

THE MODEL **HEALTH** **SHOW**

EPISODE 560

The Truth About Burning Fat For Fuel & Unlocking The Keto Code

With Guest Dr. Steven Grundy

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SHAWN STEVENSON: Welcome to the Model Health Show. This is fitness and nutrition expert Shawn Stevenson, and I'm so grateful for you tuning in with me today. At some point, Luke has to become Yoda. We've got to evolve. We've got to step up. We've got to start teaching the earlier generations on how to be a Jedi. Somebody that evolved from Luke Skywalker dancing around with this lightsaber to being Yoda and teaching future generations on health and wellness is our special guest today, Dr. Steven Gundry. Now full caveat, he might not look like Yoda, alright? He's not a little green dude. But his wisdom and his skill set is absolutely remarkable. And I'm bringing this up to say that this conversation that we're having right now about longevity, we have to learn from people who've actually achieved said longevity. It's one thing to have theories and have really well-thought-out theories and hypotheses about longevity and what constitutes longevity. But the greatest data set that we have is the people who are living to a ripe old age, but not just that. It's not just about the chronological age. It's the health span.

In his 70s, he's now publishing his newest book, which is sure to be another New York Times bestseller. And as of this recording, he's out on a ski trip with his wife and just doing the thing. While most of the time, whenever I connect with him and talk with him, he's seeing patients seven days a week as well. It's just like, "Where do you get this energy? What are you on, Dr. Gundry? What is fueling you?" And so that's what we're going to be talking about today, taking this conversation to that superhuman level, right? So, tapping into what is our potential. With a lot of the conversation that we need to focus on right now is the basics, absolutely. And we do plenty of that because this is what our society needs the most. Well, we've got to dabble in here, sprinkle in some of the leading-edge information and how we can become even better. How we can tap into the greatest expression of our genetic potential. Which, as you're going to discover, there's a component to this that is so obvious yet so overlooked, and this is our mighty, mighty mitochondria, these ancient organelles that exist. We've got upwards of 2000, even 3000 mitochondria in all of our cells. These are a spectrum, could be 1000 to 2500. Now, we have some preconceived notions about mitochondria that are going to get disrupted a little bit here.

And that's what he does. Dr. Gundry is a disruptor in every sense of the word. And he's bringing up an important distinction with one of the most popular diet frameworks today, and this is the diet framework revolving around ketosis, the keto diet. It's on everybody's lips, from high-performing athletes to everyday folks just looking to lose a few pounds. There's a tremendous amount of efficacy with some of the ingredients of this protocol. But what makes this different, and this platform, the Model Health Show, is our inclusivity in inviting in many different perspectives and people from different diet frameworks being a part of this

community and being able to glean the very best science and insights regardless of our personal nutrition beliefs. And we understand that we don't want to lean into nutritional dogma and keep our minds and our hearts open to variations in how things are actually working. Because today, Dr. Gundry is going to point out a really interesting secret about ketosis that bypasses something that we believed about ketosis. And number one, it's remarkable. Number two, it's a little bit... Again, it's a disruption to the normal programming.

And so, make sure that you're listening with an open heart, open mind, and really tune in here because it's going to make a whole lot of sense at the end of the day. And also, regardless of our diet framework that we're subscribed to, we can partition some of these insights into what we're doing in a way that works for us. And we really get to the heart of what is creating longevity. What is creating energy in a person who's in their 70s, like Dr. Gundry, and performing at such a high level? How can we aspire to that? And also, in our lives right now, how can we be the very best possible human being that we can be right now? And I know if you know, like I do, if we check in with ourselves, we know that there's another level for us, no matter where we are. And that's what I'm trying to get to. And that's what I'm inviting you to, as well.

Now, during this conversation, we're going to touch on, very lightly, the topic of brown adipose tissue. We did an entire masterclass on brown adipose tissue that, after this episode, definitely check that one out. It's so much insight on to the role of brown adipose tissue, and also specifically this thermogenic effect and being able to elevate our basal metabolic rate, our resting metabolic rate, so that we're expending more energy just doing our normal day-to-day stuff. That can be a huge leverage point for folks that are wanting to lose weight and to achieve a healthy body composition. And so, in this little nugget that I share during the episode, it was scientists who were using an fMRI to look at the brown adipose tissue primary spots on the body, which is largely going to be around your clavicles, aka your collarbones, shoulder blades, and your upper back and down your spine. That's generally where we're going to find the highest ratio of brown adipose tissue. This is a type of fat that burns fat. This is a type of fat, structurally a fat, that burns fat for fuel. The reason that brown adipose tissue is brown versus the white adipose tissue, which is a storage, more of a storage form of body fat...

Brown adipose tissue is brown because it is so dense in mitochondria, these energy-generating power plants, again, ancient powerful organelles in ourselves. It's so dense in this. This is why it's expending so much energy. So, they looked at FMRI, the brown adipose tissue spots in the body and they saw that when folks drink coffee, these parts of the body, the brown adipose tissue, essentially was just lighting up, demonstrating this resonance with the human body, coffee, and the activation of brown adipose tissue. And here's another little insight as well, seeing that some compounds that are in coffee nudging beige fat cells. So, these are fat cells that are kind of on the fence, that could become white fat cells or brown fat cells. So, storage

fats. When we think about "burning fat or losing fat" we're thinking generally about our white adipose tissue, these storage fats. And what we do, our environmental inputs can nudge our beige fat cells that are sitting on fence into being white fat, or it can nudge them into being brown fat. Compounds in coffee nudge the beige fat cells into that brown fat domain. So, with this tied all in together, one of the other remarkable things... Because just staying in this lane of longevity, Stanford University researchers recently deduced that the caffeine in coffee is able to defend against age-related inflammation.

