Doctor Youthu2019s Background and Longevity Mission

Now, Doctor Elizabeth Youth is a co-founder and chief medical officer at Boulder Longevity Institute. She's been providing tomorrow's medicine today to her clients since 2006.

She upturned her medical degree from the University of Southern California Keck School of Medicine. Completed her residency, at Irvine with a fellowship in sports and spine medicine.

From Stanford. And she has, 30 years specializing in orthopedic sports and medicine. She's made it her mission to learn and share with the latest scientific research on how to heal the body at the cellular level.

She's fellowship, trained in anti-aging, regenerative, and cellular medicine. Know has completed, 500 plus hours of training online. We're going to be talking about, ketones, and why this is so powerful.

To support anyone with a neurologic disorder. Welcome, doctor. Youth. Okay, doctor. Earth, I'm so glad you're here, and I really look forward to having this great conversation.

Now, you've had your own interesting journey from sports medicine into longevity, and I think it'd be super interesting for listeners to hear, why and how you made that transition.

Right. That's kind of a unusual way to get into longevity medicine, right? Certainly not. You're the internal medicine doctor, the yard doctors, the endocrinologist.

But my background, coming from orthopedic sports medicine was quite different. And I think I'm really now dating back 20 years ago. I started to get frustrated with the fact that I felt like all I did was kind of patch people back together and never actually get people healthy or well, right.

You know, and you'd stick steroids in the knee or you'd, you know, do things, and then eventually you do scope and then eventually you'd replace the knee, and then you move on to the next joy and do that.

And I started to explore, well, can I use nutrition and hormones and health focused medicine to actually get my patients better? And that was working.

Except that doesn't work in a 15 minute appointment, right? So I started so I opened up the institute now 18 years ago, and I did both. I would wear my big hat during the day, and then I would go, if you really want to get better, you might come see me over here.

And I would see patients in the evenings at my longevity clinic and really teach them how to get healthy and look at all those things. So eventually, really not until 4 or 5 years ago did we combine the two.

And I still do a lot of regenerative orthopedics here, but we do just all health focused medicine dealing across the world with patients with all kinds of disorders and people who just want to be healthy as well.

Okay, perfect. Now, as since we're here, talking about EMS, and the brain issues, let's talk a little bit about, why mitochondria are so important for the brain, and then, I'll follow that up with, The specific strategies that you recommend to support better mitochondria.

Well, mitochondria are not even just specific to the brain, right. I think we can link almost every disease to mitochondrial dysfunction. But if you look at the most energy dense tissue that we have, the the the one that uses the most ATP, it's the brain, right.

Why Mitochondria Matter for Brain Health

Because it never shuts off. Yeah. So your brain, your heart, your muscles are going to be the most energy dense tissues. And all of your energy really comes from your mitochondria.

So as mitochondria are utilizing the nutrition sources that you're giving them, be that glucose or fatty acids or whatever you might give them to make ATP.

So they take in this, this glucose source, usually, right, as most of us are running on a glucose source to, to keep our cells going. And those that enters into the, you know, if you eat glucose into glycolysis and then it's the citric acid cycle and then the oxidative phosphorylation that spits out ATP.

And as we age or we're sick or we have something that potentially is harming my mitochondria, I have less energy. So my nerves can't function as well.

My muscles can't function as well, my heart can't function as well. My cells eventually undergo a pop ptosis and die. Right. They don't they don't have enough energy to to to function.

And we get this extra sort of electron imbalance in the, in the, in the cell. So mitochondria are really absolutely critical to all of our health maintenance.

And I think you could probably put down that every disease that you can think of begins with dysfunction in the mitochondria, this disruption in electron balance and oxygen phosphorylation and this disturbance of of basically redox reaction reduction, oxidative potential and eventually this, this cell death.

So the brain much more affected. That's why we see these people post Covid right where it's a big mitochondrial hit getting brain fog because our brain needs so so, so so much energy.

Yeah. You know again for the listeners our mitochondria are ancient bacteria right. They're engulfed by other bacteria. And those ancient bacteria were really good at using oxygen to create ATP more effectively.

And so we've had this cooperative relationship for over a billion years with these ancient bacteria that are really our mitochondria. And now I think people know that I've been a big proponent of a, ketogenic diet, because I know that my, the kind of dysfunction drives disability and, progressive issues for people with. Ms..

And we found that ketogenic diet have been very, very helpful. Can you explain why the ketogenic diet is so helpful? Right. So let's look at that. Right.

