How Your Mitochondria Controls Your Brain Energy – Chris Palmer, M.D. – #1012

Dave Asprey:

You're listening to the Human Upgrade with Dave Asprey. Today we're going to talk about energy and your brain based on a new book called Brain Energy, and I'm super excited about this because this is a very well-researched and well-respected book that talks about something you've learned on the show over time. The amount of energy that your brain makes equals how you show up in the world and how you feel. But there's a big focus in this book on mental illness and how much mental illness is a metabolic dysfunction in the brain. So that's an excuse to talk with a really, really smart author who's drawing those connections. So if you have a lot of anxiety, you have a lot of stress, or at least you think you have a lot of stress or any of the other attention problems, all the stuff that frankly that I went through in my twenties, maybe it's not because you're a bad person and maybe it's not because you're weak, maybe you just have a hardware problem.

Wouldn't that be interesting? And that's what we're going to talk about today. And this is just very personal to me. I've done a lot of work with Daniel Amen, who is an early voice in the field. I'm on his board of directors. I've written a book about mitochondria in the brain, so I care, years of my life, care about this. And we're going to go deep with a Harvard psychiatrist and his name is Christopher Palmer. And he's just going swinging for the fences, saying, here's what's going on with mental illness. So Chris, welcome to the show.

Chris Palmer, M.D.:

Thank you, Dave, for having me.

Dave:

You're well known in keto circles because you said, "Hey, isn't it weird we take psychiatric patients, we put them on a keto diet, and a lot of their psychiatric issues just go away." How was that received when you first started talking about this?

Chris:

It's interesting because I know other people have reported similar findings from the low carb and keto communities, and for the most part they were written off. And I took a different approach and I knew from day one I would need to take a different approach because nobody would take this seriously. And so I ended up doing a really deep dive into the science of what we know about the ketogenic diet and how it stops seizures. And I really focused on the neuroscience of that, changes in neurotransmitters and brain inflammation and calcium channel regulation, all sorts of things. And I use that evidence to support why the ketogenic diet might be having the effects on people that I was witnessing. And for the most part, it was extraordinarily well-received, better received than I would've ever imagined. And some leading psychiatrists and neuroscientists quickly were jumping on the bandwagon and publishing their own scientific review articles about, hey, and some of them even kind of took credit for it all and didn't cite any of the research that I or others had done.

Dave:

Heaven forbid that there'd be people like that in academia, just like in the health influencer world.

Chris:

I know it's so hard to believe.

Dave:

It's a compliment that the number of people who think they invented biohacking is interesting. I'm like, "Okay, whatever."

Chris:

Exactly.

Dave:

I'm with you there. But you have friends like Mark Hyman and David Perlmutter endorsing the book, and they're both very well-respected doctors and authors and things, which helps. And I do think you are a major leading voice in it. And plus you didn't just say the keto diet is good for this stuff. You went mechanistically for it. And now in your book, Brain Energy, you're just saying straight up, we know what causes mental illness. So what causes mental illness? That's a baller statement by the way.

Chris:

It is ridiculously bold and audacious if people really understand what I'm saying in the book. In a nutshell, I'm arguing that the cause of all mental disorders, and there's a difference between a mental disorder and normal human emotions or reactions, we all get depressed, we all get anxious, and those are hardwired responses in the human brain. But what I'm arguing is that when people have mental disorders, so when they have depression for no good reason, anxiety for no reason, ADHD symptoms, psychotic symptoms, bipolar symptoms, that the cause fundamentally is metabolic in nature.

And I'm arguing that mental disorders are metabolic disorders. And in a way, it makes sense because metabolism is everything in biology. So on one hand, it's like some people have even said to me like, "You're not really saying much because metabolism's everything so big deal, Chris Palmer." And yet in another way, once you see the big picture of metabolism and all of the things that influence metabolism, you actually can see novel ways to intervene. And you can also raise some red flags about some of our current treatments.

Dave:

Well, it's interesting you could say, "Well, no, mercury is the cause of certain types of mental disorders." And of course mercury poisons mitochondria, which affects the metabolism in a specific way. And you can say, "Oh, it's allergies." Oh, that's funny. Do allergies affect metabolism via mast cells and regulatory cells? Yes. So I think you could, from a truth table perspective, say, "All right, yeah." But do we know why metabolism is getting deranged or what to do about it?