Their research revealed that light to moderate coffee drinkers live longer and more healthfully, have a longer health span, thanks in part to the protection caffeine provides by suppressing genes related to inflammation. We're talking about Nutrigenomics here. We're talking about literally epigenetic controllers influencing our genes. And this is a huge component here. Because again, this is... We usually have this connotation with caffeine being this bad thing. This is how things could get marketed and framed. But in reality, where is the caffeine coming from? Is this coming from a viable nutrient dense resource that has more compounds than just hitting that caffeine note down. And also, the quality of said coffee matters tremendously. There's a U-shaped curve of benefits. Whereas folks who weren't consuming coffee, they're not having this benefit noted in this study. Whereas if you're drinking too much and going ham, because they said light to moderate coffee drinkers, then you're going to have diminishing returns and possibly have some other issues, some other side effects. So, light to moderate coffee drinkers, literally suppressing genes related to inflammation.

Another recent study in talking about longevity, published in the Journal, Practical Neurology, details how regularly drinking coffee has been shown to help prevent cognitive decline and reduce the risk of developing Alzheimer's and Parkinson's disease. That's just flat out remarkable. Again, it's not just life span, it's our health span. There's something really remarkable about coffee. But here's the thing, we don't want coffee that's coming along with pesticides, herbicides, rodenticides, things that are well established to damage our mitochondria, to damage our microbiome, damaging the healthy expression of our genes. So, we want to avoid those things. Organic high-quality coffee. And also, I really want to highly, highly advise you to make sure that we're not just hitting the coffee button. But take this as an opportunity to have coffee that is infused with storied, clinically proven medicinal mushrooms like Lion's mane, like Chaga. That's exactly what I had today. Lion's mane has been affirmed by the University of Malaya. It's being used right now and studied for helping to heal people from traumatic brain injuries. The properties in Lion's mane have been found to stimulate neurogenesis, the creation of new brain cells. Flat out remarkable. If we're looking at longevity, we're going to need that.

And Chaga, Chaga medicinal mushroom is one of the most clinically studied and storied mushrooms documented throughout history. The highest source of antioxidants you're going

to find in anything. Chocolate, Chaga has more. Acai, Chaga has more. Goji berries, Chaga has more. You name it, you name it, Chaga has more. So that's the bottom line. So, what if we can infuse ourselves, and even talking about superoxide dismutase and activating these pathways for glutathione and other things we're going to talk about. It's just so wonderful, the things that we have access to today. So don't just do coffee, do organic mushroom coffee from Four Sigmatic. Go to F-O-U-R-S-I-G-M-A-T-I-C.com/model. That's foursigmatic.com/model. Get a special discount at least 10% off. Big fan of their Lion's mane mushroom coffee and also their Cordyceps mushroom coffee as well. You can get instant packs, or you can get the ground coffee itself and do your thing, make it even sexier. It's a great way to start your day to healthfully, intelligently energize ourselves. Again, we're talking about epigenetic influence, setting the template for longevity. There's nothing better than that. Go to foursigmatic.com/model. Now, let's get to the Apple Podcast review of the week.

ITUNES REVIEW: Another five-star review titled "The best," by Asorial Rojas. "I love Shawn. He's so intelligent and personable. He inspires me every time I listen to his podcast. I've made great changes for myself from being empowered through his podcasts."

SHAWN STEVENSON: Such an honor. Thank you so much for sharing that over on Apple Podcasts. I appreciate you immensely. Thank you for taking the time to share your heart. Listen, if you got to do so, please pop over to Apple Podcasts and leave a review for The Model Health Show. And on that note, let's get to our special guest and topic of the day. Our guest today is Steven Gundry, MD. And he's a renowned heart surgeon, medical inventor, and four-time New York Times best-selling author. Dr. Gundry practices medicine seven days a week at his clinics, the International Heart and Lung Institute in Palm Springs and the Center for Restorative Medicine in Santa Barbara. Dr. Gundry is also the host of the weekly Dr. Gundry Podcast. And now he's back on The Model Health Show to share some new game-changing insights. So, let's dive into this conversation with the one and only Dr. Steven Gundry. I'm a baby compared to you. You were winning awards when I was not even a thought. You are the definition of what longevity is. So, learning from you is such a gift for all of us.

DR. STEVEN GRUNDY: So far so good. I knew Jack LaLanne in his later years, and I think I've said before that Jack LaLanne really was the godfather of fitness. And I had the chance to know him, and Jack had this favorite expression. He says, "I can't die, it'd be bad for business." So, I guess that's same with me. I can't die 'cause it'd be bad for business.

SHAWN STEVENSON: That's right. Oh, man, that's really simplistic and also, just kind of jumping in here, true to form, you're being disruptive with this new book. And one of the things that you kick things off with was saying that ketones are not the miraculous cellular fuel that we think they are. Help us make sense with that, Dr. Gundry.

DR. STEVEN GUNDRY: Well, yeah. I've had a version of a ketogenic diet for 20 years and I've always told my patients that ketones and a ketogenic diet will make you an incredibly efficient fat burner and it's that ability to become an efficient fat burner that makes you lose weight if you're doing a ketogenic diet right. Well, when I was writing *The Energy Paradox*, I wanted to put some muscle behind these proclamations of explaining how ketones work and what a great fuel they are. And when I started looking up the papers to back up my thoughts and what almost every keto expert says, in fact, the papers say the exact opposite. And this is great research coming out of Harvard, in humans, from Dr. Cahill and Dr. Owen, coming out of the NIH from Dr. Veech, looking at where ketones came from, why they existed in the first place, and it turns out the exact opposite of what almost all of us preach is actually happening. Ketones are a horrible fuel. They're a fuel primarily designed to tide the brain over temporarily when we're starving. And maybe I can explain that better.

