How Traumatic Brain Injuries Impact Cognitive Decline Transcript

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Introduction and Dr. Crosbyu2019s Background

Welcome to this episode of the Reverse Alzheimer's Summit. I'm your host, Dr. Heather Sanderson, and I'm delighted to introduce you to Dr. Crosby. And today he's an associate clinical professor at Loma Linda University School of Medicine, a research fellow at Harvard Medical School and the Department of Neurology at Mass General Hospital.

He's also a fellow of the American College of Nutrition and a faculty for the Institute of Functional Medicine. Welcome, Dr. Crosby. Thank you so much.

So I can't wait to share with everyone what you found for those who are suffering with traumatic brain injuries. We know that this is a risk factor when it comes to developing dementia or memory loss and impairment later in life.

And yet there's so much more that we can do about it than I think people realize. And you and I have shared a couple of patients and one in particular has suffered with a traumatic brain injury after a military career.

So I've seen the work that you do. I've heard firsthand how it can benefit people. And I'm really, really excited to share it with our audience. Yeah, absolutely.

Head injuries are totally overlooked and one of the main problems with head injuries is that people have this thought if you get a head injury, all your deficit is lost right after the injury.

But all the current understandings of head injuries, which is in the field, what's called chronic traumatic encephalopathy, CTE, is that the symptoms are going to show up years and years later.

So it's basically the head injury, the head trauma ignites the fire like in the forest, starts to burn up. And then it could be years and years and years when a person really starts to notice some deficits.

It could be five years, ten years with two years. So then they have a hard time trying to associate their symptoms of cognitive decline and brain function, and maybe mood disorders and depression and sleep imbalances with with head trauma.

How Traumatic Brain Injury Leads to Delayed Symptoms

And then they, you know, they get regular routine lab tests that are just going to show they don't have metabolic disease and they're going to be frustrated and they're going to be like the, you know, confused, weird patient.

And then, you know, no one's going to believe them. And they go through this whole episode of not knowing what's happening, being confused and getting really frustrated throughout the process.

And so you mentioned sleep even, and I can only imagine that if you start stacking these risk factors on top of each other, right? You have a traumatic brain injury and now you're not able to sleep as well.

And maybe there's extra stressors, particularly for people in like a military situation, less so in a sports situation or even in a domestic violence situation where there's physical head trauma.

But there's also a lot of stress associated. And then if somebody isn't getting great nutrition, they're not getting exercise, it's almost this, you know, downhill spiral in terms of brain health.

And in particular with brain injury and brain injury. One, the phenomenon that occurs with it that's a little bit different than, let's say, conventional Alzheimer's disease is with the training injury to the brain, the immune cells in the brain

called microglia become really active.

They become primed and they become extremely sensitive to inflammation that's caused by anything, whether it's their diet or environmental triggers, or if they get an infection, they get symptoms right away.

And these glial cells, once they get primed, they just stay there and they just can't. This constant inflammatory response and one of the biggest clues, someone has, glial priming, is the neurological deficit symptoms from trivial exposures.

For example, you know, let's say someone who has a milk sensitivity and for whatever reason they have it, they they get exposed to milk proteins. For some people, they get like bloated and distended if their milk sensitivity.

But for some of the people, they may have like massive vertigo. That happens with specific injury to, let's say the cerebellum or the frontal lobe may be injured and they may start to have focused in concentration and attention issues or someone else, their temporal lobe is injured, then they may have tinnitus.

So one interesting things about traumatic brain injury and its impact on causing decline is that these glial cells get activated. And one of the biggest clues, the clues that it is these when proportional responses to inflammatory triggers and the symptoms that each person will get is going to be specific to the area of the brain that was injured.

So it's going to be different for each person. And, you know, some people get, you know, counter-coup injuries where they hit the fender back and, you know, front and back of their head and they get multiple sets of lesion.

But it's pretty clear that it's a neurological injury that's perpetuated over time that then created in five responses. That is an inflammatory response for the glial cells.

They train on these same mechanisms of like tau protein buildup and things like Alzheimer's disease, and eventually they will get coded decline. So the biggest clinical red flag is when someone reports that they have an A on proportional response to an inflammatory trigger.

