to come out. More people are going to be open minded, but I don't think we're going to get the big, big change because of these limitations.

If you could design a study that would illustrate what you're seeing clinically, what would it look like? What would require a huge sample population?

And then we'd have to do a lot of subgroup analysis, and we'd have to have multiple endpoints. And like those types of clinical trials, like you need an entire hospital team, but you can do it on your own like you had to get a recruiter you have to monitor so you'd have to have it would be very difficult.

And then on that point, you still can't blame some people that be very difficult. And because they never get they getting treated, they know, you know, that they're doing it.

Exercise study group is not. So again that's the problem. You can't design now. You can do some things. And I think like you did, you're doing some great work.

You have a study out on the people working on a trial. But you like to say you're not going to change the field of neurology, even if there's a 30 person clinical trial.

Well, what about like a Framingham type trial, your Framingham type study where it's a big, large, huge. But so there's no there's a retrospective thinking to go, hey, it's a retrospective study.

We don't you know, retrospective study has problems. Lots of confounders. We need a randomized double blind clinical trials. I mean, the same issue. There's some but this is this is a world of research.

Right. So coming. Right. Well we contribute where we can which we try to a ton of women's. But I just want to point it out and point by.

Diet, Ketosis, and Gut-Brain Health

This is if you are a person suffering from cognitive decline, just know that these are the the this is the atmosphere. You're right. Like this is what's happening.

Both groups have best intentions in mind, but each person has their biases and the way they think of things and how the world are seeing things from. So know that there's going to be some of those, different opinions and different approaches that know that there is valid reason for both sides and then decide what you want to do.

Doing nothing is not a good idea, without question. Optimizing your health. Make some change to improve your brain function and your overall health and physiology is going to be good for you no matter what.

I really appreciate that perspective. You know, the patients are who suffer, right? They are the ones that get caught in the middle of this argument. And it's not about being right.

It's really about getting the help to the people who need it. And thank you for just really, you know, I mean, I'm in a department of neurology at a hospital doing research, which is totally different then I'm in the trenches doing alternative medicine, which is totally different.

So it's like, these are really, really great people. These are really, really great people. They think this way, they think this way. And then the invitation to go to do it, you're like, well, sorry, but that's frustrating.

So anyways, that that's important people to know that because I think they, they still end up knowing like it's, it's it's the atmosphere. Right, right.

And everyone is really trying to do their best to help. Yes. Yeah. We're going to spend an entire day talking about toxins and the summit here and how they change cognitive function.

But I would love for you to just weigh in on that topic. We hadn't talked a ton about it. You mentioned pathogens, which can kind of act like a toxin as well, creating, you know, signaling that the brain needs to protect itself.

But I'm wondering what your clinical experience has been around detox. Yeah. And it also, I mean, I've had several publications on, on chemicals, how they impact the brain that we've published and made a contribution to this.

But in literature and one of the things that we saw, there's toxic chemicals that increase inflammation, they increase oxidative stress. They they activate and promote the neurodegenerative process.

And that it's I don't think anyone doubts that anymore. I think it's pretty accepted. But something that we contributed to was that it's not really the amount of toxin you get exposed to, but whether you start to have immune reactions to the chemicals.

So we did some initial studies where we looked at, for example, BPA, BPA found a plastic products, and we found that certain toxic chemicals like BPA in plastic products and that your problem is, you know, like a fire retardant, which is like your furniture that sprayed in those type of compounds, everyday compounds.

For some people, they can bind to their proteins in their blood, rejecting material albumin. And then when they bind to the protein, it changes the structure of their protein.

And then the immune system starts to make antibodies against it. And then this is where a trace amount of the chemical can, can then cause these immune reactions.

So our initial study that we did we published in the Journal of Applied Toxicology, we looked at 400 healthy blood donors and when to go hey. And we randomized them to like race and age of the US population.

So you get some clues of how this affects to a healthy human population. This was a group of people have no disease. But we found between 10 to 15% of them had chemical reactivity.

So then we did some follow up research. And we go over these people that chemical reactivity, how many them have brain inflammatory markers like myelin basic protein Melander filament.

And it was a high percentage of them. And so we published a lot of issue showing even not the toxic level, but just these trace chemicals. If your body starts to react, immunologically to them, that can actually cause auto antibody reactions and cause inflammation in the brain.

So, so the contribution that I can kind of share with you that maybe other speakers haven't is this, this immuno immuno reactive rule that takes place now.

And the question is like, why does this happen to 10 to 15% of population, not the other percent. And it really goes back to what's called immune tolerance.

So immune tolerance is the body's ability to react to the environment not reactive. And that goes back to microbiome health and leaky gut and healthy T-cell function.