Chris:

I think we do. I mean, at the end of the day, a lot of neuroscientists and psychiatrists know that the broad overarching theme is correct. And that research actually goes back a couple of centuries. This is nothing new. I am simply integrating decades and decades of clinical genetic neuroscience, neuroimaging, metabolic research, putting it all together looking comprehensively at what do we know about the mental health field, and how can we put it together in a coherent way? So if you talk broadly about metabolism, people think about all of the different metabolic pathways and enzymes and Krebs citric acid cycle and all sorts of things, and it gets overwhelmingly complex. But if you really ask big

picture questions, like what exactly are the primary regulators of metabolism? Where is metabolism controlled in the human body or NSL or whatever, you continuously get led to mitochondria.

And once you understand mitochondria and the connections there, and mitochondria, it's like a whole new universe so much that we have to learn, so much to understand about them, but once you understand the mitochondrial connection, that actually allows us to connect all of the dots of mental illness and the mental health field. And it allows us to say, in fact, mental disorders are definitely metabolic disorders. That means some type of derangement in mitochondrial function. And again, what's so powerful and important about it is that once you understand that, once you understand that they are the center of mental illness, you can start to see why do certain risk factors precipitate or cause mental disorders. But you can also understand novel ways to intervene. Mitochondrial dysfunction is not about inheriting a defective mitochondria from your mother, mitochondrial dysfunction is about environment and lifestyle factors adversely affecting them and their function.

Dave:

It comes down to epigenetics and in fact, biohacking is a clever restatement and expansion on that general idea. The definition when I first launched it was the art and science of changing the environment around you and inside of you so you have full control of your own biology, including your brain, which means including your thoughts. And if you have the persistent negative thoughts, the super bad critic in your head, you can do all the laying on a couch you want and pay for someone's kids to go through college. It might feel good, but it probably isn't going to fix the root problem. But if you stop eating crap that was inhibiting your mitochondria and got off the MSG that's causing electrical disturbances in the mitochondria inside the neurons in your brain, magically you might just fix the problem and not have to lay on a couch.

Chris:

Absolutely, a hundred percent agree. And one of the beautiful things about the mitochondrial theory is that it also connects psychological and social factors that we know can play a role in mental disorders and also metabolic disorders. So childhood adversity, trauma, stress, they all impact mitochondrial function. And we know we've known for many decades that they also play a role in mental disorders, but they also play a role in things like premature cardiovascular disease. And again, the way to connect them is through mitochondria. So one mitochondrial researcher actually said, "You think of a cell as a computer." A lot of people say the mitochondria are the power cord to that computer.

Well, they are. They are definitely the power cord, but actually they're also the motherboard of that computer. They are making strategic decisions about allocation of resources both energy and mass because when we eat, it starts to even get into E = mc2 stuff because when we eat food, it's either getting turned into energy that fuels our body or is getting turned into physical substrate to repair cells or grow new cells or whatever. And so we start looking at all of that kind of stuff and mitochondria are critical in all of those kind of "decisions".

Dave:

A lot of my last five years of work has been deducing what I think the operating system in mitochondria actually do, like how do they make decisions, because there isn't that much DNA in them. They don't have a lot of compute capacity or storage, so they're making simple decisions very, very quickly. Do you have thoughts about how they prioritize?

Chris:

To be honest with you, it is a mind blowing experience. The deeper the dive you do into mitochondria and the decisions or the algorithms that they're using, because mitochondria don't have brains, but yet they are behaving in certain ways, they are responding to the environment in certain ways. And when you actually do a really deep dive, it starts to mess with almost everything we know about biology.

If you want, I'll give you one really [inaudible 00:12:24] example has nothing to do with psychiatry or brain energy, but there are some researchers here in the Boston area who are looking at flatworms and they took a flatworm, they applied a magnetic field to this flatworm at a specific developmental point in time, and the flatworm ended up developing two heads ahead on both ends. That flatworm then can reproduce and reproduces a two-headed flatworm. Those flatworms reproduce and produce two-headed flatworms. If you asked any biologist now, where is that coded that a flatworm should have one head or two heads? Where is that coded?

They would say it has to be in the DNA, it has to be in our genetics. And in fact that study says that ain't so. And those researchers, I just happen to have a little bit of knowledge that those researchers are, I mean, right now they don't have an explanation. Where the hell is that being encoded and how is it being transmitted along generations? Where is that information encoded? And right now the answer is no one knows, but the trail is quickly leading to mitochondria are somehow encoding that information that a flatworm should have two heads instead of one head or one head instead of two heads, and how the hell that works and how they know, because you're only transmitting gametes and it's like mess. So I don't really know how it would work. I don't think anyone does.