Normally, and we talked about this, you and I are fanatics about having metabolic flexibility, the ability on a dime for our mitochondria, the little energy-producing organelles in most of our cells, to take glucose as a fuel and make it into ATP, our energy currency, or to take free fatty acids as a fuel and make that into ATP, but the process for doing that is very different. But normally mitochondria, if glucose runs out, if you stop eating, if we run out of glycogen in our muscles and liver, in a few hours we should be able to literally on a dime switch over to burning free fatty acids as a fuel and that's good, except free fatty acids can't be used by the brain. They could be, but they can't get into the brain because they're actually long-chain fats and they can't get through the blood-brain barrier fast enough to fuel neurons. So, neurons would be perfectly happy to use free fatty acids as a fuel, but they can't because free fatty acids can't get through the blood-brain barrier fast enough. So, enter ketones. Some free fatty acids go to the liver when you liberate free fatty acids and there, they're converted to ketone bodies and ketone bodies are short water-soluble fatty acids that just so happen can go through the blood-brain barrier quickly and it just so happens that neuron-mitochondria can use ketones to kind of hold the line to keep things alive until the next food arrives.

Dr. Veech at the NIH made a huge point of this, that the ability to generate ketones was really what made us, and our ancestors survive from famine to famine because we always didn't have a great kill or we didn't always have food available, grains or fruit. And so, during those times, ketones were a great temporary substitute, but Veech took it one further. He said our natural condition is to be starving and we should always try to be starving 24 hours a day. And in fact, he became so famous for it, he made the cover of *Time Magazine*, that we should always be starving. That's actually a very bad idea. But it was actually Veech's colleagues at Harvard who said, "Not so fast. When we actually look at human beings, in fact, that actually does not happen at all. In fact, the exact opposite happens. Ketones are a pretty lousy fuel, and we should start to look at, well, wait a minute, if they're a pretty lousy fuel and they're only there to keep our brain okay before the next meal arrives, but they have some really cool effects that everybody

who does ketogenic diets benefit from, what the heck are they actually doing if they're not this super fuel?" And that's when, unfortunately, I ran down this rabbit hole and realized that ketones are really incredibly signaling compounds. They're signaling agents that tell mitochondria that times are rough and to protect themselves at all costs. And we'll get into that.

So yeah, sorry, folks. And in the book, I jokingly produce a lot of quotes that are in a bunch of the ketogenic books with ketogenic experts, and I've not included their names to protect the innocent, but... But all of us can have a very good laugh at those quotes including one quote from a ketogenic expert that says that ketones are the liver's preferred fuel. In fact, the liver can't use ketones as a fuel and that's why the liver releases them into our bloodstream. So, I'm sorry, we're wrong, I was wrong. And one of the things I guess that's made me believable through the years, is that I want to find out what I'm wrong about, I want to find out why I was wrong, and I want to tell people hey, I was wrong. Guess what? I've learned something and the purpose of research is really to reject conventional wisdom and find out how we were wrong about something.

SHAWN STEVENSON: That's called doing science.

DR. STEVEN GUNDRY: That's exactly, right.

SHAWN STEVENSON: And this is the thing... Again, I really admire about you, number one you're demonstration of longevity and this is yet another epic book that you're writing. When most folks have already phoned it in. And I know you've got tons more in you already, but you've been somebody who has a healthy amount of skepticism and keeping that open even within the ideas that you carry. And because of that, you've been able to offer up some pioneering game-changing insights that then trickle themselves throughout all of nutrition in all of health and impact the lives of millions of folks who don't even know that they're coming from you, it's that remarkable. And one of the things that you brought up in the book like in a way that I haven't really seen before, you do emphasize this relationship with mitochondria, but the relationship with mitochondria and the role that ketones play really jumped out for me in an entirely new way. But first, I want to highlight this relationship with metabolic health and our mitochondria. You have this study in there with identical twins, can you talk about that?

DR. STEVEN GUNDRY: Yeah, this one, I think was a real eye-opener when I stumbled upon it. Most of us are convinced that most of what happens to us is our Genetic Destiny. It's our family history. And one of the things that's interesting about twins, is that twins obviously have the identical genome and there is a fascinating study with twins, who are different weights despite having the exact same genetic makeup and there are Twin Studies... A lot of them are headed

up by Tim Spector from the UK, who heads up the British Twin Study, but this particular study looked at one twin who was overweight and the other twin who was normally, thin let's just say and they looked at the foods they ate, they couldn't find any evidence that there was something different but when they looked at the mitochondria of the twins and how active the mitochondria were, they found that the fat twins mitochondria, and this is their word not mine, were lazy compared to the skinny twins mitochondria and we'll get into what that lazy means. But the mitochondria, the fat twins, weren't actually using food efficiently and it was actually a lot of the food they were eating was being transferred over to fat storage as opposed to the skinny twin. Their mitochondria were actually wasting large amounts of fuel. They were actually inefficiently using fuel and so for the same amount of calories to produce the same amount of energy...

