Introduction to Brain Diabetes

Hello and welcome to the Reverse Brain Disorders Summit. I'm your host, doctor David Jacobs. And today we're talking about diabetes of the brain. There is so much research out now showing how diabetes, insulin resistance, pre-diabetes, high blood sugar or just blood sugar dysregulation, how that really impacts the brain and how it impacts inflammatory levels in the brain and is a major risk factor for developing dementia, Alzheimer's, Parkinson's, really all neurodegenerative health conditions.

And then even earlier in life, these blood sugar disorders can actually cause mood problems, anxiety, depression. They contribute to brain fog, memory problems.

So there's an intimate link between your blood sugar and your brain health. And so I brought on Doctor Brian Mole here for this great interview. He is the founder and medical director of Sweet Life Diabetes Health Centers.

He serves clients worldwide as the diabete, his coach for over 20 years, Doctor Mole has been helping people around the world to optimize their health, metabolism, control blood sugar and reverse type two diabetes.

Using a natural, personalized lifestyle approach. In addition, he is the host of the number one rated Mastering Blood Sugar podcast and author of the number one international bestselling book, The Pro Fast Diet Burn Fat and Reverse Type two Diabetes in just six weeks.

So he's an expert on diabetes, and we're going to dive into this topic on insulin resistance, blood sugar dysregulation, and brain health. I know you guys are going to really get a lot out of this content.

Please share it as well with somebody that you know and that you care about. Well, Doctor Brian, welcome. And, I know we're talking about diabetes of the brain.

Such a hot topic. So let's talk about the connection between blood sugar dysregulation, insulin resistance and brain health. Yeah. Thank you Doctor Dave appreciate it man.

And this is a really, really important topic. It's one that I don't think people like to think about, but it's sort of, no pun intended, sort of in the back of the mind as just one of those things that no one ever wants to deal with.

You know, like it's probably if you can list out some of the worst things to suffer with in your old age, Alzheimer's or dementia would be probably at the top of just about everybody's list.

So it's, it's an important thing. And, one thing that, you know, I think we can help people to understand is that there's a lot you can do to prevent it.

If you focus and pay attention on keeping the brain healthy. And I'm glad you mentioned insulin resistance, because really, Alzheimer's disease and in fact, all forms of dementia, including, lower body dementia and vascular dementia have, one thing in common, and that is their connection to metabolic health or poor metabolic health, metabolic dysfunction, as I like to call it.

And it's really more about insulin resistance than diabetes.

Insulin Resistance and Brain Health

You know, this is, we talk about type three diabetes is there's been, coined as diabetes of the brain. I don't love the term because, you really don't need to have high blood sugar, which is the characteristic of diabetes to develop dementia.

It's it's really it's about insulin resistance, which is the underlying cause of type two diabetes and prediabetes. And, you know, many, cases of obesity and overweight and PCOS and other things like that.

But it is also the root of, I would venture to say, most cases of dementia of, of all kinds. Yeah. And that's really interesting that you said that you don't actually have to have high blood sugar, because typically when people think about and this is really how how diabetes is diagnosed is high blood sugar.

Over 126, fasting blood sugar. But somebody could have a normal blood sugar on a, on a lab test or, you know, even if they're checking their blood sugar on their own, but their insulin may be through the roof, and most doctors are not actually testing your fasting insulin levels, which is a great test to look at in your body.

Maybe putting out so much insulin in an attempt to try to get the sugar out of the bloodstream and put it in the cells. And so let's talk a little bit about the dynamics there.

What is why is insulin so important and why is insulin sensitivity so important to keep blood sugar under control. Yeah. Good question. So, insulin is really I mean, it's hard to rank them, but one of the most important hormones in the body, we certainly could not live without it.

Just ask anybody with type one diabetes who doesn't make insulin how important insulin is for their life. And, you'll, you know, quickly find out that this is a, this is this is a life or death or so if we can't get a nutrient into a cell, I mean, you can't get sugar, right?

Nutrients and magnesium. You can't get them into the cell without insulin. So it's literally like a key that opens the door, right? Yeah. So, you know, when diabetes was first described, you know, hundreds of years ago, it was, described as basic, you know, almost like we see in late stage cancer.

The people were withering away because they couldn't store anything, so they couldn't store fat, they couldn't store carbs, they couldn't maintain muscle, they couldn't even hold on to minerals.

So everything was just liquefying in the body, coming out through the urine. So in the in the urine, you would see high sugar, you'd see high ketones, you'd see high sodium.

You'd see all of this stuff just pouring out of the body because there's no insulin to hold it in. And so yeah, that's what insulin does. And so it's so important.

But you can imagine if you have too much insulin then too much gets held back. So you get, too much fat in storage. You know, you get the, kidneys hold on to too many of those, you know, important, minerals, which are electrolytes and important for fluid dynamics in the body.

So our blood pressure goes up because we're retaining those. And that's ultimately what leads to this metabolic dysfunction. So we get inflammation, high blood pressure, we get overweight and obese.