Dave:

But there's definitely a magnetic thing going on and there's probably information fields involved with it as well where the mitochondria is setting up an information field where the tissues follow and we know the disjointed bone experiments from running small amounts of electrocurrent that will cause tissues to regrow a fracture in a bone. A lot of this goes back to a book called The Body Electric that really changed my view of all this when I was a computer hacker, a cyberpunk in the '90s, I read this book, I'm like, "Oh my God, we can hack human bodies."

I know what governments and big companies are doing to computer systems and how hackers are stopping that. I think we need the same thing in humans because we're imminently hackable with electromagnetic frequencies and not the stuff you see in a lot of movies, but we do respond at a quantum level. The study just came out about last month that showed that every time your heart beats, the proton spin of protons inside your brain actually changes on a per heartbeat basis, which is de facto proof that we're quantum beings. And when you take it from there and you say, "Well, I'm going to lay on a couch and smoke a cigar and say, 'Tell me about your mother.'" I feel like there's a bit of a gap between those two realities and I'm a little more attracted to the hacking one. I don't know about you.

Chris:

No, absolutely. I am definitely more attracted to the hacking one, especially with all of this new information. It's really fascinating because especially over the last 20 years, the research on mitochondria continues to explode and boom. And I think most of the emerging science continues to just shock people in terms of what is going on. And they really are like a universe under themselves. Even in a single cell, it's like a whole new world. And so I agree. I think mitochondria, at the end of the day, if you ask what single factor is most responsible for the control of the human organism, I think the answer would always come down to the network of mitochondria throughout the human body. Now some are arguing we need to subcategorize and maybe there are thousands of different types of mitochondria, and it's too simplistic to just say that they're one thing and I agree with that.

But I think if you consider that they are a network under themselves, they communicate not only with mitochondria within the same cell, but they communicate with mitochondria in other cells, cells share mitochondria, one of the primary functions of stem cells, for instance, everybody knows stem cells are great. One of the things they do is they transfer healthy mitochondria to struggling cells. And so they come to the rescue and say, "You need some healthy mitochondria so that you can live and stay alive and repair yourself." And macrophages, one of their primary functions is to go to a site of healing and inject new mitochondria into struggling cells that need repair and healing. And so it really is appropriate, I think, to talk about mitochondria not as things contained within one cell, but as a network of mitochondria within an organism. And at the end of the day, yes, they are playing a major role in our fear responses, our behaviors, our eating behaviors, everything. Because at the end of the day, as you said, we as an organism are hardwired to respond to the environment in certain ways and try to survive.

Dave:

How flexible are these networks? You see people are mentally ill. Do they fix their metabolism, their brain gets better and they get younger and they do all this stuff? Or are they still walking wounded?

Chris:

I think there's a whole range with humans, obviously. But as a rule of thumb, when I get patients who've had schizophrenia for decades, they're usually obese because of all the meds they've been forced to take. The medications that we give them actually directly impair mitochondrial function, and that is the mechanism of action of some of the permanent side effects of some of the meds we prescribe. Certainly it plays a role in all the metabolic side effects such as weight gain and diabetes and premature cardiovascular disease. So a patient with schizophrenia who's been on meds for decades is definitely an unhealthy organism as a rule of thumb and in part because of the illness and whatever was causing the illness and in part because of the treatments that we end up delivering. And as a rule of thumb, when I implement strategies to help improve their mitochondrial function, not only do their mental symptoms get better, but everything else does. Their weight normalizes. For most of them, that means significant weight loss.

Dave:

And you actually gain weight when you take antidepressant drugs for the most part?

Chris:

A lot of people do. And with the antipsychotics and mood stabilizers, it's enormous weight gain. I mean, we're talking more than a hundred pounds for most people. Over at least over time, I see so many people gain massive amounts of weight and it's just considered the price we have to pay. Well, sucks to be you to have a serious mental disorder and we're sorry our treatments are so ineffective and come with horrible side effects. And some people even compare it to cancer treatment. It's like, "Well, you have cancer of the brain just like we deliver chemotherapy and radiation and we know those are toxic. These medications are toxic, we get it, but what's the alternative? You're going to be dead or in jail."