Something really fascinating because you're describing something highly specific. You can point to the area of the brain that was injured and then sort of expect this bias.

However, people injure different parts of their brain. And so there are different responses. And so even though it can be highly specific, it's hard to connect the dots often, I would imagine.

Yeah, it's very hard to connect the dots. And you know, that's the thing, too, is like people, you know, most physicians, most health care providers learn about the brain and they pass their boards to, you know, they have some confidence in it.

But when it comes to clinical applications, they don't they're not trained to think that way, you know, but when you really think of the brain, you know, different regions have different functions.

And then when it's injured, it's inflamed and they may show up years later if the injury there's clear presentations. So some can have like mysterious leg numbness that only happens or face numbness.

And it's the sort of parietal lobe that was injured. Right. Or someone could have issues with falling asleep because they can act then inhibit the reticular formation.

So all all these different weird symptoms, a lot of times are really brain injuries and they just get overlooked. And we don't really have a health care model.

Even the world in neurology, there's not really health care model. We're looking at traumatic brain injury that is starting to express itself four or five years later when the acute brain injury, I think, you know, there's some pretty good models to really get in there, just what he mentions.

But once an injury starts, the activation of these inflammatory cells in the brain kills glial cells and creates that cascade and that inflammation will then start to destroy the surrounding neurons in the area.

And over time, more and more of them will get degenerated, and then it actually accelerates. And then the more inflammatory features they have in the lifestyle with that injury, the faster it progresses.

And then they really end up not ever having anything significant enough to show up on an MRI because these inflammatory responses won't show up within routine MRI and they don't see anything wrong with lab test.

So the patient is completely fresh.

Why Brain Injuries Are Missed in Routine Care

You know, with a neurological exam, you can clearly see deficits like they can't feel part of their face. We use a, you know, a pinwheel or a tissue. They can bounce on their leg, they close their eyes and they get vertigo like there's something wrong.

So it's clearly identified through an exam, but not really through imaging or just routine bloodwork. And as you mentioned, many doctors learn those exams in school, study for boards, and then kind of forget them for the rest of their career.

And so you need to go to a highly specialized doctor who practices this regularly. Now, I want to go there, but first I want to break it down. You mentioned that there's a model that many people know for acute brain injuries and then there's a less well known model for what to do when symptoms are starting to present themselves many years later.

So can you take us through those two things? Because I know many of our listeners either have experienced them and maybe it's been in the past year or maybe it was 25 years ago.

What do they do if they're in one of those camps? So if you have an acute brain injury, you have like a six, six month window name window to make dramatic changes in the expression of this. And first of all, when we look at studies have been published in trauma journals, you'll see hormones that immediately improve survivability.

So there are some trauma centers that as soon as you get a brain injury, they'll they'll put the person on it. On progesterone, DHEA, testosterone is shown to improve their survival and the effects of their injury.

So we know hormones right away seem to have an anti-inflammatory effect. They protect the brain from injury. Hyperbaric chambers are phenomenal. And especially in that first initial when I mean, after brain injury, the sooner they get into to hyperbaric chamber or hyperbaric chambers just basically to push oxygen into their tissues in that pushing of oxygen through the tissues breaks down the vicious cycle of neuronal injury that takes place after trauma.

So it can be can be very, very protective. And then from the world of nutraceuticals and then as usual applications, we know that high amounts of fish oils, EPA, DHEA, we're talking like five, 10,000 milligrams have been shown to have some benefits.

So it's not like one cat, one capsules, like a thousand milligrams. So, you know, about a 10th. Of lucky, right, if you get a good one because I'm going to get 3 to 500 milligrams.

And so we're talking about big doses. Doses, yep. Some people would want to do as a liquid rather than all those capsules. Yeah. And you have to be cautious if you're on blood thinners to do something like that.

But outside of that, I think most people that are they should be okay with them. And then flavonoids, there's lots of different flavonoids that we associate with its food color that have been shown to damage these glial cells.

So green tea, extract, turmeric, resveratrol and all these different flavonoids we've all been able to cross the blood brain barrier. And they definitely also as a matter of fact, if you just were a scientist and wanted to know, how do I dampen glial cells, what's been published in the National Library of Medicine, you're going to basically finding flavonoids as your main, main application.