If my mitochondria are not working as well, and everything comes down to how much ATP I can produce because that's going to be what supplies me my energy, right?

That's our energy, our energy source. That's our our putting gas in our car. It's how much ATP we have, you know, so if I can't efficiently use glucose because my cells are not working well, then I can switch over to another source.

And it's actually really a more efficient source. And that's ketones. So why are ketones so much more efficient than glucose? So when you look at glucose it really has to go through glycolysis.

Right. And then conversion to to basically acetyl CoA and then that. So that's and then citric acid cycle cycle and oxalate phosphorylation. So that's for every molecule of glucose utilizing two NAD sources to make this.

And you're going to it's very, you know sort of triple process to get it for every molecule of the main ketone in the body, which is beta hydroxybutyrate, you get direct you you don't have to go through glycolysis.

Right? I get to skip that whole step. So I skip this whole big piece of making energy. And I go right to direct conversion to something called a pseudo CoA.

Right. And then that can enter into citric acid phosphorylation. So I can more efficiently make ATP. So it's much more energy efficient to do that. It requires less oxygen per ATP generated.

I get to skip this really energy consuming step of glucose transport into the cell, and glycolysis. And if you compare the energy yield per carbon atom, let's say per oxygen molecule, consume ketones are about 30% more efficient than glucose forgetting that.

So if you think about this oxygen efficiency or is that particularly important the brain. Right. So I'm really getting a much more efficient energy source by using ketones instead of glucose to make energy.

I'm using up less oxygen. I'm using up less NAD so I can make energy faster and more efficiently. Okay. So there are, so people we can do a high fat, low carbohydrate diet, right?

And make more beta hydroxybutyrate. We may have some keto flu, so making us, not feel quite as well the first few days or a week or two. I know that there's some individuals who use ketones, exogenous ketones.

What are they and why might people want to consider adding them? So let's talk about why.

Ketosis and the Benefits of Exogenous Ketones

Maybe it's even more efficient to bring in exogenous ketones than actually letting your body make them themselves. Okay. So when you're in ketosis, remember.

So I've, I deprive my body of glucose has no choice but to go to fatty acids as their energy source. Okay. So basically no glucose I'm going to go to my my my body knows it needs energy.

It's going to use fatty acids. So from that those fatty acids that I'm taking in some of that's converted to B hydroxybutyrate. So about 2,080% of it goes to beta hydroxybutyrate.

About 2% goes to acetone. That's why you get that weird breath sometimes when you're in ketosis. Right. That's acetone. So actually when you breathe out that acetone that's what that's that's what you're breathing.

The rest of those two acetal acetate and the ratios of those vary. They vary depending on the duration you've been in ketosis, the level of ketosis, the level of exercise, the state of your liver.

So there's a lot of things will vary. How much beta hydroxybutyrate, how much acetate I make and how much acetone I make. Remember the mean molecule I want there is the beta hydroxybutyrate.

So I'm getting a little bit of unpredictable amount. You know when you measure ketones, when you when you use ketone strips what you really measure is acetal acetate.

Right. So that's the urine ketones that's in your ketones. Right. So when you're measuring your ketones not so much blood ketones. Right. You're measuring a pseudo acetate.

And that's why those urine ketones are useful kind of early on in ketosis. But as we switch out of making as much of this keto acetate, they become less reliable.

And so so then that's why the longer you're in ketosis, the more beta hydroxybutyrate you make, the better off you're going to be in terms of energy function.

But if we use exogenous ketones instead. So let's say I'm just going to get in my body. The main ketone is relied on. So hang on for a moment. So I want to explain.

Everyone just means that I'm taking ketones by mouth as opposed to making, making them myself. Making it myself. So they've got endogenous or things that we're doing inside our cells, inside, inside.

So endogenous is something I'm doing inside myself. Exogenous is something I'm bringing in from the outside. So I can make my own ketones by burning fat.

Or I can take ketones and the main ketone that we take in is something called beta hydroxybutyrate. Right. And that's the key to that you're making more of over time when you're in ketosis, less of when you first start ketosis.

So I can immediately get these beta hydroxybutyrate in 100% of my ketones. Now beta hydroxybutyrate enter the circulation, cross the blood brain barrier.

So we know that beta hydroxybutyrate can cross the blood brain barrier. They're taken up by cells through a transport mechanism. And then they activate this histone deacetylase inhibition, these Ampk pathways.

So they can actually start to not only provide this rapid energy source, but also by what they're doing. And natural ketones will do this too. When you're in ketosis, it just takes a lot longer to see this change.