And all of that is sort of the other side of the coin from what I described of these people withering away. They're sort of in this chronic state of storage and growth, you know, of, fat tissue and so forth.

So, so then you ask, well, what causes high insulin and high insulin can come both, sort of acutely from, sort of certain dietary influences, like if you had a high sugar, high carbohydrate diet, you're going to get a huge insulin surge and it can come chronically.

And that usually is due to, a poor metabolic health state, which largely comes from bad body composition. So, you know, we've got too much fat storage, not enough muscle mass.

And so the body shifts and the body becomes insulin resistant, which you mentioned earlier, and then shifts into this high insulin state. And it's that high insulin that ultimately leads to, cardiovascular stress, endothelial dysfunction and things like Alzheimer's disease and brain, issues, in fact, even cognitive dysfunction.

We'll see that in people who are insulin resistant. Yeah. Now let's talk about so we've talked about insulin being this key hormone that drives nutrients into cells.

And so as the cells lose their sensitivity. Right. So we need more and more insulin. Our body starts producing more and more insulin to try to get these nutrients like, like glucose or sodium or magnesium or whatever it is, into the cells.

What is happening here with our brain and our neurons? Yeah. That's a that's a great question. And sometimes I've heard it described that, you know, if you're insulin resistant you can't get glucose into the brain for fuel.

So the brain doesn't have, that, you know, fuel to burn and so forth. And that's what leads to the problem. That's not that's not exactly true. I think that, there are cells.

So so first of all, we have to look at what which cells respond to insulin and what the response is. So, for example, the the way you just described it is exactly right for certain cells.

So like muscle cells for example, they need insulin to take up glucose in a resting state when you're exercising is a little bit different. But when you're in a resting state, the what's called the, glued for glucose transporter is insulin dependent.

How Insulin Works in the Body and Brain

So insulin, like you said, is the key that unlocks, that allows the glucose to come in. Fat cells are the same. There also have insulin dependent glucose transporters.

Liver cells do not. So they have something called glue two which is not insulin dependent. So glucose can just flow right into the liver. Doesn't need insulin to do that.

But what insulin does in the liver is it basically stops you from breaking down glucose. So in the form of glycogen. And then also something called gluconeogenesis, which is the production of new glucose from other substrates.

And insulin basically puts the brake on those two processes. So, you don't release glucose into the bloodstream. This is important. And we'll get to the brain here in a second.

But this is important because a lot of people say, you know, geez, I'm fasting and my blood sugar is still high, you know, how is that even possible? And you have to look at, okay, where does that glucose coming from?

It's not coming from your diet. It's coming from your liver. Your liver is basically, either releasing its stored glucose, the glycogen stores, and sort of releasing that into the body.

That's for the first maybe 24 hours after that, it's making glucose and exporting it. And you have to ask, well, why is it high? Why isn't it keeping the blood sugar normal?

And that's because it's insulin resistant. The insulin is not there to hold back that process. So it's over overdoing it. In the brain, there are some cells that are insulin sensitive, but the majority of brain cells are not.

The majority of brain cells can just readily, readily absorb glucose and use them for fuel. But insulin has other functions in the body. Then just, allowing certain cells to uptake glucose.

And it has, it has functions in the brain that are important for, for, function, basically. And one of the things is there's an enzyme which actually breaks down, insulin, which also breaks down, plaques in the brain.

And, I know there's some controversy around amyloid plaques and how, you know, whether that's really the cause of Alzheimer's disease. I don't seems like it's probably not the, prime or cause, but, definitely, we see an association there, and those plaques can certainly create some dysfunction, and the body breaks those down.

But the same enzyme that breaks those down breaks down insulin. So a lot of that gets used up, breaking down all that excess insulin. And so it doesn't break down the amyloid plaques.

So that's one of the connections. Yeah. And we also know that, inside the brain, insulin has some, function for fuel, metabolize ISM and, and metabolic function.

So, it's not so much whether the brain absorbs glucose out of the bloodstream. That's going to happen for most brain cells. Although there are parts of the brain, that are insulin dependent, and those parts do seem to be, you know, a little bit more connected to, Alzheimer's disease, but, but but it's more complicated than that.

What we know, though, is that with insulin resistance, typically comes high insulin. That's a contributor to Alzheimer's disease. We know that it's there's dysfunctional glucose utilization.

That's a connection to Alzheimer's disease. And we know that that high insulin triggers chronic inflammation. And there is a strong connection there to Alzheimer's disease.

So if we can, improve metabolic health, improve body composition, improve insulin sensitivity, lower blood insulin levels back to normal, I think that's going to be very protective, for long term brain health and allow people to prevent things like Alzheimer's and other forms of dementia.

Yeah, it's a really great, explanation there, Doctor Brian. And and when people have blood sugar dysregulation, some individuals get high insulin. Other individuals deal a lot with reactive hypoglycemia or hypoglycemic types of episodes, which can be really, really damaging to the brain.