So we saw we saw an acute head injury. We try to look at considering hormone replacement in just the acute stages. And it's not about hormone, it's not about balanced and hormone levels.

It's just to give him some juice. And Bricknell alone came out hyper chambers as soon as possible and give him some flavonoids. And also there's some evidence of compounds that increase blood for the brain to help with recovery.

And the two main nutraceuticals is ginkgo biloba, which everyone's, you know, knows from memory. They gingko activates vascular endothelial oxide synthase, which allows blood flow.

And that's been shown to help with recovery and healing in another product called Been Positive, that does the same thing and they've definitely been studied in stroke subjects after they get an injury from a blood vessel occlusion that really impacts their function and in their outcomes even years later and even people who have had a stroke or brain injury, when they start taking those compounds, it can make a difference for some of them.

And that's also another clue.

Acute Brain Injury Treatment Strategies

If someone comes in and goes, Man, I have depression whole life. Or, you know, I get weird symptoms when I get exposed. Information and you go, Hey, why don't you try some flavonoids and some visuals that high dose and see how you do.

And if they notice like, oh, my brain fog was lifted in feel a lot better, it starts to give you a clue that that inflammatory injury mechanism to the brain may part because it directly impacts it.

I've got to follow up questions there. When you mentioned stroke, so can we put strokes in this TBI category or are they just so different that we can't.

When they're they're considered a stroke, brain injury? So once that's that's how I think of it, too, that's really validating. I'm learning so much from you.

The other thing I want to double click on. Oh, can I add one thing to that really quick? I wanted to ask you this is so a lot of people get MRI images and they show with white men or hyper intensities and they call them up and white men hypertensive.

But those are really injuries to the brain and some of those are small vessel disease. And with what has gone that's happening in the world of radiology, interpretation is there's just kind of look at a person's age, oh, well, they're 70, they should have some and they put normal MRI, you know, age related changes in brain help, sort of like on the report, like, no, that's small little mini microvascular injuries that are happening and it's kind of becoming routine now. So, you know, so then you'll see a patient that went to this clinic, they checked everything and went to the Mayo Clinic.

They checked everything. They said everything was fine. You either reporting the weight is hyper intensity is white matter lesions all throughout your brain.

They just are so common with the, you know, age group population as they get older that they're just seeing a normal variant. But it's it's common, but it's not normal.

It's pathology. You know, I love having these conversations that we we are doctors who do not accept that normal

degradation is what you get with aging like that.

You should accept that that's going to happen, though. There are so many things that we can do to either reverse those changes hopefully, or at the very least delay and prevent them.

So really exciting. I just want to add or basically ask you, I use a lot of fast, slow, clean and phosphatidylserine for patients who have had traumatic brain injuries as well as methyl B12.

And if possible, I've in 80 plus. So if you have any thoughts about that part of my protocol for TBI. I just forgot to talk about those. But those are those are also phenomenal and I may be is becoming a major breakthrough in head injury trauma.

So so thank you for remembering you know yeah. We see miracles happen for people. Yes. Traumatic brain injuries and I couldn't agree with you more that the closer we can get to the date of injury, the better the results.

And, you know, I've seen people lose jobs over Tbis and and lose partners. You know, relationships fall apart just because it can be so destructive. And so seeing people get better is really, really satisfying.

And it's so nice to hear, you know, you're getting similar and and similar thing. Okay, so you're going, oh, tell me, I want to switch gears and talk about what to do later on.

So if we're not within that window of acute brain injury, that 6 to 8, maybe 12 months and it's five, ten, 20 years later and those those impacts are showing up in symptoms, what do we do?

So you still try things like de therapy for some people seems to be beneficial like you mentioned and all the same nutraceuticals would apply, but it just depends on the possibly to get an outcome and ultimately those glial cells, once they get into a prime and stay there and stay in a heightened state, they have to be removed.

So this is where the goal is to, first of all, get them into an inflammatory state and then promote autophagy. And this is where all this research coming out on intervene, fasting in time, restricted feeding and short term fast seem to have a lot of potential.