Dave:

I learned eventually, I must have seen a couple dozen doctors when I was trying to figure out what happened with the poisoning of my mitochondria by toxic mold, which wait a minute, doesn't mold make antibiotics like penicillin that attacks bacteria and has for two... Oh, funny enough, you live in house of toxic mold. Who would think you'd get mitochondrial disorders? But to unravel that, because

the symptoms, I had so many of them, they were all over the place. It was, oh, you're a hypochondriac, you're crazy, you're lying, you're eating Snickers bars all the time, just all these things.

Then I finally got to the point where I'd go to the doctor and say, "I want to do X." And if the doctor said that was impossible, I would just say, "I'm sorry, I wasn't asking your opinion about possibility. I was telling you I want to do it, so are you going to be curious with me and are you going to help think outside the box because I'm desperate here?" And if they wouldn't do it, it was like next. Go see a different one. Do you think people should do that more often? If doctors aren't going to work on solving the unsolvable, even if they say, "I don't know how to do it, but I'll work with you." Should we fire our doctors?

Chris:

I really do want healthcare professionals to learn about this, to step up to help people recover using all the strategies you've been talking about for years, using the strategies that I outlined in Brain Energy, but coming together, understanding these relate to metabolism and mitochondria that we need to treat the whole human being and not just symptoms with pills that we know do not promote long-term healing. So yeah, I do want people to feel empowered. I want people to demand better because you don't deserve to suffer, people don't deserve what they're getting.

Dave:

No way. I feel so bad when I see someone who is clearly struggling with this kind of stuff. They're just morbidly obese and you can tell that they're drinking a diet soda because they were told like I was in my twenties. Oh yeah, that's how you lose weight. But you know there's evidence that it introduces metabolic dysfunction and it gives you intense food cravings. And it's not my place to walk up and say, "Hey, man, you have to stop," because it's just rude. In chapter eight in your book, you're saying that if the cells that control anxiety are underactive, you're going to have anxiety symptoms and if your memory cells are underactive, you have memory issues. And given those cells, they're underactive because mitochondria, what do you think is telling the mitochondria to make those cells underactive?

Chris:

So the way I think about it is that something has happened to the mitochondria in those cells, and there can be a few different ways to think about it. So one is that if you suppress a cell over time, say by drinking excess amounts of alcohol or smoking cigarettes, which poisons mitochondria, if you assault mitochondria, the number of mitochondria in that cell will decline. And that cell is receiving signals through say GABA, through alcohol or a benzodiazepine or other medication that those substances, environmental substances are suppressing cell activity. That cell is essentially going into almost a hibernation state as a result. When it does that, it ends up with less mitochondria because that cell sense is we don't need mitochondria anymore because we're just in this hibernation state. So we're just chilling out. Well, as soon as you don't use that substance, then that cell comes back online, but it does not have sufficient healthy mitochondria to deal with what it needs to deal with.

So it is metabolically compromised now and then it can malfunction, and that's the easiest way to put it. That cell will malfunction and if that cell malfunctions, it can result in symptoms of what we call mental illness. I do think there are environmental toxins. You've named a few, mold and mercury and others. If people have exposure to environmental toxins, those can adversely affect mitochondrial function. If people have a really toxic diet, tons of junk food, super high calories, you're spiking your glucose levels all the time, that results in kind of overwhelming mitochondria results in oxidative stress, which actually damages the mitochondria.

And so now you've got lots of defective mitochondria in that cell. But all of those different scenarios, so we've talked about suppressing, we've talked about toxins, we've talked about other ways that this can happen. But if it happens, if that cell is metabolically compromised, meaning it doesn't have sufficient healthy mitochondria to manage normal operations, that cell can malfunction and that results in mental illness. The great news, as you know, and as I know, a lot of the strategies to improve this are common sense obvious advice like follow a healthy diet and we can get into that or people already know that probably from you, but follow a healthy diet that's going to promote mitochondrial health, that's going to promote metabolic health.

Dave:

Well, people definitely know my Bulletproof Diet is cyclical, keto, clean fats, et cetera. But you just wrote a book and it's not a diet book at all. But given all of this, some of your experience in clinic and in research and all, give me the bullet points for what your mitochondrial healthy diet is.

Chris:

For some people, it really can be just whole food diet. So avoid all the processed stuff, avoid all the chemicals, avoid all of-

Dave:

What does that mean? Do you eat the walnut shell when you're doing whole food?

Chris:

No, no, no.