It was actually costing more calories for the twin than the lazy twin's mitochondria. And I talk about it in the book, every one of us have friends, family members who can eat three pizzas wash it down with three pieces of cake, have croissants for breakfast and they're stick figured thin and there's a person like me in my earlier years where I could look at a piece of chocolate cake and gain weight and despite, I was an obese guy running 30 miles a week and going to the gym one hour a day and eating pretty much a vegetarian healthy diet. I'm going, "what the heck!" Well, now I know that I happen to have had for lack of a better word lazy mitochondria and that skinny person actually had mitochondria that were incredibly good at producing energy with throwing calories away.

And another way to put this in where I was wrong and most keto experts are wrong. I was told that... And I tell my patients that you're going to become an efficient fat burning machine and you're going to have this mitochondrial efficiency and you're going to be so efficient that the fat will just melt off. Oh, it sounds good, doesn't it? Well, it's not true. It turns out the definition of efficiency is to get more production out of less, right? So, if I want to be an efficient car and let's call gas fat then I'd buy a Toyota Prius because I could go 50 miles on a gallon of gas. So that's an efficient car. On the other hand, if I wanted to waste my gasoline, then I'd buy a Ferrari because Ferrari's really good at wasting gasoline. Now, there might be other reasons that you and I would want a Ferrari but for the purpose of the analogy, if I wanted to waste fat and fat would be gasoline, I'd get a really inefficient car like a Ferrari instead of a Toyota Prius. So, the whole idea that ketones are somehow making mitochondria efficient flies in the face of what actually is happening.

So, what's happening? Well, it turns out this has been known about since the 1970s. And it's sadly, poorly named. And believe me, I spent six months trying to come up for another name for mitochondrial uncoupling. And nowadays, most people think of uncoupling as ending a long-term relationship or getting a divorce. But uncoupling in mitochondria, basically means uncoupling oxidative respiration, burning of fuel from producing ATP. And it's been known

about since the 1970s. And so, I use a kind of a fun analogy in the book about the Mito club, and their electron transport chain in mitochondria, but I'll stop there, 'cause we'll get back to that.

SHAWN STEVENSON: This is already so fascinating, because this is turning it on its head, because you just said the thing, "We want to turn you into an efficient fuel burning machine of... An efficient fat burning machine." And now... But I love this analogy and I know you got to use this more often and flesh this out, as you talk with more folks. We're exclusive by the way, I got the book early, I might have got one of the first copies. And also, this is one of the first time that you're actually talking about this on a big platform. So, folks really listen in closely. When you gave this analogy with being a Prius, or Ferrari, if we use that as an analogy for the bodies that we want, it's just like, "I'm trying to have that... I want a Prius hump on my shoulders." versus being something sleek and fast and dynamic and attractive. You're actually inefficient at burning fuel, you're, "wasting" a lot more of the fuel that you're taking in, due to this mitochondrial uncoupling phenomenon taking place.

And so, there's this really sneaky thing, because the researchers in that study you mentioned, they said that the twin who was overweight or obese had, "lazy" mitochondria. And you also mentioned this earlier too. We've got different pathways, we got... With the mitochondria, we got beta oxidation, we've got cellular respiration. It's not just this one thing. And we tend to think like we got to fuel, give the mitochondria this particular thing, but we're kind of missing the point, because here's where we talk about ketones. This is the role that ketones actually play in this mitochondrial uncoupling. Let's talk about that.

DR. STEVEN GUNDRY: Alright. So, let's first of all, try to accept that what I've said so far is true. I can assure you; I don't make this stuff up. And it is backed up with really great research that I didn't do. So, I'm trying to figure out, Well wait a minute, ketones are produced, primarily when you're starving to death. And yes, they're a great way to keep your brain online while you're waiting for your next meal. They're produced during a ketogenic diet, and they're produced under extreme exercise. But if ketones, in fact, are telling mitochondria, who are starving to death, to waste fuel, you go, "Wait a minute! That makes absolutely no sense." If I was designing an organism, and there's no fuel, there's no food coming in, I want to design my kind of mitochondria to hold on to every last ounce of calorie to become profoundly efficient at turning those calories into energy because, if they don't, I'm dead." But then there's an obscure paper that just twisted my brain and just spat it out by Martin Brand in the year 2000. And it's a very simple title, anybody can Google it. It's called, "Uncoupling to survive."

And he said, and the proof is actually in the pudding, "If you're starving to death, ketones should instruct mitochondria to protect themselves at all costs, because without mitochondria, they're, we're not... We won't exist. They are our power plants." So, ketones

instruct mitochondria rather than becoming efficient, to number one, waste fuel... Waste fuel because making ATP is really damaging to mitochondria. And I go into why this is. Producing energy is hard work and it damages our mitochondria. So as strange as it seems, if you want to keep your mitochondria in as good a shape as possible, you don't want them to do much work. So, ketones tell mitochondria to waste fuel. That means uncouple. Number two, simultaneously, ketones, which are signaling molecules tell mitochondria to make more of themselves. And that's called mitogenesis. And the cool thing about mitochondria is that mitochondria have their own DNA. And so, they can actually make lots of mitochondria within a single cell without the cell dividing.