So an animal models where they do time restricted feeding those those injured cells those prime glial cells those protein aggregates that happen with inflation.

They do clear and we don't have human studies and we never will because you're making a sacrifice, a human subject for it, for study. But those same mechanisms definitely translate so well.

We have people that have really severe brain injuries. First of all, we've got to get their inflammation down. So anything that can help them get information on whether it's their insulin resistance in the butcher.

Speaking of the place, them intolerance, the foods that they keep getting exposed to, they have environmental triggers where they live like poor air quality, whatever it may be.

And that's where personalized medicine comes in, which, you know, it's you know, obviously, one of the things that applies specifically to each individual patient, but ketogenic diet has been shown to be very anti-inflammatory.

So let's hazard people cut down the carbs. And so to really get into a high healthy fat diet, how are they eating? Lots of healthy, essential fatty acids like avocados and olive oil and cobra and the mean the carbohydrates and having lots of different vegetable fibers that are low glycemic.

They seem to have some really nice responses with that. And in addition to that, sometimes just going into fasting periods, but to really get rid of the debris, the translation from some of the animal studies that it's got to be like a three day fast, like just not eating for ten hour or 15 hours or 18 hours, whatever.

The time is not enough to really have a huge impact on getting rid of injured cells. It can have some influence and it'd be beneficial. But so if I have someone who's had a brain injury and it was clear that's the mechanism, well, typically wolves for sure having to take flavonoids in antioxidants in fish oil, things red inflammatory.

We try to find voluntary triggers in their diet lifestyle, but we'll we'll try to get them into ketosis. And ketosis has been shown to elevate ketones which dampen these glial cells.

A lot of times they're going to ketosis like the brain works and it's functioning. And then from that point on, once they get adapted to using fat for energy, it's very easy for them to then transition to training a14 day fast to the tune faster three day fast than we allow them to drink coffee and and things like green tea throughout the past to help with their appetite because they're also very protective of the brain and will have them do maybe a round of that every two or three weeks for several months until they can get rid of that.

And then slowly over time. So may do like a three day fast January.

Long-Term Recovery: Fasting, Ketosis, and Inflammation

Maybe they felt something. Maybe they didn't do it again in February, maybe next year, March, possibly. It's getting better. April, I think it's I think it might be working, you know, like you have to kind of repeat it over again, but it won't be like you did a three day fast enough and your brain's fixed.

It's like this, this process of doing several rounds of that with people that have had severe brain injuries and you're trying to get rid of those injured cells.

Yeah, you're essentially you're taking out the trash. And for all of our listeners, we have an entire day on the ketogenic diet and on diet and how this impacts the brain.

Because I have seen exactly what you have in my clinical practice and also in my research is that getting into ketosis is so beneficial for cognition and and recovery of the brain.

And essentially what you're describing is what we call the horn medica effect. We're putting a little bit of stress on the system and that signals the body to trigger apoptosis or the cell death.

So we're literally like going into a messy house and cleaning it up and taking out the trash and we've got to get it to the dumpster. So we can't just, you know, kill those cells.

We've got to come out of there. And so things like sleep, I know, is really important for that exercise and blood flow are so important in structure. Here you have a doctor, a chiropractic medicine, and so like that structure is the head above the shoulders in the right way so that all of that blood can go into the brain and out of the brain.

Do you have any any thoughts about some of those components and how you incorporate that with these periods of fasting and ketosis? Well, fasting ketosis is definitely where people need to go when they're having protein angry disorders like a brain injury or Alzheimer's disease.

It kind of decline nutrition diseases for the most part. We're putting up with these. And, you know, other things that you can add to that would be things like cold plunges, cold punches have been shown to impair cultured proteins, which actually changes gene expression and gene genotoxic changes in sauna, you know, hedgehog proteins get released.

So dramatic effect like you're talking about an exercise, get an automatic effect. So ultimately it's like the answers are all there. They're all they're in the literature, right?

Like if you read it, get your insulin down, get your carbohydrate down and get your healthy fats to get into ketosis, get some physical exercise, promote her or Mrs..

Yeah put your body into temperature changes hardcore and you know, improve your cardiovascular fitness, prepare cardiovascular resiliency and those are the ways the body heals.