Right. Because there's not enough blood sugar. And this is why, you know, for for a lot of people, when they have hypoglycemia, the main symptoms that they experience are associated with brain symptoms anxiety, irritability, cravings, sometimes nausea, which, you know, in this case is actually brain related.

Nausea, not stomach related nausea typically, you know, so they're they're experiencing, you know, the, the hangry kind of, feeling that I'm sure, you know, most people that are listening here have experienced at some point in their life.

So what is happening there when somebody has hypoglycemia or like a reactive hypoglycemia a few hours after a meal? Yeah. So really good point. And and you're right, when you don't have the blood sugar, you don't have the glucose in your blood to, for the brain to take up and use, then the brain is going to suffer.

And not only the brain, but all the other organs like your heart as well. You know, the heart can burn other fuels. It can burn fat, it can burn ketones, the muscles can burn fat, glucose, ketones.

But, but, you know, they like to burn glucose in a, in a short window. It's readily absorbable. It's usually readily available. It's a quick burn, a little bit dirty or fuel, perhaps, but it's a quick burn.

So the, so when that's not available, certain organs, particularly the brain, is going to suffer. So it's important not to have high blood sugar because high blood.

And I'll just define it real quick. If you if you do a fasting glucose test, either a finger prick, on a glucometer, which is whole blood or or you go to a lab and have your blood drawn, which is a serum test.

The the number should be around, 80. So we use a range of 76 to 92. There's a little bit of variability there. Once it gets into the mid to high 90s. Over 100 certainly.

That's starting to become elevated, in a fasted state. And, the, the chief reason for that is insulin resistance. So again, you're, you're, the insulin isn't, your liver isn't responding to the insulin well enough to hold back the glucose release.

So, so you don't want high blood sugar? Certainly you don't want blood sugar. That's, you know, in 150, 200 range and above. That's very, very toxic to pretty much every cell in the body.

The, but you don't want low blood sugar either. So if the blood sugar starts getting into the 60s and 50s or even low 70s, for some people, that's not healthy because you don't have that fuel available to the brain.

So what causes that? It's basically, you know, we can think of this as just this regulated, blood sugar. And, you know, the body has a regulation system for keeping your blood sugar in a pretty tight range, just like it does body temperature and, blood pressure and other things.

You know, it can go up a little bit after you eat, but it should come back down and it should come back down into a healthy range.

Hypoglycemia and Brain Symptoms

So if it's dropping too low, either after exercise or after, a meal, typically a higher carb meal, usually what's happening there is you're having an over release of insulin.

So we talked about, insulin and how it's, Well, I don't know if we talked about this, but it's released, in a in a fasting state to hold back glucose.

It's released after a meal to allow those, muscles and fat cells to absorb glucose. And, if you over release insulin, you're going to get too much of that effect, and your blood sugar can actually drop to low.

Now, the other, side of that coin is adrenal function, because your adrenals make hormones like cortisol and adrenaline, which have the opposite effect.

They actually tell your liver to make and or release more glucose. So there's sort of a, like, I like to think of those old radio dials where you sort of turn the knobs a little bit, and if you, if you turn it too much to one side, it's staticky, too much, the other side, static is going to get right there in the right spot for anybody who's over like, maybe 35 or 40 understands what I'm talking about.

So the, the, the idea there is you have to get those hormones dialed in properly. And of course, the body has an innate intelligence and inborn intelligence that does that for us, but that can become altered when our metabolic health or our adrenal health is, is dysfunctional.

So it's an over release of insulin, usually from, you know, an existing state of insulin resistance or a high carbohydrate, diet, especially simple, you know, refined carbohydrates.

And then, we usually on the other side of that, we don't have the adrenal health to balance that. So, we'll see the blood sugar drop to low and then, you know, people can get, like you said, hangry.

They can get dizzy or lightheaded. You know, they can become even delusion, you know, sort of have, delusions if it gets too low. Out. Pass out. Yeah.

So it can become very, very dangerous. I mean, I've, you know, these are people who usually are on insulin, but I've, I've had patients who, you know, their family had to break the window of their car because they were in their car with it running and, you know, in sort of some, some sort of altered state about to go drive somewhere in a hypoglycemic state.

So, it can be super dangerous. You know, most people don't experience that unless they're unless it's some, you know, drug induced, basically. But, but it can get low enough to be really uncomfortable or cause a lot of sugar carbohydrate cravings for people, make them, you know, affect their mood.

Certainly. And it's not really a great way to live, you know, having to sort of manage your diet all day long so you

don't drop into a low blood sugar episode. So.

So you know, the solution? There is a combination of, good insulin sensitivity, a good, healthy real food, lower carb diet and, and adrenal health, making sure your adrenals are healthy so they can help regulate your blood sugar.

Yeah. That's key. And, you know, a lot of people with insulin resistance are overweight. Obviously not all of them. A lot of the people that I see that deal with these hypoglycemic episodes, people that I can think of, that passed out, I mean, just even at my church in the last year, I think 2 or 3 people have passed out just during worship, or every time it was due to a hypoglycemic episode.