And so, ketones actually tell mitochondria, "Okay, each of you don't work so hard. But I want you to get five of your buddies online, so that the five of you now, each of you don't have to work as hard, but the five of you now will make as much energy as the one guy did before." So, it's like having five horses on a sled rather than one horse on a sled. The horses have to do less work. Number three, what ketones do is tell the mitochondria to repair any damage because, "We've got to keep you guys pristine, because we don't know when we're ever going to get something to eat again and protect yourself at all costs." So, in this simple paper Bran said this is actually why ketones work, and it's exactly the opposite of what anything... Anybody thinks it. Now what he's subsequently done... And here's the kicker, if you look at super old people or super successful healthy animals, they have the most uncoupled mitochondria, you look at a 105-year-old people, they have the most uncoupled mitochondria compared to anybody else. So now you go, wow, I kind of like to uncouple my mitochondria, are there other ways to do this? And that's the purpose of unlocking the keto code, 'cause it turns out there's a whole bunch of easy cool ways to do it.

SHAWN STEVENSON: This is phenomenal, phenomenal. So, we are activating the creation of more mitochondria, we are creating a situation where we're repairing our mitochondria, which again, you said they're getting damaged in this... Is basically, it's a good analogy of they're doing a workout but not getting a chance to heal in a sense.

DR. STEVEN GUNDRY: That's exactly right, that's exactly right. And in a way, the more you actually make them do a hard workout, the more damage they do, and you and I both know that me and you probably by experience, if you don't have rest and repair days... And LeBron is a perfect example of this right now. If you don't have rest and repair days, I got news for you, the damage will rapidly show itself in one way or another. And so, we know this now about mitochondria, and if you like the mitochondrial theory of aging, which I like a lot, then your mitochondria, keeping them in tip top shape is really one of the keys to successful aging.

SHAWN STEVENSON: I love this. So, our mitochondria, very special, this is a big part of us being the humans that we are, is thanks to these little remarkable organelles. Let's talk more about

them. How many mitochondria do we have? How many do we have in our cells? How many do we have in general?

DR. STEVEN GUNDRY: Well, this is kind of fun because most of us in high school biology, you would see a picture of a cell and there would be a mitochondria which kind of almost looked like a radiator, mitochondria are engulfed bacteria, from what we can tell that were engulfed two billion years ago, that made eukaryotic cells. And mitochondria in exchange for food and a place to live, generated copious amounts of ATP for the cell. I can give you an example that I talk about later in the book, there's really essentially, two ways to generate energy from sugar or other things, one's glycolysis, which most of us know as fermentation. So, for every molecule of glucose, you get two molecules of ATP from glycolysis or fermentation. A mitochondria can take that same molecule of glucose and make 32 molecules of ATP. Now, talk about a return on investment. But in exchange for being that, just powerhouse of converting calories into energy, damage is done 24 hours a day, and that damage really rapidly adds up.

Now, we have some damage control systems that I talk about, I call them bouncers in the mito club, and the mito club is the hippest, hottest place to be, it's where all the 20-somethings and some of the millennials are trying to get into. And the mito club is what's called the electron transport chain, where we take sugar or fats and convert them into ATP. And this process, it's hot, it's steamy, and you got all these protons and electrons, and oxygen molecules pushing and shoving, wanting to couple up to produce energy, and that's where the word coupling comes from. And people are drunk, people are horny, their hormones are flying. And so, there's bouncers in these clubs to kind of put the lid on everything. It turns out there's only two bouncers in mitochondria despite what everybody has been convinced of, and they are melatonin and glutathione. They are the only two mitochondrial antioxidants. This idea that we ought to swallow antioxidants, and they're going to help our mitochondria is so old and incorrect, it's amazing. So, there's only two bouncers in the club, melatonin and glutathione, and we'll talk about melatonin if time permits, 'cause it's not a sleep hormone, folks. And you sleep not to go to sleep, but you sleep to produce melatonin to repair your mitochondria. It's so cool, it's amazing.

SHAWN STEVENSON: This is remarkable. We absolutely must talk about these bouncers a little bit more. And so, within the context, this cellular club atmosphere, do we have 100 of them in our cells or like...

DR. STEVEN GUNDRY: Oh yeah, yeah, so we actually saw our cells, like muscle cells, brain cells have thousands of mitochondria in individual cells. Some cells have very few, but the real guys who need power have thousands of mitochondria, so it's nothing like what we see in our picture books. In fact, a lot of people have heard about brown fat, and I go into this extensively, there's brown fat, and there's white fat, which is our main storage fat, and then there's beige

fat, and that beige fat is white fat, it's being transformed into brown fat. Now, brown fat gets its name from the fact it is so packed to the gills with mitochondria that it actually looks brown under the microscope. And that gets me to my second point, brown fat produces heat, and we've known that for years that, for instance, hibernating animals produce heat from their brown fat.

They make heat by uncoupling mitochondria and it's the release of some of these agents, like extra protons from making ATP that actually produces heat. And fun fact, you and I sitting here right now, 30% of everything that's heading into our mitochondria is uncoupled from making ATP, 30% of the calories at rest, and that's because in the process of wasting these calories, we actually produce heat as the process of wasting calories. And to go back to the club analogy, for instance, so it's hot and steamy in there, there's fights breaking out, there's a lot of coupling that's going on that shouldn't be going on, there's a lot of guys, let's call them protons, who are missing out on coupling with oxygen. And eventually, a lot of these protons get pissed off and they go, I'm out of here, I'm going to go down to a club down the street. Unfortunately, normally the way our mitochondria works, there's one door in and one door out, and the door out is the way we generate ATP, it's literally a revolving door, but we have built into our mitochondria emergency exits, and they're controlled by uncoupling proteins, there's five of them that were discovered in the '70s, and what happens is if things get pretty crazy, these protons push the emergency exits open, and they go, Oh, I'm out of here".