And if you take all those away, let's say we have a head injury person who has a head injury and they are pre-diabetic and they have insulin and then they're a smoker.

They get no movement, they get no activity. They have an inflammatory bowel disease that's uncontrolled. All those things have occurred. Time are just going to accelerate the expression that injury.

And a lot of times it's just a matter of switching. People the other way. It's so clear it's all there. So I hope you are an expert in these brain injuries.

And I want to understand what makes a brain injury. One of those ones that's going to affect us, right? We've all hit our head, bumped our head on a beam or on the car door or something silly.

Right. And then other people have had four concussion. So there's a spectrum there's a wide range. My I have a daughter. She's born, you know, she helps her head like not that it's not that uncommon.

Should I be worried about her? Also, as people age, they fall, you know, falls, happen, and sometimes there are head injuries involved there. So how do we assess how do we know if this is something we need to run to a functional medicine doctor for to get and get on the list of supplements you described?

Or is it is it kind of normal? AT Okay. Yeah. So, you know, with head injuries is kind of confusing. And then sometimes what people only think about is the variable of how hard a person hit their head.

But there's all these other variables that then determine once the impact is there, how bad it is. So the key concept is how activated or how much information is already in the brain, how how active is microbial cells are before the trauma will have a huge impact in determining how severe the injury is.

So if you go back to the example of a person who was, let's say, had inflammatory bowel disease, was a smoker, and they had pre-diabetes, if they get an injury to the brain, it may be expressed much, much greater than someone who doesn't have those things because they would have preexisting inflammation in the brain.

And there's also the concept of the second hit phenomena where one person gets a brain injury. It's pretty bad. The brain's inflamed. They get a second one.

Now, it's devastating because their brain is so inflamed, it's already activated and they reactivate it. So systemic inflammation from your God, from your blood sugar management, from your antioxidant status, from environmental free, radical exposure.

All those things have a toll on the brain to some degree. So that's one of the key key factors is how much preexisting inflammation is there before that trauma.

Now, the other key factors like this you want to kids is like for kids, you know, the white matter still developing until age 20, 21, 22, being managed, developing age eight nine.

They could have severe injury and they connect to it around. It hurts and it's fine once we get older and especially as are as we start to get into the aging process more express with the brain in the forties and fifties that's when it could be devastating, especially if a person's inflamed.

So can kids play football? Like, how would you let your son play football? I would not. Yeah, no, it's not worth the fear. That would not. So I want to ensure everyone understands there is inflammation.

Inflammation is kind of what I when I take that step back and think about cognitive decline, dementia, any sort of neurodegenerative disease, often inflammation is what people point to as the cause, but something else caused

that inflammation and we're putting traumatic brain injuries in that category is something that triggers inflammation, which then triggers like these protein op athletes that we've been discussing.

Is there something else to that? How of how traumatic brain injuries lead to cognitive decline? Well, I mean, the main mechanism is traumatic brain injury.

And it's like when so very interesting research. First of all, when people get an animal studies, when they cause brain injury, the gut barrier is completely destroyed within three days.

Like they get leaky gut to get tested so that their microbiome changes, their blood sugar regulation can change the cancer and you can imbalances of social impact, signaling to the ear, the brain, the hypothalamus, they can going down this this vicious cascade and everyone's very, very different.

So the key part of that, that the systemic effect is happening in when all these mechanisms happen from the brain injury, they also make a person more susceptible to inflammation.

And then from that point on, like they're inflamed, like someone will have a car accident and say, I was never the same afterwards. And like what happened?

Like, I don't know, the airbag deployed. I didn't have any serious injury. I was in and out, but it was never the same.

Assessing Injury Severity and Risk Factors

Well, yeah, you had a head injury and they can see like from that point on, I should have multiple food sensitivities. Yeah, because you disrupted the break axis and now the semi been normalized and then that's perpetuated period of time.

So you see these are things we hear in the history all the time working with with patients of brain injuries. And when we look at the literature, we can see that there is these these mechanisms that take place after brain injury that then make a person more prone to inflammatory cascades in those voluntary cascades.