Like, this histone deacetylase. Histone distributions are really important. So so when you inhibit these histone deacetylase, that's actually a really important part of healing and recovery.

So that's one of the things that initiates a sort of anti-inflammatory effect. So I'm not going to say that it's not beneficial to be in dietary ketosis.

But could we do the same thing and maintain better metabolic flexibility, have higher levels of the most important ketone the beta hydroxybutyrate have get higher levels.

It more with a more standard amount and get all those benefits you know, without having to to that, you know, and you know as well as how hard it is sometimes, especially when you're sick or people like, I look at my cancer patients or people like that, sometimes it's very hard for them because you're trying to just keep caloric intake in them is hard, right?

So sometimes trying to keep them in ketosis, especially when they're, you know, their their their appetite is not good. And you're trying to keep some, some caloric intake in them.

That can be very difficult. So if I can keep metabolic flexibility and get the most of that's both the best world, I think that we can really do some nice things with these, you know, and I think it's important for us to, think about that, because I don't want people losing weight, who have cancer.

Right. And, in my trials, we, people who are lower weight, we have to be careful that they don't become underweight. Now, there are several different types of ketones.

Exogenous ketones are on the market. I've got, salts, esters, about identical ketones. What are the differences? In is there advantage, one over the other that the body.

So our body primarily makes a ketone ester. Okay. So with ketone esters, they have significantly superior bioavailability. Ketone salts. Ketone salts are ketone linked to a mineral load, either sodium or a, some or magnesium is some kind of mineral low so that.

So that number one they're much more slowly absorbed. And a lot of times we actually want that more rapid effect. When I'm taking in ketones I need that brain energy more rapidly.

Like I'll, you know, drink one now while I'm talking, for instance, to, to try and and bring a more rapid energy source. So so ketones lots you're not going to get that.

There also is an issue with potentially disturbing the metabolic balance because of the mineral load that you're giving or sodium load. So let's as is are bound to assault.

And that can actually change that. So levels sort of the the the metabolism of the cell. So there's downsides to ketone salts. The upside they're cheaper.

So they're significantly less expensive than ketone esters. The downside is I don't trust their bioavailability. They're lower. The I don't know when the absorption is going to peak.

So I'm kind of all over the place on how to dose them. And I limited it how much I can use. So I can't use massive amounts or I will potentially disrupt somebody's metabolic like ketone esters are much more bioavailable.

They're more instantly bioavailable. They have much faster absorption. So I know that I can maybe potentially use them, for instance, before a workout or in my recovery phase and get a nice rapid effect, you know, so I can use them a little bit more, spread sporadically throughout the day and get a very rapid effect.

We know that you can reach higher beta hydroxybutyrate levels. You can you can measure beta hydroxybutyrate. You can reach significantly higher beta hydroxybutyrate levels with ketone esters without the ketone cells.

And you don't get this electrolyte load. So I know that I'm not potentially changing or disrupting electrolyte balance in my patients. You know, which is a concern, especially with those patients who are more delicate in their health.

If you look at bioidentical ketones, what they've done is it's, ketone esters are a beta hydroxybutyrate bound together with something called one three butane diol.

Okay. And then when we digest them, they break apart so that ester breaks apart. It's the two different components. So when you take it ketone esters that's what happens.

You digest the ester that bound together molecules you buy separate. So that utilizes the beta hydroxybutyrate. The bioidentical ketones actually separate those out beforehand.

And and they were the first developed kind of for medical use because we could get a much better flavor. They actually taste much better because ketone esters taste like gasoline.

And by breaking the bond the horrible. Right. So it's hard to get people to take them in any kind of appreciable amount. Interesting. When they broke that bond, they got a much they didn't get that horrible gasoline flavor by breaking out the one three butane diol from the beta hydroxybutyrate.

And you still got the same beta hydroxybutyrate, in fact, better levels of beta hydroxy beta on testing than when you took ketone esters. So we really consider these probably the most efficient source.

And by far with my patients, for instance, by for better compliance simply because they they take the extra taste good. You know, that they, they don't have that gasoline flavor.

They have a nice they, you know, they flavored them with different things sometimes, you know, these natural flavorings, they sweetened, some of them, they sweetened with a little value as the medical high level medical grade ones don't have the alkalosis to them.

Sometimes we don't want that in our patients.

Ketone Types: Salts, Esters, and Bioidentical Formulations

But for that sort of standard ones that that people can buy, they they come in a can that you can drink or, you know, and a little thing you can just add to your water and they actually taste, you know, I like them.