Those are the things that when they get disrupted, caused you to react abnormally, had an exaggerated response

to environmental things. And that's where, we believe that some of this, trace amount of chemicals, even though it's not high, can cause significant impacts on people.

So everyone's measuring the load like, hey, what's your heavy metal load, how much toxins you have, how much more could have been? But it's also good to measure chemical, antibodies.

So for example, Sara has a panel called chemical right 11, which, I was on the team to help develop. And that measures for chemical antibody reactivity.

So this might also explain why a husband and wife say they're in the same environment, exposed to the same thing, but one of them is debilitated in the other isn't.

Or even the siblings, you know, people in the same household, if we see this come up a lot in the old world, well, why is she sick? But I'm not. And we're in the same environment.

And that is a really great explanation for why. It's because there's a different immune response because of other factors. Right. And again this is as multi variable kind of soup that we live in that that's real life that you can't separate all of these out, that they really come together to create either health or disease.

Yeah. And this is a in the field of immunology. It's called chemical tolerance. So if you have people of different degrees of chemical tolerance and chemical resilience, everyone you have people living in the same household doesn't mean they're gonna have the same reaction.

Someone can have a better time than the other person. And this is why sometimes it's frustrating for a person suffering through it, because they go and talk to their spouse.

Again, I don't this this mildew Nolan. These things, bother me, like, you're just you just put this in your head like I can't feel. So how could it be real for you?

But it is real for them because they have a different immune immune system than they do. Exactly. So what are the most harmful toxins when it comes to cognitive function?

Can it can we separate this out? Is there something that we should really aim to avoid?

Research Limits, Detox, and Mood in Cognition

Or is it just like detox as much as you can and good luck. Good luck out there in that toxic world. In obviously the more oxidative stress or inflammation it causes, for sure those those would be most toxic.

And I'm sure you have speakers. That would have the list better than I do. But I think at this point, because my focus is always been on the immunologic response to chemicals, not so much the actual oxidative toxic load. So, you know, but but the most common is obviously solvents, pesticides, you know, the ones that we really like, but we're not working in, in factories and being exposed to magnesium metals in the air and breathing it in for most of it were were around cigaret smoke were and in the freeway with car exhaust were sleeping in and beds that have lots of, plastic compounds.

It's favorite fire retardant eating a Jennifer through plastic compounds. Those are those all play a role to they're not as toxic as, let's say, mercury free and harmful.

But they they can definitely. Especially if you have an Australian tolerance. They can be a significant contributor to neuroinflammation. One of the things that we see show it is this overlap between anxiety and depression.

And then cognitive decline. I would love for you to talk about the role that mood plays in cognition and maintaining good cognitive function. I mean, when you look at the so like times that's really relate to frontal lobe degeneration to the frontal lobe, is where you have focused attention concentration and you executive functions.

But your frontal lobe also has a pathway that dampens an area, the brain of a little bit brain. And these are called frontal striatal projections, where the frontal striatal projections that generate becomes very easy to get excited and you get nervousness.

So it's not uncommon for people to have Alzheimer's disease or dementia or Parkinsonian and or yeah, whatever brain injury, CTE, they have these, injuries to the frontal lobe.

If they forget the frontal striatal projections, the injured or degenerated, they will absolutely have anxiety with depression, focus and concentration issues.

So I don't think it's specific neurochemical I mean because we see it in we do a thorough exam. We're like oh the frontal lobes are not doing well. So we need to rebuild that.

Do we build the frontal lobe. We see those things change. So I don't think it's chemical specific. I think it's more of a pathway. Well this conversation has certainly been good for my brain.

I think I've learned new things. It's certainly made me a little happier because it's always a pleasure to talk to you. And, I've learned just so much every time that I've interacted with you, every time I've opened one of your books and Doctor Crossing, and I just can't thank you enough for spending some time with us and sharing with all of our listeners.

Where can they find out more about you? I don't think I've tried. So I don't think you're taking patients anymore. Yeah. We just have a long waiting list, so.

So that's a problem. But we have I mean, I work with patients every week, so. I mean, I still see patients and I work with them. My, my website is called doctor K news.

Okay. And ors.com. I have lots of articles on brain health and applications. So if anyone's interested please check that out. And then obviously my book was in my brain working in one that's available on Amazon and bookstores.

And you train providers as well ready for any providers listening. Yeah. So I do do do postgraduate education. We have an education system called the Crossing Institute.

My last name, Institute. And if you're interested in learning, from a clinician clinical perspective, how to work with chronic diseases, you can always check out the crossings to.com.

Do this satisfying work that we do with reversing dementia, reversing cognitive decline. So.