Dave:

What is the whole food? I can't even tell anymore. People are eating kale, which is not even food. It's garnish.

Chris:

You are correct. I guess I would say if you can't read all of the ingredients and you don't know where they can be identified in nature, then it might not be an ideal diet.

Dave:

So avoid chemicals, artificial sweeteners, artificial colors, all that kind of stuff. All right. I like that. What else? But that can't that because I mean, orange juice isn't an ideal diet, I don't think, if that's all you have.

Chris:

It's not. So certainly low glycemic load. I mean definitely no added sugars. The diet that I am known for is extraordinarily similar to Bulletproof diet.

Dave:

Okay. So we're in general agreement there.

Chris:

No, I mean that's exactly what I'm doing. Ketogenic diet plus or minus some intermittent fasting.

Dave:

But it's not always in keto, right? You allow carbs sometimes, but not always. Or are you go keto all the time?

Chris:

It really depends on the person, honestly. So if I'm treating somebody for severe bipolar disorder or for schizophrenia.

Dave:

Keto the shit out of them.

Chris:

They actually have to stay in ketosis like an epilepsy patient. It really is controlling their brain function. It's not a lifelong diet for most of them. There are people with rare genetic disorders like glucose transporter deficiency syndrome that may need a ketogenic diet for life. But the majority of people, it ends up being a two to five year prescription to allow your brain mitochondria to heal or all the autophagy that needs to happen to just reset things. Because if you are having seizures, if you're having psychotic symptoms, your brain is really in disrepair at that point. I'll just say it's metabolically compromised in a pretty serious way, and that's not going to heal in two months, unfortunately. So those people, I usually say two to five years. And if we're talking somebody with mild depression or burnout or mild ADHD symptoms, I totally agree with you. Intermittent fasting, maybe introduce some carbs. Carbs would probably be more in the form of berries and fruits and some fruits and some other things, I'm not going for granola bars and cereal and a lot of stuff like that.

Dave:

But they just say kind right on them and they're made by glued together sugar with a few nuts [inaudible 00:31:16], right?

Chris:

Exactly. That's not what I'm talking.

Dave:

That's why I ask about whole foods because a lot of people think that's a whole foods. No, it's not. It's processed and it's full of sugar. And it does feel though, and this is something that rocked my world when I was getting into mitochondria in the brain, we have neurons, which are the rock stars in the brain, and neurons will prefer ketones even in the presence of glucose. They drink ketones because they're just hogs that they need that to make electricity. But the glial cells that appear to be shepherding some of the mitochondria and certainly are the inflammatory and cleanup systems in the body, they prefer glucose in the presence of ketones, even though ketones are higher energy. So in nature, okay, either you're in ketosis and the neurons are happy because you're starving, i.e. fasting or you just ate a bunch of meat, and then sometimes you have carbs and then the glial cells are doing, "Yay, we have carbs. Let's do our cleanup."

And gluconeogenesis, which is when the body, just for listeners, when the body makes sugars out of proteins that you eat or that are in your body because you need them, that's not enough level to make the glial cells happy. So I'm like, how do I power up the neurons but then have some time for the glial cells to do the brain cleanup? And it feels like in people with mental illness, the glial activation and the ability to not over activate the immune system in the brain, but to do the cleanup and repair and even the autophagy functions of glial cells, you're going to need a piece of fruit or you're going to need some honey, or you're going to even need some dark chocolate made with real sugar, but just not that much real sugar. Am I onto something there based on what you've seen? I mean, it's heresy in the keto community to say, "God, parts of your brain might want carbs," but I think that's the case.

Chris:

The story with glial cells is even a little more complicated because there's this lactate shuttle. So glial cells are actually a primary source of energy for neurons. So neurons are just kind of clean engines. Neurons do not store any energy. They don't store glycogen. So they are just sucking in fuel and burning it or turning it into substrates like neurotransmitters or hormones or whatever else they need. But glial cells, this story's getting even more complicated because the study just came out not too long ago that suggests astrocytes play a critical role in glucose regulation throughout the entire body. And so who knew exactly how that all works and how that plays out? What the hell are they doing that other cells aren't doing? But yeah, I think that for some people, like I said, I've had some patients with schizophrenia, so I'll just speak to my clinical experience.