And... Oh, it feels good to breathe again, I'm heading down to the next club, I'm tired of this club. And so, it's opening up these emergency exits that it's what actually ketones do to our mitochondria, and it's really fascinating how beautifully designed this was, if we just pay attention to how the design works.

SHAWN STEVENSON: Yeah, man. The uncoupling protein one, for example, and again, you just mentioned we've got five, but this reminded me of some research that I saw... This has been a couple of years ago now. This study was using MRI technology, FMRI, and looking at...

DR. STEVEN GUNDRY: Functional MRIs.

SHAWN STEVENSON: The parts of the body that were lighting up based on different substances that they were giving test subjects, and they found that when folks were drinking coffee, brown adipose tissue sites on the body were lighting up, and they were linking this to something happening with uncoupling protein one. And so, as you mentioned, brown fat being so dense in mitochondria, it gives this brown appearance, and even though they could be considered essentially weightless, we have so many mitochondria that it actually makes up a notable amount of our biomass as a species.

DR. STEVEN GUNDRY: Correct, Correct.

SHAWN STEVENSON: But here's the rub, our brown fat ratio is not that high, especially in adulthood for the average American, that's the key for the average American, because that ratio can be influenced by our lifestyle, and this is another kind of powerhouse opportunity for us to... Not necessarily, gain, we... We're burning more energy in the old mindset, but we're wasting energy, we're kicking off energy through this process of thermogenesis by our mitochondria being able to do this, this magical work and ketones play a big role in this. So, let's link this together now with... You've touched on a few things and how we can influence this process, but I think there's one more critical building ingredient, which is the role that our microbiome plays in this, because you said that our mitochondria itself or themselves are essentially bacteria that have integrated with our quote human tissues, our human cells, and we've created this kind of symbiotic relationship through our evolution, now, there's so much science being dedicated to our microbiome, and it's just like all of this is linking together and you're really helping us to flesh this out, so let's talk about how our microbiome and mitochondria are tethered together.

DR. STEVEN GUNDRY: Yeah, so these literally... The Sisterhood, as I call them, so we actually inherit all of our mitochondrial DNA from our mother, and we don't get anything from our father, sorry guys. And we actually inherit all of our microbiome initially from our mother, our mother basically takes a crap on us on the way out, and many of you have been suspicious of this and I can confirm it, and so our mother actually seeds us with her mitochondria genome, and her microbiome, and so they literally are linked, and for years, we were very suspicious that the microbiome talked to the mitochondria because they literally were sisters, and for years, it was postulated and a professor from Paris, Marvin Etis, who I talk about in the book, years ago, used to tell me that, number one, anyone who thinks polyphenols are antioxidants, just... I don't have any time for you, it's not true. And number two, he was the first one to tell me, he says, Look, they... The microbiome talks to mitochondria. They control mitochondria, and I go, Well where's... Why haven't we discovered these? He says just trust me, we will.

Well, he was right, the first post-biotic was Nitric Oxide, and it got the Nobel prize, and nitric oxide originally was discovered from the microbiome. We now know that there are a ton of language, a language, that the microbiome talks to the mitochondria, and I profile this in the last book, and I bring it back in this book, and they're called post-biotics. They're either called Gaso messengers or Gaso transmitters, and your microbiome has to have prebiotic fiber, soluble Prebiotic fibre to eat and in the process of eating this fiber the microbiome transforms this into these post-biotic gaso messengers, and one of the coolest of them is Butyric, so butyrate butyric acid. Butyrate just happens to be a mitochondrial un-coupler in its own right, but butyrate is actually a substrate for Beta-hydroxybutyrate. And anybody into the ketone world knows about BHB, which is Beta-hydroxybutyrate. And so, the more butyrate you can

produce, believe it or not, the longer you live, the healthier you are, and as I talk about it in a sidebar in the book, butyrate and other of these short-chain fatty acids are actually incredible cancer suppressors, and they're called histone D acetylase inhibitors, it's okay, don't worry about it.

But these things actually prevent cancer cells from growing and dividing, and so butyrate is really good. Number two, there's another short chain fatty acid, that almost everybody's heard of, but has no idea why it's so important, and that is vinegar. Acetic acid. Vinegar is another short chain fatty acid as a product of fermentation, and this goes on in our gut all the time, but it also goes on in fermented foods, and as I point out in the book, fermented foods have nothing to do with you eating healthy probiotics in the fermented foods, but everything to do with the fact that you're eating a short-chain fatty acid, acetic acid... Oh, by the way uncouples your mitochondria just like ketones do.

So, surprise, surprise the benefit of Apple cider vinegar or Balsamic vinegar isn't some magical mystical thing it's actually uncoupling mitochondria. And since you brought it up, Coffee contains polyphenols, and we'll do that next but the reason most of us get a warm feeling when we have a cup of coffee, even an ice coffee, is because the caffeine and the polyphenols in the coffee are both major mitochondrial un-couplers and they do so in brown fat among the other things, and that's why the brown fat lit up on the functional MRI.

SHAWN STEVENSON: Remarkable.

DR. STEVEN GUNDRY: Cool.

SHAWN STEVENSON: Remarkable. Yes, this is so cool. So, we've got to talk about polyphenols now, this whole conversation of post-biotics in and of itself is remarkable because for years, folks that are in the know, have been talking about prebiotics, right? And it's kind of like pre-life, if we break down the word itself, and of course the probiotics for life, it sort of means for life, but then understanding this is another step in this process, prebiotics help the probiotics to make post-biotic. So, these things that are getting created in us for us, and if there's a break in this pathway, we're going to have some serious problems and one of the... So, let's talk again. I'm going to pass this to you to talk about polyphenols because going back to your guy who was saying, "I've got a problem with anybody talking crazy about polyphenols", now we actually know so much more, and this is a remarkable thing about nutrition.