And these were people that were these were typically young women, teenagers or maybe an early 20s, right, who are pretty lean. Right? So you would look at them and you think, well, they're probably pretty metabolically healthy from the outside.

They look that way, but they're having this blood sugar dysregulation and hypoglycemia. Exactly. And, you know, probably had a donut or a bagel and some orange juice for breakfast and had an insulin spike.

And then, you know, sitting in church, sort of relaxed and calm and the, blood sugar just starts dropping, you know, and, you know, maybe they don't have that cortisol release from the adrenals and boom.

Yeah. That's, Yeah, I see that a lot. And young women are those neurons. What is happening, actually happening to the neurons that ends up causing those, neurological symptoms?

Are the neurons actually dying because they're not getting the glucose, and therefore you're kind of getting this excitable toxicity because when one neuron dies, it spills out its contents or to other neurons and causing kind of like a cascade of death.

Is that actually what's happening? Yeah, that's a good question. I haven't seen that, data and I would think that the neurons probably aren't dying, but they definitely go into a dysfunctional state.

Clearly, you know, they're they're being starved. So, you know, they're they're definitely not able to, you know, carry out their function essentially.

So I think, you know, I'd have to probably look into that. So it's a really good question. In fact, I'll probably go to see if I can learn a little bit more about what's actually happening there.

But but yeah, I would definitely say, you know, and this is true for any cell. I mean, if you don't give. Yeah, obviously they need oxygen and other nutrients, but if you don't give them, some sort of your glucose or fat to, to burn for energy and and, you know, the brain's a little bit unique because, it's hard to get fat to the brain for, for fuel.

Because it doesn't fat doesn't cross the blood brain barrier. So, you know, the brain likes glucose and ketones basically for fuel. And, if you don't, you know, if you're not in a ketogenic state and you're depending on glucose and you don't get the brain, the glucose it needs, it's it's not going to work. Yeah. Yeah.

And that's my understanding is that those neurons, they need a continual supply of glucose or ketones and of course, if you've got, you know, high insulin at times and if you've got blood sugar dysregulation, your body's not producing these ketones, at least not a sufficient quantities to be able to support, the metabolic needs of the brain.

And if your blood sugar is dropping, those neurons are not getting the supply that they need, and a certain percentage of them start to die off and kind of spill their contents and cause this sort of neuro cytotoxicity.

So it's actually very, very dangerous. Yeah. I'm having these hypoglycemic episodes and a lot of people with type one diabetes, for example, obviously they're more prone to having it because they're not producing insulin.

They need, you know, supplemental insulin basically through, through through, injections and a lot of them end up

with, retinopathy. Right. And so, you know, which is kind of part of the brain.

So the retina is like, you know, it's part of your eye, but it's also, you know, our eye is basically like an attachment of the brain, right? A lot of these cells start to die.

They end up with, you know, a lot of vision issues and, you know, other neurological issues as well. And there's also a strong link between somebody who has a lot of hypoglycemic, episodes throughout their life and their risk for dementia, for, you know, developing Alzheimer's and things like that as well.

Oh, yeah. Definitely. And, and type two diabetes, we see that, you know, I do a lot of consultations and I would say, you know, probably 30 to 40% of the people who have type two diabetes at one point had pretty bad reactive hypoglycemia.

Interesting. Yep. And so, you know, we're talking about there's different ways that people will express their blood sugar dysregulation.

Blood Sugar Patterns and Diabetes Risk

So you have some individuals that they just have this you know they have this reactive hypoglycemia like we talked about other individuals that it seems like their blood sugar is good.

Their hemoglobin globin A1, C may even look good, but they've got very high fasting insulin. And then you've got other individuals that you know insulin doesn't seem to be terrible but their sugar is high.

Right. And then you've got other individuals that have both high insulin and high blood sugar. Yeah. So what is what is happening when you have high for somebody who is diabetic, let's say they've got high blood sugar.

You talked about how that's toxic for the neurons. What is actually happening. Like what what are those sugar molecules actually doing. Yeah. Yeah that's a good question.

And so those are you just described, three patterns there. And I think, you know, maybe we should just talk about that for a couple minutes, because I think it's important to look at that because people get confused, even, you know, even functional medicine practitioners and so forth sometimes get confused because, you know, insulin in conventional medicine, it's just not looked at at all.

You know, rarely ever tested, maybe in cases of, you know, like insulin, diabetes or type one diabetes. Yeah. But even even that, they don't really look at insulin, maybe C peptide, but so, so it's it's largely ignored in, in conventional medicine and functional medicine and sort of, you know, nutritional medicine, you'll hear it talked about, oh, do a fasting insulin and the normal is, you know, in the range of somewhere usually 2 to 6, something like that, which, which I totally agree with.

But that is assuming blood sugar is normal. So, if you have an insulin A5 and your blood sugar is 300, that's not good, right? So, you know, you're supposed to be making insulin to bring down your blood sugar.