I mean, I enjoy drinking them so I can get my patients who sometimes I really struggle with getting things down them, especially my cognitive decline patients. Right?

I try to get them to eat something that tastes horrible. They're not going to do it. It's like try to feed a two year old something to like, right? They don't do it. So this is a, a godsend for me and my patients.

Now, what are the promising, therapeutic applications? If you look for somebody with a neurologic and autoimmune condition affecting the brain, such as M. S.

or any of the other neuro immune problems. So an autoimmune issue that has neurologic symptoms, pain, fatigue, mood problems, anxiety, depression. Right.

And you know, we look at M. S. or all of these autoimmune conditions, cells are really in this energy crisis state. And you preach this all the time, right?

I mean, we're in this constant state of energy crisis, and it's due to a lot of things. It's due to this, this inflammatory damage to the mitochondria is due to disrupted glucose metabolism.

We just don't utilize glucose as well as it becomes after traumatic brain injury. Right. The brain can't utilize glucose as well. So even if you're eating glucose it's not being utilized efficiently.

And then there's just higher energy demands from being in a sick state. Your body is trying very hard to help you to fight this inflammation. So much higher energy demands.

So these people are are are in demand for ATP. And they can't get it because the body's really trying to mount this, this nice immune response. And they don't have the energy to do it.

So again by Keith. But like ketones are going to improve the efficiency by skipping that glycolysis state or to deliver ATP faster to these struggling cells, we're going to give them some energy so that they can survive.

Do well. We can activate these and one macrophages. So we can actually actually you know mount a really good efficient response. We also know that when we bypass glycolysis a lot of things that could go wrong in glycolysis.

So there's a lot of places in glycolysis where energy production fails. And we're reactive oxygen species are produced. And I know you talked about this right.

When we look at diseases like M. S. or other autoimmune conditions or, you know, most conditions where we're in a disrupted state, we have a high level oxidative stress.

Well, that's produced when I, when I at most leading these steps of glycolysis is a lot more reactive oxygen species, things like superoxide and hydrogen peroxide that are produced when we're going through glycolysis.

There's a lot more stress placed on these already compromised metabolic pathways. So that's really critical when we only have these damaged mitochondria.

Last thing I want to do is throw more oxidative oxidative stress into the picture, make them, you know, have them have to deal with more of these oxidative free radicals.

You know, we also know that that, that when we, when we give ketones that not only are they offering this energy source to mitochondria, but they themselves are causing are producing anti-inflammatory benefits.

So ketones and you know this, whether this is just me, we take them in or we put ourselves in Nikita state, we increase brain drive neurotrophic factor.

So Bdnf is one of our protective agents for our brain right brain derived neurotrophic factor. It actually helps our brain to recover and heal. And we have low levels of NF and a lot of neurologic diseases.

So we can actually naturally increase the production of Bdnf with ketones. They're also really anti-inflammatory. So

think about one of the things that happens in these diseases M. S.

autoimmune disease, cognitive decline, cancers is that we have very high levels of something called the LRP three inflammasome. And this Nlrp3 inflammasome initiates a lot of the kinds that are responsible for ongoing inflammation.

So it becomes a sort of vicious cycle of inflammation. So basically by when you take you to own it actually suppresses this inflammasome activation. So now your body can actually stop getting out of this vicious cycle of inflammation.

So you know, hang on. For the listeners the these inflammasome are increased as we age. That's called inflammation. And there's more evidence that's continuing to grow that multiple sclerosis and many of these, autoimmune diseases affecting our brain is a disease of accelerated aging.

So I think what I'm hearing you tell me, doctor, youth, is that ketones, including taking more exogenous ketones, can stop that accelerated aging, or at least slow that down and reverse that.

So that's exactly right. And you are you are right that we are all we are all destroying myelin as we age. Right. And that's happening much more rapidly because your immune system is attacking myelin.

But we that is happening to all of us our age right as we age I my sensation is now as good. My muscles do not react as well. My my reflexes are not as fast.

I can't move as easily as I did when I was younger. Why is that? So we all are getting some degree of neural loss, just not at the piece that you see with M. S.

but we are all on that same path. So this is why ketones are so important to all of us. Honestly. And why either, you know, doing intermittent fasting or things like that to put yourself into ketosis or using exogenous ketones.

You know, I'm real skinny. So for me, going into, you know, long, fast is not very conducive to my right, keep my weight on. So I can I can by reducing these inflammatory inflammations, I stop these cytokines.