We know that with epilepsy world, some people do need strict ketosis. They cannot have chocolate with any sugar. They can't have a nice piece of higher glycemic index fruit. They can have a few berries or something, but with a lot of whipped cream on it. And when they do, I will just speak firsthand about the patients I've worked with. So patients I've worked with, psychotic symptoms are in remission on a ketogenic diet. Their hallucinations are gone, or at least 95% gone, their delusions are gone. They are functioning at a completely different level, and they go out and eat a chocolate bar because they think they can. And some of them are even labeled keto chocolate bars unfortunately, and it makes their blood glucose spike and they get floridly psychotic within 24 hours. The hallucinations come back with a vengeance or the delusions come back.

Dave:

All right. Wow.

Chris:

And so for them, I would say exactly where in the brain, which cells, who knows? I really don't know. I don't think anyone knows. But clinically, I would say for those patients, they need continuous ketogenic diet. Most of those patients get to a point though, like I said, after a few years of doing it, they get to a point where they're much more adaptable and then they can veer off the diet.

Dave:

I've noticed there's a window at about two years, and this just comes from millions of people doing Bulletproof Coffee. So for the first two years, if you're metabolically dysregulated like I was, you put four tablespoons in your coffee and you're like, "Oh my God, butter's my religion. I use butter as my deodorant." You need it in your soul. And after about two years, it goes from that to, "I like butter. I'm going to have a couple teaspoons." And you just back off a little bit.

And two years is coincidentally almost exactly the half-life of lipids in your cells. So at that point, you've washed out half of the fat in your body, you've increased the percentage of saturated fat, and you've also gotten rid of lipophoric toxins that the fat dissolved toxins that inhibit mitochondrial function. And if you go the really sick patients, you go another two years to four years, now you've replaced 75% of the fat in your body with clean, high quality, undamaged fats, which is going to help to fix your mitochondria. And of course, two years later you've gotten 80 something percent of it. And does that seem like that might be a part of why that timeline is there?

Chris:

I think it definitely might be. So the membranes of mitochondria are extraordinarily important and critical, and they're actually very dynamic and fluid. A lot of people don't know this. Mitochondria are constantly changing shape, but the mitochondria that move actually will fuse with each other. And at that point, they're sharing material and membranes and proteins and all sorts of stuff, and then they'll split apart again. And so yeah, if you have damage like oxidized fats, fatty acids, or other molecules making up mitochondrial membranes, it may take time to clean that out, replace those with all of that fat with healthier ones. I mean, certainly the cell membrane is important as well. And a lot of people are focused on the cell membrane, especially when they talk about omega-3 fatty acids. But omega-3 fatty acids are actually more located on mitochondrial membranes than they are on the cell membrane. So once you understand the critical role of mitochondria, it's like they're everything.

Dave:

What do you think about statin drugs and their effect on mitochondria?

Chris:

Oh, we know that they are toxic mitochondria. You know that.

Dave:

Yeah, I do. I was hoping to slide one in past you and be like, "I thought you know." Yeah, so everyone listening, if you're on statin drugs, unless there's an extreme circumstance, which is not cholesterol of 220, then you're poisoning the system and your body responsible for your mental health as well as your longevity. So there's just isn't a good argument for the vast majority of people taking them, especially on a preventative basis in modern science. I think it's actually criminal what's happening. Do you see people who go on statins have a higher likelihood of mental illness if statins cause mitochondrial dysfunction and mitochondrial dysfunction causes mental illness?

Chris:

So most people who go on statins end up, they're usually in their forties and fifties when they're getting placed on statins. We definitely have many case reports of people on statins having acute mental changes. Some people have become aggressive, some people have had severe personality changes. Those are extreme. The much more common scenario that's really hard to tease apart. So we know people with type two diabetes, a metabolic disorder, are two to three times more likely to have clinical depression. But when they get clinical depression, it lasts four times longer than it does in people who don't have diabetes. So at any given time, a recent study from the UK actually said about 46% of people with type two diabetes, so half have enough symptoms of major depression to qualify for at least a mild case of major depressive disorder.

And so it's hard to tease that apart from the diabetes meds that they're on, the statins that they're almost certainly on, and all of the other medications. For a long time, it was thought that statins might protect the brain from Alzheimer's disease or Parkinson's disease, but there were some flaws in the way those studies were analyzed. And some recent research at least raises the possibility that statin use may in fact be associated with increased risk for both Alzheimer's disease and Parkinson's disease. And now for some people will say, "Well, why are you bringing that up? Those aren't mental illnesses, those are neurological disorders." But in fact, everybody, just about 100% of people who have Alzheimer's or Parkinson's have mental symptoms. They end up getting depression, anxiety, but even psychotic symptoms, hallucinations and delusions as part of those disorders. So even though they are neurological disorders, they are part of the brain and they commonly result in mental symptoms.