So in that case, you know, we wouldn't say, oh, wow. Well, your blood sugar is high, but your insulin is totally normal. Now we would say, okay, your blood sugar is high.

And your, you know, you're not making nearly enough insulin to be able to bring your blood sugar down there. So there's a couple problems, probably insulin resistant, but also, something is starting to happen with the pancreas and the beta cells, which make the insulin not being able to produce enough.

But that's usually late stage. So by the time somebody gets there, they've usually been dealing with this for decades. So what we see, in the early stages is, as you said, more normal blood sugar or slightly elevated.

So maybe it's in the low hundreds. And then you check that fasting insulin and instead of it being five, it's 15 or 30

or 50. And so those people are highly, insulin resistant.

And so they're having to make huge amounts of insulin to keep their blood sugar down. Now, fortunately they're able to do that. So their pancreas is working.

But but it's it's going to take a huge toll on the pancreas over time. And then you'll see blood sugar will start to climb, insulin will start to fall.

So a lot of times we'll see somebody with a blood sugar of, say like 131 4150, which is diabetic, and then their fasting insulin will be like 10 or 15.

And so those are people who are sort of in between those two, you know, they're starting to lose control of their blood sugar. They're still making insulin.

Which, by the way, I just want to say, I know this is supposed to be at the brain, but this is a, this is a common misconception in conventional medicine.

You know, once you're diagnosed with diabetes, most doctors just believe your pancreas at that point is sort of not making insulin or not making enough insulin.

And, and for most people, I mean, probably 80% of people with type two diabetes, the in the pancreas is making plenty of insulin. It's just, they're highly insulin resistant.

And so all of this, of course, is related to the brain, because the more insulin resistant you are, the higher your blood sugar is and the higher your insulin levels are for, you know, a period of time, the more damage is being done to those to those brain cells.

I sort of went off on a tangent, if you would ask me a question there at the end. Yeah. So following up. So the high blood sugar when sugar is high, what are the sugar molecules.

Oh yeah. Yeah yeah. So so yeah. Once the once the blood sugar gets high that's you know I talked about how high insulin can cause damage inflammation and endothelial dysfunction and can affect kidney health, eye health and other things.

Well, high glucose. That's like a double whammy. So that that causes something called glycation to the form of sort of what we term oxidative stress. It's, it's basically, damage to the delicate proteins in our cells, tissues and organs that, that leads to, you know, dysfunction.

So, we call these ages advanced glycation end products. And so if you've ever seen, like, as people age, they get like dark spots on their skin or skin tags and things like that.

Those are examples of visible ages, advanced location products that are basically, you know, mutated cells, damaged cells, from, oxidative stress. In this case, it would be from high glucose.

So glucose, just like we talked about insulin, very important for the body. But when it gets elevated glucose becomes very toxic. We can measure glycation with the hemoglobin A1 c which is a form of glycation of the hemoglobin.

Actually our red blood cells. Yeah. And so that's a great test for that very reason. If you want to know how much damage is happening to your brain and your blood vessels and, and your organs, like your kidneys or your eyes, the A1 c is a good surrogate for that because we're measuring basically, damage done to the red blood cell.

And the red blood cell also carries oxygen. The hemoglobin on the red blood cell carries oxygen. And when you when it's, sort of sugar coated or loaded down with glucose, it's not able to do that very well.

So you get poor wound healing, poor circulation, you get, clotting, you get all kinds of problems from, having a high A1, C and dysfunctional red blood cells.

But yeah, it's mostly it's a window into the damage being done to your body. So normal. A1, C is, around four and a half to 5.5%. It's a percentage of, glycation.

Or if you think about it like, sugar stuck to the to the hemoglobin in the red blood cell. So normal is around four and a half to 5.5%. If it gets over that, then, you know, it starts impairing the function of the red blood cell.

So if it gets up to six, seven, eight, you know, ten, I've seen people at 14. So these are, you know, obviously, you know, causing massive damage. And there's been studies that show for every 1% that the A1, c goes up.

So like from 6 to 7, 7 to 8, it's about 18 to 20% greater likelihood of any complication. That could be a heart attack, stroke, dementia, kidney failure, you know, blindness, amputation, all of those things that are associated with.

So sugar for every 1% rise in hemoglobin A1, C, there's an 18 to 20% rise in some sort of major health complication, risk of health complication. Yeah. Yeah. Yeah.

So so you know, it becomes almost logarithmic when you see it go from, you know, your A1, c go from 6 to 7, which, by the way, 7% is considered acceptable to most, general practitioners, at least in the diabetic community.

So, they would say, well, we don't want you to go too low for all the reasons we talked about earlier. So just keep it around seven. And, you know, they figure they're going to develop complications anyway.

So, you know, we don't want them rushed to the hospital and in the middle of the night where I got to go into the hospital and see them. So, you know, let's let's keep their blood sugar a little high, you know, that's safer.

They consider. But, you know, I think that's probably, you know, not great medicine, I think. I think it's, you know, we should always shoot for normal blood sugar.