And we know these cytokines that are produce interleukin one beta, interleukin six, two men across this factor alpha. And there was just an article that came out showing if we could alpha levels low, we age more slowly.

So we know that if we can reduce that cytokine production, and it's absolutely been shown that ketones can do that, we stop this immune system that's what you call the inflammation, the immune system, aging.

You know, our listeners are probably now like, okay, this sounds like a good idea. Maybe I should try ketones. Do we have any suggestions for how they could begin?

Trying those? So there's, you know, so, you know, there's there's several brands out there. And again, I like this kinetic brand because it's the first one that actually made this bioidentical ketone.

Therapeutic Uses for MS and Neuroimmune Conditions

And and it it's good. So I buy these cans because they taste really yummy. And I drink a couple of them a day. But if you're going to use you can also just buy in condensed form.

So there's we know that they're most beneficial in the recovery phase of exercise. So so let's say you're you're injured or you have M. S. and or you're just like me and you go workout hard.

Then in that recovery phase, if you drink ketones right afterwards, we can actually help muscle building, prevent lactic acidosis, stop some of the inflammatory reactions that lead to you inability to train hard.

So we can use a after exercise. They've been really well documented, but when we're dealing with disease states, we actually like to use them before exercise as well.

And and or if you're doing a long endurance events, you might want to actually start adding them in. But the the key is if we can do them before, can we actually give my cells to sources of energy.

Right. So if I'm eating carbohydrates and I have some ketones on board, that when I exhaust my carbohydrate store, my body has these active ketones on board so I can switch over if I'm doing a longer event or if I'm in a metabolically unstable state and I'm not utilizing that glucose well, right.

So I wear out fast in my exercise, one of the pieces you'll see right when your Ms. patients right is they can't exercise. They can't exercise. Absolutely.

So by giving ketones ahead of time I'm giving them some ATP. I'm giving them gasoline. I'm giving them energy because they can't utilize those glucose, that glucose.

Well, we've already said that their brains are inefficient, their muscles are inefficient, their mitochondria are inefficient at utilizing glucose. So you ate your carbohydrate before exercise or whatever and or, you know, and but by using ketones now I've got an energy source so I can exercise a little bit harder.

I can give some energy to myself. I'm not going to fatigue as rapidly. So. But what I think I'm hearing is that for for the Ms. patient, the autoimmune patient taking ketones, with lower inflammation boosting nerve growth factors, improve energy with probably less fatigue.

I'm predicting, greater mental clarity. And, because there's more evidence that anxiety, depression are linked to high levels of inflammation, that probably is really helpful for your mood.

Now, do I do I take the, ketone? I drink it all at once. Do I add it to my water and I sip it throughout the day, and the amount you're going to use is going to depend on your goals.

So typically if somebody is more in a disease state, we're going to use higher doses of ketones. So for instance in my Ms. patients or my autoimmune patients I mean it's 20g 3 or 4 times a day before exercise after exercise in the afternoon.

Is there fatigue for somebody like me who's isn't it just kind of to boost my energy through the day? You know, I will take like 12g a couple of times a day and and you can't sit them through the day.

A lot of people actually do like to add it to the water and just sip it through the day just to keep their, their, their ketone levels a little bit higher.

So they're always have that energy source. I kind of find that I utilize them more when I'm starting to get that just drop in energy and I need a more rapid pickup, so I'll drink a can all at once.

Right? I'll just drink it. I mean, I can't drink that. In my clinical trials, we monitor blood ketones, see if people are in nutritional ketosis looking for a point five greater.

If I started taking your, ketones, I'm, what I see is my ketones are 2 to 3. So, much higher levels. What are the ketone levels that, that you see in your clinical practice when you're using ketones?

So it does again depend on how you're utilizing them. Right. You are going to see a faster rise in ketones. If you take a big, you know, a big dose, you will see a faster rise.

And when you're going into some ketosis where you're keeping a more steady level, but if you can sip them a little bit more throughout the day or find the dose that seems be more readily, you can keep those ketones about where you want them at, that sort of that sort of one level, for people now, I want mine to go up into that kind of two level

at times.

So, you know, and I could do that very easily with about a 12 gram dose of ketones. Measure it about 30 minutes later and you'll see that, that go up and maintain for about an hour or two.

Okay. Does this have any, do we integrate the ketones with other treatments that we use or always. Is there anything that we don't do that. Right. I think there's very few things in our type of medicine that we're saying.