Dave:

Very well said. Bottom line is, yeah, you go on statins, your risk of getting anxiety or another mental illness goes up. And if you get it, it's likely to last longer, which is support for your hypothesis, which by the way, it's one that I believe matches reality very, very well. And the trick now is to get the rest of the medical profession to look at your work, to look at Dr. [Daniel] Amen's work and to look at the other cutting edge researchers who are just realizing, why are we focusing on your willful changing of your behavior when this is not a system that's controlled by will? It's the system that controls will.

So it's like beating your dog for not solving a crossword puzzle. You're like, well, the dog couldn't do that because that's not in its control. And so I feel like there's a lot more compassion that's going to come about in the healing professions, especially around trauma resolution. But that brings up trauma. You see some real bad stuff. I was just with a special forces veteran, an older guy, and we talked, it was actually really cool. We talked a lot about how PTSD had affected him and how he was helping younger guys and then got out of the service, just reconnect with life. But PTSD triggers these mental disorders. Are you saying that mitochondria get PTSD? What's the connection?

Chris:

Yeah, no, it's a great question. And we know that trauma impacts mitochondrial function and metabolism. So people who have a horrible trauma history, let's just put it at that, whether it's a war veteran, whether it's a woman in an abusive relationship, whether it's a kid who had a horrible abusive childhood.

Dave:

Or traumatic birth, that was my big PTSD source, you get smacked in the face coming out of the womb a few times and well, you might think the world's not a good place, who would've thought?

Chris:

So people who have trauma histories are much more likely to develop mental disorders, but it's a lot more than PTSD and a lot of people don't realize this. It's actually all mental disorders. They are more likely to develop depression, anxiety, personality disorders, substance use disorders like alcoholism or opioid addiction. And guess what? They're also more likely to develop bipolar disorder and schizophrenia. So it's almost across the board. The neurodevelopmental disorders aren't necessarily included in that because they would've occurred already. And so if you've gotten through neurodevelopment, yes, those disorders are not on the list, but most of the other mental disorders are. Alzheimer's is, Parkinson's is, seizures are, all sorts of brain disorders, but also metabolic disorders.

People with trauma histories are more likely to have obesity, type two diabetes and cardiovascular disease and die early deaths.

Dave:

It's almost like there's really strong evidence that trauma affects mitochondrial networks and changes their behavior metabolically.

Chris:

And it does. And we have pretty good evidence for that. And researchers, this is a fairly new field. So yes, we could certainly use more research and I'm all for more research in this area, but we have decent preliminary evidence that people with trauma histories have differences in mitochondrial number and the function of mitochondria in different types of cells. And one of the ways that I think about it is like what you said, that when an organism is threatened, it has a few responses.

So when people are traumatized, their entire system goes on red alert because they know that, hey, this is life and death. Somebody or something may kill me. And this is no time for sleeping, this is no time for repairing my body. This is time to defend my existence. And that means all of these resources are going to the fight or flight system, but it also means that all the repair work is not getting done, you're probably are going to have disrupted sleep. And that is a protective mechanism of, it's not a disorder, it's a protective mechanism. If you're being threatened, you should not be soundly sleeping for somebody to come and bash your head in and kill you. That's not a good thing. You should wake up at the slightest sound because maybe somebody's coming into your room to kill you. And those are normal protective things that they absolutely take a toll. They absolutely take a toll on people's health.

Dave:

One of my older fantasies from my late twenties was that I was just going to take out some of my mitochondria and use CRISPR, which hadn't been invented yet, but I was pretty sure something was going to come up and just hacked a living shit out of my mitochondrial DNA so that they just massively produce glutathione and they make ATP four times more than normal humans and then I could pick up trucks. How far away are we from hacking our individual custom mitochondria to give ourselves a little bit more energy than we had before?

Chris:

So researchers are actually working on mitochondrial transplantation. So that is underway. I think one of the challenges is getting the right number of mitochondria into the right types of cells. So one really important point for your listeners if they don't understand this, you can have some cells with horribly dysfunctional inadequate mitochondria that are just barely hanging on for their lives. Cells that are in great disrepair, ready to die, and you can have other cells somewhere else in your body, or even very nearby those cells, brand new, healthy, happy mitochondria and that cell is just doing everything that it needs to do. And that's one of the challenges. But again, as I said, stem cell transplantation, that's a really big area still. One of the things that those stem cells are doing is donating healthy mitochondria to any struggling cells.