The, the great doctor, Richard Bernstein, who's a diabetic, advocate, an endocrinologist, has type one himself. Says, you know, everyone deserves normal blood sugar, especially diabetics.

So anyway, the, But, yeah, 6 to 7%. You're just increasing your likelihood of any of these problems by 18 to 20%. And as it gets higher than that, it gets into really scary territory.

Yeah, absolutely. And from from a functional health perspective, I mean, I like to see it under 5.2 really. And year five, you know, and we know that, hey, there's less oxidative stress, less inflammation, less kind of browning.

You know I think about glycation almost like browning inside of our body rusting. And so there's less of that going on. It's going to slow down the aging process. You're going to feel better.

You're gonna get more oxygen delivery to all the different tissues of your body. So your heart is going to function better. We're talking about brain here.

So your brain is going to function significantly better. So yeah keeping that hemoglobin A1 C under control is really important. And I'll see a lot of people when I look at labs where they're fasting blood sugar looks okay. Their insulin looks good.

It's in their right range. But their hemoglobin A1 C will be 5.75.8. You know, are you seeing things like that as well. Yeah. Yeah. And so that, that usually means that there's like wide blood sugar fluctuations.

And so the A1 C is sort of, you know, it's picking up your blood sugar all the time. So you can those red blood cells can get glycated, you know, when you're eating or not eating or whenever the blood sugar is high.

So, you know, if you're fasting, blood sugar is perfect, but when you eat, it goes up to 180. And especially if it stays up for longer than, you know, than it should, then, yeah, you're going to be, you know, you're going to have high blood sugar for too long.

Glycation, A1C, and Long-Term Damage

You're going to be experiencing glycation. And that's, you know, that's going to affect your health. So, and you know, you'll see it reflected in the A1.

C so I that's why I think we have to look at all of these. Like, you can't just do an A1, C and say, oh, it's you know, it's 5.4. So everything's great.

You know, if your blood, if you're fasting blood sugars like 110, you could potentially have an A1, C of five and a half if like, that's the highest it ever gets.

That's still a problem. There's still something going on there with your with your, insulin sensitivity. So I think it's good to look at and, you know, one thing you could do is wear CGM continuous glucose monitor, which will help you see those fluctuations throughout the day.

They're not perfectly accurate when it comes to sort of, monitoring your baseline blood sugar so they can be off a little bit compared to what you get in a lab or with a glucometer.

But they're really good for tracking changes and fluctuations. So, you know, you can see, okay, you know, after I eat this particular meal, how's, you know, what happens to my blood sugar after I do this particular type of exercise?

What happens if I, you know, have a good night's sleep versus a bad night's sleep? What happens to my blood sugar in the morning. So. Or even overnight.

So the CGM is really good for that. And it can help you to sort of, get a little bit more data on perhaps why your hemoglobin A1, C is a little higher than you'd expect it to be.

Yeah, that's really good. The CGM can really help identify certain foods that, you know, you think are healthy. And, perhaps your spouse responds really well to.

Right. They may be wearing a CGM and then you're not responding well to it. For whatever reason, your blood sugar is going way up. When you consume that food, you may have a sensitivity intolerance to it.

You know, even things like coffee, you know, in a family, one spouse, maybe a normal caffeine metabolize or another spouse, maybe a very slow caffeine metabolize or they drink the same cup of coffee.

One of them, their blood sugar goes way up, stays up. They feel fatigued, you know, or they feel overly anxious. The other individual feels great and they're able to perform at a really high level.

So sometimes we don't even, you know, sometimes there's factors like that. Oh yeah. That play a role. Yeah. That's annoying. Now let's talk about best strategy is to get blood sugar insulin back under control and support metabolic health.

Yeah. So I think sometimes we have to look at big picture. I mean, there's a lot of things and you do a great job of this. There's a there's a lot of supplements and tools and things that can help protect the brain can help with blood sugar.

But if we just take a step back and look at, you know, people who develop, Alzheimer's or other forms of dementia or have poor brain health, usually it's in people who are not metabolically healthy.

So I think that's the first thing we have to look at is how do we produce good metabolic health and a lot of that comes back to body composition. So we want to, make sure that we're insulin sensitive and, we can, you know, we've talked a lot about that.

We can talk more about it as far as maybe measuring that if we want to, but want to make sure we're insulin sensitive, we want to make sure that we have muscle.

You know, as we age especially, we lose a lot of muscle. And particularly people who are, maybe have struggled with their weight over their lifetime. They've done a lot of dieting and things, and they've, lost a lot of their muscle mass.

And if you're not actively working on building muscle, then you can end up with too little muscle mass on your frame. And muscle is, you know, really your best protector when it comes to, glucose.

It gives you a lot of metabolic flexibility. You have more insulin receptors, you have more room to store glucose as glycogen. If you have more muscle, you're going to just use more glucose and and all fuel over the course of the day, your metabolic rate is going to increase if you have more muscle.

So all of those things, all of those things are reasons to want to build more muscle. And so so that's really key. And then on the other side we want to, you know, reduce excess fat.