They create this vicious cycle. Then the areas where the trauma was to the brain, those glial cells change, their expression become prime. So they're overly sensitive and hyperactive from that point on.

And then the person has proportional responses to any inflammatory triggers that then causes specific neurological symptoms to the area of the brain that was injured.

And those are the now over time, those inflammatory responses also lead to these tau protein sticking together in aggregates and the mechanisms that are similar to Alzheimer's disease.

Right? Well, yeah. So it's really thanks a lot to put on a helmet. Right. Certainly when we're doing anything active, like biking or skiing or something like that.

So what relationships exist between past trauma and I'm going to kind of broaden our our definition of trauma here that we've been talking about physical trauma and there is a link between like this PTSD plus physical trauma, particularly at the same time, and then hypoxia at the same time when there's sort of multiple blows and then Alzheimer's.

Can you can you connect those dots for us? You're sure? I mean, ultimately, whether it's psychological trauma or hypoxia, my son has near-drowning carbon monoxide poisoning.

It's of an extreme to the brain. There was one central, unique mechanism to all of them. And they all turn on these glial cells, these these glasses. Now, these glial cells are good for us.

Normally, they're there to get rid of debris in our brain. And, you know, when our neurons start to dysfunction and

age, they clean up the debris. So are neuron synapses can healthy connect to each other and they sometimes give us a connection with neurons are inefficient.

These glial cells will eat these these inefficient branches where neuron transmission is more efficient. So we definitely need them. But whether it's vascular injury or hypoxia or even PTSD, emotional nodes, there's a characteristic thing that these glial cells do then turn on, get activated.

And the only thing with the brain is these glial cells. They only cell in the brain that's immune cells and there's no off switch. They can sometimes change their expression to what's called M1, pro-inflammatory M2 and inflammatory things like ketosis can do that.

Potentially flavonoids can do that, but wants to get in there inflammatory cascade in the brain. It's really hard to get out of it. So it can take years before you've been diagnosed and then once you're there, all the interventions we talked about, you know, cold plunges on intermittent fasting, terror feeding, exercise, automatic effects, getting proper sleep, having day, daily life.

And then also getting rhythm or ways your body can turn on the messengers to heal. And sometimes people have to engage in all those all those strategies to heal.

The good news is whether someone has Lewy body dementia or frontotemporal dementia or traumatic brain injury. Tucson, Gemma, a city based dementia loss mechanism's lifestyle wish for for all of them because of their pathophysiology similar right.

Right which is which is hopeful. Right. We don't have to have this super specific approach. We can really help support every cell in the body. I want to talk about sleep.

You've mentioned it a couple of times and I'm wondering what you tell your patients about the importance of sleep and also if you can speak to the lymphatic system and that's its relationship to the microglia cells.

Well, you know, as you know, first of all, you know, I think it's one I think why do you fall asleep? Like, why do you sleep? Know we sleep because we actually have to get rid of these cellar degrees.

So these you know, throughout our life, we approach to have cells. These cells fail at some point and they have to be cleaned up. And that cleaning a process called the autophagy.

Trauma, PTSD, Sleep, and Neurodegeneration

So our body has to change its energy demands to clean up debris every day and there's a point where we just shift into sleep for those metabolic killer processes that take place.

And if you don't sleep and you have proper sleep, they can't take place, which then perpetuates the path of physiology of basically most the mechanism of cognitive decline and new generation in brain injury.

So sleep, sleep is really, really important. So think about pathologies that don't allow them to sleep, which is very hard to unwind. As you know, we've worked with some cases like that and, you know, the ability to fall asleep is also brain based.

You have to have enough activation of the circuits in the brain to inhibit every brain called reticular activating system. You can fall asleep if those circuits are injured, then you can actually prompt.

But for a lot of people, you know, their sleep issues are just like poor sleep hygiene or they have a blood sugar issue and they wake like, is there lots of air spikes or or blockbuster drops or various inabilities to manage your stress, you know, things like that that cause stress issues. But it's a dealbreaker.

We can person isn't getting sleep. They're not going to recover it. It's matter like how many nutraceuticals they

take. So when it comes to like recovery from brain injury, I would tell you sleep is number one for sure.