You put in stem cells and they are going in to donate and spread around mitochondria. So I think that we're probably years, if not decades, away from practical applications of this. Although with heart failure, it's a lot easier because we know the organ, the organ is the heart. And if we could get more mitochondria in those struggling cells, like somebody with heart failure, if we could get more mitochondria in those cells, that person's heart would come back online. Yeah, at the end of the day, I

mean, you are the biohacker, but I will say if there was ever a path to immortality, it is through mitochondria. That is the path to immortality.

Dave:

Amen, brother. It certainly appears that way. We might need to do some other systems as well, but if you don't get that one, the other ones don't matter. It's refreshing to talk to someone, especially with your credentials. You're at a major institution and you know your craft really well, who's just openly talking about mitochondria. On a personal level, it feels kind of validated because I just believe this so fervently for a long time. But also I can see how this is a big part of changing your profession.

It's disruptive and it's a little bit risky to be honest academically and professionally to be just standing up like you read a big book, Brain Energy right here, here's the evidence. So thanks for taking the risk and having mitochondria that weren't so fear driven that you didn't just pull up the couch and tell me about your mother kind of thing. So I think you're doing a really great service to the world, and I feel like I could ask you a bunch of other questions. And there's one more I want to ask you that came from the upgrade collective, our live audience. And that is why do you think when some people get metabolic dysfunction, they get heart disease or cancer and other people get mental illness? What's causing the switch between those two?

Chris:

So, I would argue it is probably because No. 1, there are so many different environmental factors that can impact mitochondria in different ways. So sleep dysregulation, trauma history, epigenetics from your parents, diet, let's just take those alone. There are others too, but those all impact mitochondria, but they impact mitochondria in different ways and in different cells. So some cells are going to be more affected than others. And then clearly we have different genetics and epigenetics that we've inherited. And so some of our cells are going to be more vulnerable to metabolic or mitochondrial failure than others. So again, they're either built to last or they're maybe built to sprint, but maybe have more likelihood of disrepair or something under certain environmental circumstances.

And at the end of the day, that's the way I see it, is that different cells have different inputs. And depending on what environmental impacts you've had, you can get that sense. At the end of the day, we don't need to know specifically what all of those inputs are because the body and brain are going to tell us which cells are malfunctioning, and they're going to tell us, because you're going to look at somebody's weight or you're going to measure someone's blood pressure or you're going to measure their blood glucose, and you're going to see that it's problematic and you can use all of the common sense strategies that you have already been talking about for years and some others, but you can use all of these types of strategies to address the problem. And even if we don't know the exact cellular mechanism of exactly how are we lowering this blood glucose kind of doesn't matter at this point. At this point, we know we can do it and we can improve people's mental and metabolic health, and that's what really matters.

Dave:

That's fantastic. And Chris, thanks for being on the show. Your book, Brain Energy, Christopher Palmer, and where do people go to get the book? What's the best URL?

Chris:

Brainenergy.com.

Dave:

That's an easy one to remember. Guys, if you're having the voice in your head that won't shut up. If you're having the anxiety that's diagnosed or not diagnosed, you're critically tired. All this stuff that probably attracted you to the show about biohacking, maybe it really is your mitochondria and there's a lot of new knowledge in Brain Energy that's worth your time to consider. And if you have none of those problems and you're just here for good looks and all, I totally respect and admire your devotion. So there you go, to Chris, obviously.

Chris:

Thank you.

Dave:

Thank you so much for listening. Chris, thanks for staying up late and doing this interview. Profound work. Thank you for taking the big step of changing your profession. It's very, very meaningful.

Chris:

Thank you, Dave, for having me, and thanks for doing all the pioneering work you've been doing to set things up for work like this.

Dave:

My pleasure. I'll see you guys on the next episode. If you like the episode, leave a review. If you read Brain Energy, leave a review. If you drink Danger Coffee, leave a review because you usually tip your barista, well, the way you tip someone who makes cool stuff, whether it's a book or a podcast or anything else, is you just leave a little review that says, "Hey, this was worth my time." That matters more than you'll ever know to Chris and his mitochondria, or to me and my mitochondria. See you later.