DR. STEVEN GUNDRY: Yeah, many people who follow me know that I've made a lot of my career on getting polyphenols into people's mouth. I'm the guy who said the only purpose of food is to get olive oil into your mouth, and I stand by that, but anyhow, as I'm researching the effects of ketones and particularly ketones on weight loss and a ketogenic diet on weight loss,

I stumbled upon a paper from the 19... Actually, from the 1920s, and it turns out there was... It was known that munition factory workers in France and Germany during World War One were profoundly skinny, even though they ate huge amount of food they couldn't keep weight on, and they were running a temperature, and nobody really knew why, they just knew it was working in these factories.

Well, it was subsequently identified as a compound that's used to manufacture gunpowder called 2,4-dinitrophenol. Hear the word phenols, it's called 2,4 DNP, it's abbreviated DNP. A couple of Stanford doctors in the early 1930s discovered that DNP was causing these people to be really skinny because it increased people's metabolic rate, basal metabolic rate, they didn't know why, they didn't know how, but they knew it did. So, they said, "Hey, what a great weight loss drug. Look at these poor guys that couldn't keep weight on," so they actually wrote in the 1930s, 100,000 prescriptions in the United States alone, and thousands more overseas were written for DNP as a weight loss drug.

And let me tell you, it was miraculous. A little bit of DNP taken every week would resolve in a pound a week weight loss, 50 pounds a year. If you took more DNP, you could lose five pounds a week, I mean just try to get your head around that. So, it was miraculous. Except for one thing. So, all these people, particularly in higher doses started running very high temperatures like 101, 102 they started having thyroid issues, it turns out that people started developing cataracts and cataracts... This was before cataract surgery. So going blind while losing weight is really not a good idea and then surgical rate...

SHAWN STEVENSON: Right.

DR. STEVEN GUNDRY: Right. Now I can't see how good I work. And at high dose people were dying right and left. And we'll get to that in a second. So, in 1938, the FDA, which was newly formed, one of its first official things was to ban DNP from use. Now, as I talk about sadly, you can actually find DNP on the Internet, on the black web. But please, there's better ways. So what DNP was, was the actual first, it was not known mitochondria un-coupler, and that's how it were. And like I talk about in the book, you want a little dabble do you? And in mitochondrial uncoupling non is no good, some is really good, and a lot, you literally lose the ability to produce energy and you die. And so, finding that sweet spot, the Goldilocks rule, as I tell it, not too little, not too much, just right, is what we want to do when we're harnessing the power of phenols. And it just so happens that polyphenols are lots of phenols strung together. So now we go back, we go, Okay. We've known about polyphenols for a long time, and we've known that a number of polyphenols are thermogenic compounds. Thermogenic compound.

Oh yeah, you want thermogenic compounds because it'll help you lose weight. I advertise it on some of my products. Well, why are they thermogenic compounds? Well, it's because these

compounds uncouple mitochondria. Okay, so now where do polyphenols come from? It turns out that plants have their own mitochondria. Now, they're called chloroplasts in plants, but they're mitochondria. They're supposed to take carbon dioxide and glucose in the presence of sunlight, photons, and reverse engineer them to produce oxygen, sugar, carbohydrates, and water. So, the problem is making energy from sunlight is damaging, it's damaging to their mitochondria. So how do they protect their mitochondria from damage? It just so happens, they produce polyphenols, all those dark pigmentation colors to uncouple their mitochondria. The other thing, which was a real shocker when I wrote the last book, they produce huge amounts of melatonin. And you go, wait a minute, plant doesn't need to go to sleep, what are they doing producing melatonin?

It's actually to do the repair work of their damaged mitochondria. And I profiled that in the last book, and I profile this book for instance, Pistachios are a great source of melatonin. Red wine is a great source of melatonin, olive oil is a great source of melatonin, mushrooms, coffee is a great source of melatonin, and it all came from plants who didn't need to go to sleep, but they needed melatonin. So now what happens is, polyphenols are there to protect the mitochondria of the plant. When we eat those polyphenols from the plant, they not only feed our microbiome, they act as prebiotic fiber, but the microbiome then transforms those into absorbable polyphenols that then uncouple our mitochondria. So, it's like, Holy cow, it's all about protecting our mitochondria, whether you're a plant or an animal, and it just so happens that eating the rainbow of plants is not eating the rainbow of colors, it's eat the rainbow to uncouple your mitochondria.

SHAWN STEVENSON: This is...

DR. STEVEN GUNDRY: Who knew?

SHAWN STEVENSON: Remarkable. This is this beautiful synergy of life, like I'm seeing...

DR. STEVEN GUNDRY: Yeah.

SHAWN STEVENSON: I'm hearing some Lion King music in my head right now, Dr Gundry, The Circle of Life.

DR. STEVEN GUNDRY: I know, it's one of my favorite songs.

SHAWN STEVENSON: We've got a quick break coming up, we'll be right back. The importance of Vitamin C cannot be overstated. The big issue today is its simplicity, something so simple cannot be so effective, can it? Well, vitamin C is obviously a major part of our immune system function and how it does its work, and this is the key, is that it helps to reduce infection-

oriented inflammation. A recent study cited in the journal, Pharma-nutrition, investigated the impact of vitamin C in relation to the cytokine activity associated with COVID-19. They found that vitamin C is effective by inhibiting the production, the cytokine storm. Several clinical studies are now affirming that timely administration of vitamin C can dramatically influence the outcome of COVID-19 infections, and this simply has not been talked about but we're going to change that. Now, it's important to also note that all vitamin C is not created equal, we've got synthetic forms of vitamin C, and we've got botanical, real food-based vitamin C.