And it's not just subcutaneous genius fat. I mean, you know, there is a there's genetic patterns for how we store fat. So some people, store a lot of subcutaneous fat.

The fat under their skin that sort of, you know, leaves the sort of rolls and bulges and things. Other people store very little subcutaneous fat, and, they can actually be in a more precarious situation because they may store, you know, they may only be, say, 15 pounds overweight, but most of that fat is stored around their organs or in their organs or their muscles.

And so I think we've got to be a little bit careful with that. And we want to look at body shape. We want to look at numbers like our triglyceride levels.

On a blood test. We want to look at our fasting blood sugar on a blood test, because those are going to give you signs about, you know, are is your body composition optimal or are you starting to develop some problems?

And, I mean, there are lots of again, sort of bio hacks and, and things that you can do to improve or protect your brain health. But I think the biggest thing is you just really, you know, don't lose the forest for the trees.

Make sure you're doing everything you can to become as metabolically healthy as possible. Yeah. So building muscle, burning fat. And we know muscle also has, unique hormones like mild kinds that actually help increase the, the trophic or the growth factors in the brain, like beads.

Yeah, exactly. Nerve growth factor, things like that. So it's interesting. So not only do you get the metabolic benefits where you kind of have the glucose sponge effects in the muscle, but muscles actually releasing compounds that stimulate greater connectivity and, neuroplasticity, positive neuroplasticity in the brain, which will help prevent against dementia, age related memory loss, different things like that.

So yeah, super powerful there. So I'm I'm huge on that good exercise. How about nutrition. What are some of the key nutrition principles. Yeah. So I think you know, everything we talked about goes back to, you know, good blood sugar management and good, you know, good blood sugar control.

And I think that's really important for brain health. Again, that is unless you're, you know, fasting or purposefully, heavily carb restricted and ketogenic, your brain is going to be largely burning glucose.

So we want to have a good, steady, state of glucose in the bloodstream. You don't want it to be all over the place.

And I think what we found is, the diets that do that best are going to be protein centric.

So you're going to be focusing on protein. You are going to be restricting carbs to some degree.

Improving Metabolic Health for Brain Protection

You know, compared to the standard American diet of 3 to 400g a day, you'll probably, you know, be somewhere in, you know, I don't know, 75 to maybe 100 gram of carbs if you're if you're, you know, highly active and you are metabolically healthy.

I think a lot of people can tolerate that. Coming from healthy carb sources. And again, that's optional. You don't have to eat that many carbs, but you probably could tolerate that many.

And then, and then the rest is, you know, healthy fat sources. So, you know, you are, you're probably going to wake up in the morning and, you know, some sort of mild, nutritional ketosis.

And then, whenever you break your fast, you'll, you know, you shift into a fed state, you'll start burning the fuel that you're eating. You'll have normal insulin sensitivity.

Your body will will process and store the fuel that it doesn't burn right away. And, you know, you'll get back into a good fasted state until it's time to eat again, and.

And your body just maintains, you know, a good, healthy, steady state, blood sugar, lipid level, and, you know, and functions. Well, I think that's the best thing for the brain.

So, you know, as far as diet goes, it's going to be a, you know, it's going to be protein centric. Is there protein is going to stimulate muscle growth.

It's going to be there to provide all those amino acids for, the myriad functions in the body that amino acids are important for. And it's going to keep you satiated and full, and, you know, you're going to fulfill that protein hunger that, that we all have.

And then, you know, nutrient dense carb. So, you know what? You take your pack, you can eat a little or more, but, you know, the leafy greens and maybe some low glycemic fruits and, you know, healthy, non-starchy vegetables.

If you're an athlete and you're burning tons of calories and running and doing that kind of stuff, there's probably some room for some more starch in your diet.

So that's, you know, that's a choice you can make, you know, or you can try to become like a keto athlete and, and, and get your body super fat adapted.

That's okay too. And then the healthy fat. So, you know, healthy fats are going to come from animal products, I think largely. And and then some plant sources, avocado and, you know, maybe some olives and a little bit of olive oil that type of thing.

I do try to recommend avoiding any type of refined, packaged foods. So even even from an oil perspective, you know, we'll use a little olive oil here and there, of course, but, and, or maybe some coconut oil and so forth.

But, you know, these are still refined oils, really potent, high energy sources. So I think it's best to get our, you know, our fat from food, you know, from the food itself whenever possible.

So, you know, you know, that those are, I think, the areas to emphasize on the fats and certainly avoiding the, this is not new news to the listeners here, but avoiding the, you know, the industrial seed oils, which are the highly processed, sort of quote unquote, vegetable oils, which are, mostly linoleic acid, become oxidized and rancid and drive inflammation.

And, they actually lead to insulin resistance, have a lot of metabolic byproducts, like for honey and others that that drive inflammation. So, we want to avoid those.

Yeah. No. And I'll add in intermittent fasting as well with, you know, when you're eating like, this, high protein, like you talked about healthy fats, lower carb, you'll end up having more satiety and the need to eat or the need to snack.