It's it's, it's, it's, it's up there. Like the mechanisms that are necessary to work will not work without sleep. And, you know, all the anti-inflammatory models are counting on being in a state where person actually falls asleep.

So you can't have the, you know, losses occurring. So it's so important. And then this you mention the circadian rhythms. Are there things that you suggest to your patients to kind of get back on a rhythm if they've if they're struggling with insomnia?

Is there low hanging fruit that everyone can kind of try to improve their sleep? Yeah. So even with the just recovery of brain injuries, if we can get patients into a normal circadian rhythm meeting, like start planning on having your meal exactly the same time, start planning having your exercise exact the same time of the day, start planning your, you know, your day throughout a routine basis, going to be sleeping, eating and exercise like exactly the close to the same time each day their bio rhythm becomes more efficient and it helps them recover faster.

And there's some very clear literature on circadian rhythms in recovery that are that are important. So we do try to get patients into circadian rhythm.

Obviously, you know, their sleep disruptions might take a while before they get to routine thing, but maybe they can get their sleep right away, but they can eat their meals at the same time of day, or they can after they can do a morning work at the same time they are afternoon workouts for them day they going to a call point the same time they were there, whatever their routine is.

So I'm know you're aware of this literature, but for our audience and everyone creates amyloid plaques and to some degree at night it's when we take out that trash.

And there are studies that show that even people in their twenties and thirties who are decades away from potentially having Alzheimer's, they don't get rid of that amyloid plaque.

There's amyloid plaque buildup in the morning if they've been sleep deprived. And so this is just shows how critical sleep is that we can measure that just after one night of sleep deprivation.

And then we also know from the literature that sleep deprivation, that last and those even in those earlier decades of your life through your twenties, thirties and forties, sets you up for having a higher risk of being diagnosed with Alzheimer's later in life.

And so sleep isn't something to take seriously once you start having symptoms, but really from the beginning, very important for prevention. Oh yeah. Because I think as we all get older, we, we, we get wise to, oh my gosh, I've got to get my sleep.

Yeah, we've all been jetlagged, right. That thing we do have jetlag and think, oh, my brain doesn't work today because I didn't sleep or I'm on the wrong time zone or whatever it is.

Okay, now I need that. It's good motivation. So tell us actually, Christine, you you've written a number of books. What do you what is your current project?

What are you working on excited about these days? You know, everyone says they're finishing a book by what really are actually your fishing. But I was like, oh, I'm working on a book and like ten years later, still going to work.

We actually have going through each we're at the point now we're just finalizing each chapter at it, each each Monday.

Books, Resources, and Closing Remarks

So we're going through. So I do have a book coming out on Autoimmunity Research and and what would the

various triggers are for autoimmune responses. So we're open to finalize it and hopefully won't be one of those people that says they're writing a book.

And ten years later comes out. But several of your books are myself, so I know that you are capable of getting books published. Doctor Crowson I will even. COLWIN Okay.

Yeah. You, you wrote Why Isn't My Brain Working? And this is this is a gargantuan resource that I referred to in my practice. And certainly I've learned a ton from you, not only about brain health, but about thyroid health as well, your book on thyroid.

And so I'm thrilled that you're going to have another resource out there for doctors and patients on autoimmune on the other immune processes. So be on the lookout all of our audience members for those books.

And if you're curious, pick up a copy about why is it my brain working and there's tons to learn in there. Thank you so much. And how else can people learn more about what you have to offer?

So I do have an educational website called Dr. K News dear k nwc dot com. Crazy and very difficult to spell so you went with that and I have lots of articles there.

I have some online courses for people like an auto munity or GI and things. That's just a way to help people step process through way through it. And we, you know, we try to update it all the time.

We have a Facebook page. I know that's for older people. Younger people don't use it, but with that is. Certainly the people. And Instagram, Instagram, Instagram and Facebook will find you there.

Fantastic. Well, Dr. President, I couldn't be more grateful for your time. You are a sought after clinician and instructor teacher. You have taught the not to panic students here at best year.

Of course, you teach for this super functional medicine. And then I know that my patients have trouble getting on your schedule so your time is valuable.

And I just could not be more grateful that you spent some of that with us. A pleasure. Thank you so much.