This is the answer to everything. Although if I were to take one thing, that's going to be a pretty big answer. Ketones are going to be a pretty big answer to things.

But always I'm going to be utilizing other things too, right? I you can't just take ketones and all your life is better if you're still eating sugar all day long and, you know, and and not doing anything right with your help.

But we have to look at how do I help mitochondria function in general besides ketones, because mitochondria are hard to support, especially when they've been damaged.

So I like to also think about other things. The mitochondria needs. People are all getting into these NAD infusions. And I will tell you the problem with NAD is the reason that NAD drops when you have disease states like M. S.

or aging, which is a disease state, you. The reason your NAD levels are dropping is because you have a very high levels of enzymes that are degrading the NAD.

How to Use Ketones and Support Mitochondria

It's not that your nicotinamide, which is your biggest source of energy, is dropping. It doesn't. It's because you have high levels of two enzymes, Cd38 and MTY, which is a methyltransferase enzyme that is depleting these.

So if you measure NMC levels in Ms. patients or myself was 63 years old, they will be significantly higher than when we were younger. And that's why are NAD levels degrading.

So if I get an ad and I have this big leak in my bucket, what am I doing? All I'm doing is actually feeding the the downside metabolite, which is this term they call for pure tone, which is actually very bad for me.

So I get very concerned that when and we're also stealing methyl groups because the way we get rid of that, the NT is getting rid of that NAD is by methylation.

So now I've also disrupted my methylation. So I'm giving the cells high doses of NAD which are disrupting methylation, which is going to lead to cancer and other diseases and metabolic disturbances.

And they're creating a byproduct call for pure don. So the better thing to do is block these enzymes. You can use apogee to block cd38. You can use what they call one methyl nicotinamide or one MDA to block and an MT.

That way I can actually rebuild my NAD stores. So if I if I use ketones which are sparing NAD because I use twice as much NAD with glycolysis than I do with ketone.

So I spirit and I can build that up and I block the degrading enzymes. Now I've got this nice NAD stores in my mitochondria and that's going to really help them.

But I've done it naturally the way the body does. Right. So so that's much better than throwing a bunch of nad into the system that people are doing. We're going to see downstream problems with all these people doing this energy and then supporting other, you know, what else does the does the mitochondria need?

Well, it needs, you know, coenzyme Q10. It needs you know, I like you to listen to what I do to support mitochondrial function. And then when my people are really severe mitochondrial function, I pull in some of the

peptides.

You know what? You're getting into much more complexity. But you know, those things like mitochondria itself. Remember, as I said, they're their own little beings.

They have their own little DNA. And so they are making their own peptides. And so I can give back those peptides. They're making sense. 31 human in my SC, I can use these peptides to also boost my mitochondrial production.

So if I do all of those things blocking the NAD aid, giving ketones to support my NAD and my ATP production, restoring my mitochondrial health with some of the mitochondrial peptides, I can see dramatic improvement in mitochondrial function, which is going to lead to dramatic improvement in my mind in every disease, including aging.

Well, this has been phenomenal. What I my listeners are probably thinking like, well, this seems like, worth exploring. So if people want to learn more about, exogenous ketones, and the ketones that you're using, where would they go?

Well, I think that that, mean there's a lot online on ketones. I do like it. So I don't really have any investment in this. I just like them because they've been great for my patients.

And the company has been really helpful to me to actually help me make high dose ketones for my patients. But, so their site, the kinetic I kinetic, okay.

Okay. Okay. So their site has a lot of information that there's a lot of research on ketones. We do I have an educational academy. I know you do a lot of lecturing on this stuff, too, so I think listening to your podcast, listening, we have an educational academy.

If you go to Bali, but once you have the NCP Elite Academy, we have an educational academy where we talk a lot about these things as well. So there's a lot of sources out there, guys who think that, you know, be careful on who you're listening to because there's people who are just trying to sell you things.

And that's why you love people like Doctor Waltz, who doesn't really, you know, he's trying to sell us anything. Like I said, you can always do your own ketosis.

I just think this is a nice option for people who who have difficulty with eating, you know, staying in a constant state. And I will tell you that you don't want to always being ketosis, because that that state can disrupt some of your ability to even use glucose.

So I like this approach of, you know, going back and forth, back and forth, back, because that's what our ancestors did, literally from that place of yours.

So I agree completely. Again, doctor, your, this has been wonderful. Thank you so, so much for chatting with me today. Thank you for having me. I really appreciate it. I was.