The drive to eat, throughout the day goes down. And that's a really good thing. And fasting helps stimulate autophagy. And this is key, especially when we start talking about neurodegenerative conditions or really all brain related conditions, because we even know like for example, depression is related to brain inflammation.

And so as we start to go into a fasted state, for periods of time, like let's say 12, 14, 16, 18 hours overnight, we start to bring down that inflammation, improve our insulin sensitivity, and then also, when people start developing the like, we talked about beta amyloid.

These plaques in the brain, this is a sign of protein toxicity or protein toxicity. And that's not related to protein in our diet. But it's actually related to an inability to break down and repair damaged proteins in in different regions of the body, like in this case, the brain.

And so when we fast like that, we undergo autophagy in our body actually starts to break down these damaged proteins and starts to regulate them and eliminate the bad stuff.

And we combine that with good sleep. Which act helps activate our lymphatic system. You already mentioned exercise really important for the lymphatic system.

We drain the damaged proteins, the protein waste out of our brain through our lymphatic system and out through our, you know, all of our detoxification systems are our feces, our apps, things like that.

We get rid of all this bad protein in the brain is something we need to be doing regularly. So, so critical there. You know, and I think I mentioned something about this earlier, but I think this is probably can be the biggest takeaway from this talk today is that I do believe that dementia and Alzheimer's is an accumulation problem.

Yeah. And, it really happens because we're not breaking down those damaged proteins in the brain. And, you know, insulin is a potent stimulator of Em tau, and it stimulates mTOR, in all the wrong places.

So when you, you know, protein sometimes gets a bad rap because it stimulates mTOR, but it stimulates mTOR in the muscles. It's pretty specific to the muscles because it's stimulated muscle protein synthesis.

Insulin stimulates mTOR in the liver, the brain and other places. So the problem with that is if you're walking around with high insulin 24 hours a day, which I mean, I would say 90% of the people I test are they're never, really in that accelerated autophagy state.

And even if they're fasting, so, you know, they may fast for, say, you they might be doing like some time restricted feeding.

Nutrition, Fasting, and Supplements

And so, you know, they say, well, I don't eat until noon every day, but we test their insulin at noon right before they eat and it's still like 15. Well guess what? You're not getting those benefits of autophagy because you're still high insulin.

You're still in so anemic you're still turning on mTOR. And you're kind of blocking that pathway. So, so yes, fasting is incredible. Sometimes times people who are insulin resistant do have to fast longer to start to see those benefits.

And just as a side, I'm not a big fan of sort of multiple day fast for most people, at least not on a regular basis. But,

but certainly, you know, anything up to a 24 hour fast, you've got plenty of stored glycogen on board.

You're not really going to have to break down muscle tissue for glucose at that point. So, so yeah, I, I love like alternate day fasting, for example, for people who are insulin resistant.

Yeah. Any sort of stacking in exercise resistance training with that. Yep. Super key. What are your top let's say 2 or 3 supplements that you'd like for helping support insulin resistance?

No. So tall is great. A really important compound. Berberine can be helpful. It's a, basically, it has a kind of a clear tropic effect on the body. So it acts on the liver to suppress the release of glucose.

Similar to what metformin does, which is a diabetes drug. It, activates Ampk, which is a nutrient sensor that basically is, you know, one of the things that's turned on with fasting and it, you know, helps our body to, burn energy and, so berberine can kind of accelerate that process, which is good.

And, let's see, for insulin sensitivity, those are probably the top two. I also like, chromium and biotin combined. They're really good for. Yeah, for glucose tolerance and zinc.

So zinc is something that is important. You know, we think about it with immune health which it does have some functions there certainly prostate health but has has a lot, a lot to do with insulin.

Production release and insulin sensitivity. So zinc is yeah. Zinc is, is involved in the, you know, production and release of insulin, which is basically insulin is a protein.

It's a 51 amino acid protein, made in the pancreas. And zinc is sort of important in constructing that. And then, and then its release and in the, response at the cell.

And then one last thing I'll say, this is sort of a secondary effect, but anything that reduces inflammation, chronic systemic inflammation, I prefer to do that, you know, from a root cause perspective.

But, if you're looking for short term inflammation relief, like, you know, curcumin or other anti-inflammatory herbs can be helpful. Yes. Mega three threes. Absolutely.

Yeah. Really good stuff. Doctor Brian, this has been a great interview. Went through a lot of really good topics. Really appreciate that. Where can people find out more about you?

Yeah. Thank you for that. You know website is doctor mole.com. That's Dr. Mo w Elle.com. There's, something on their blood sugar manifesto, which is just a, you know, sort of a 45 page guide on how to improve blood sugar and metabolic health, which you can get for free.

Podcast is mastering blood sugar. So check that out. And, that's probably the best way to get on the mailing list. And then, you know, and you got a great book to the pro fast diet.

Guys going to check that one out as well I appreciate that. Awesome. Absolutely. Thanks so much, Doctor Mole.