A study published in the journal of cardiology had 20 male smokers consume the number one source, the highest botanical source of vitamin C found in camu camu berry over the course of a one-week study, and it led to significantly lowered oxidative stress and inflammatory biomarkers. They were measuring this by utilizing C reactive protein. Now, here's the rub, that camu camu berry was not just put up against a placebo, wasn't put up against nothing, it was put up against synthetic versions of vitamin C, just an ordinary vitamin C tablet that you might find as you're checking out the cash register at a gas station, something of the like. And here's what they found, the researchers saw no change in these biomarkers, reducing inflammation and oxidative stress in the placebo group. That placebo group again, was a synthetic version vitamin C. For the researchers, this indicated that the combination of other antioxidants from the camu camu berries had a more powerful antioxidant effect in standard vitamin C products alone.

This is why I utilize camu camu berry combined with amla berry combined with acerola cherry, the three highest botanical sources of Vitamin C ever discovered in my favorite vitamin C supplement of all time the Essential Sea Complex from Paleo Valley. Go to paleovalley.com/model, you're going to get 15% off the incredible essential sea formula. Go to P-A-L-E-O-V-A-L-L-E-Y.com/model for a special 15% off right now. Vitamin C is of the utmost importance, outsourcing matters more than ever. Get the very best, not the third best, not the fifth best, not the 100th best, get the very best vitamin C possible that's going to be in the Essential Sea Complex from Paleo valley. Go to paleovalley.com/model. Now, back to the show.

Just taking this another step and tying in the underlying message of the book, Unlocking the Keto Code. If we really look at the big picture, which I remember going in for my latest book into the publisher, I was meeting with different publishers, they were pitching me, and they were like, "So what kind of book you're writing? Is it a keto book or is it a..." because it's hot and they got the books on the shelf that are just kind of fitting into this paradigm versus like, how can we serve people and not give this... Which again, as you know, ketogenic diets can be remarkably effective, but we can oftentimes get stuck in a framework and miss out on the details that matter for the individual.

DR. STEVEN GUNDRY: Correct.

SHAWN STEVENSON: And that's where you really operate, that's where I operate is like, let's help this to make sense in a broader scale and also personalize it for you, and part of the thing that... You've probably seen a note that I've seen that can be missing in a great structured ketogenic protocol is the lack of prebiotics to help in this process. So, let's talk a little bit about that specifically, because this is kind of an upgrade, whereas folks... I remember a friend of mine back when I was in college, and he was doing an Atkins-type de facto ketogenic protocol, and he was eating eggs and cheese and sausage every time I come over. I'm just like, "Where is your bun, bro?" He's eating the burger without the bun, he's like, "I'm doing this Atkins, it's keto, ketones." And well, we're missing this key ingredient because there's steps in the process. Prebiotic, probiotic, post-biotic, we need the post-biotics, so let's talk about fiber in regard to this ketogenic protocol that you have.

DR. STEVEN GUNDRY: Yeah, and that's really one of the big failures of a traditional ketogenic diet. And years ago, I published a paper looking at flexibility of blood vessels, the ability of blood vessels to expand and contract, and also looking at literally how sticky the surface of a blood vessel was attracted to cholesterol, activated cholesterol. And I showed that you could take good people, polyphenols into this paper. It was grape seed extract and Pycnogenol, which is French maritime tree bark and fish oil, and show within three months that their stiff blood vessels would become flexible, and that the stickiness of their blood vessels would become lined with Teflon. And then I showed that if we took these compounds away from people, that within three months, they'd be back where they started.

And I've seen... I see patients six days a week, and so I've seen some real hardcore keto dieters, 70%, 80% fat, who walk in for the first time and their blood vessels are stiff as rods and the amount of inflammation stickiness on their blood vessels is just through the roof, and they're feeling good, and they go, "Oh yeah, but I feel so good." I say, "Well yeah, but look, long term, this is not serving you because there's really good literature that if you've got sticky blood vessels, and if you've got stiff blood vessels... You are not long for a great life." In fact, there's a joke on longevity that you're only as young as your blood vessels are flexible. And so we'll take them and put them on my version and see them back in three months, and all of this disappears because we're giving them pre-biotic fiber so that their gut bacteria have something to work with, that we need to tell our blood vessels to dilate, to reduce the inflammation on the inside of our blood vessels, so we've lost that in the translation of, "Oh, ketones are so good for you."

SHAWN STEVENSON: Facts. So, this is bringing up a very simple but important question. Does this point to the fact that we are deficient in Metamucil, or should we get our fiber from real foods?

DR. STEVEN GUNDRY: Yeah, so one of the things you and I both say, so you got to eat whole foods and quite frankly you ought to eat them all. So, Metamucil, unfortunately, even the sugar-free Metamucil has sucrose in it, which is a great way to destroy your gut bugs, but it's so easy to do. For instance, for lunch today, my wife and I had a salad, chicory containing vegetables, radicchio and Belgian endive and frisée, and we had it with some walnuts, and we had it actually, with some blue cheese, which I go into in the book, and we just had the best food for our gut buddies that I could have possibly imagined. So, the chicory family is great. Inulin, which is a perfect prebiotic fiber is contained in the chicory family. It's in asparagus. It's in Jerusalem artichokes. It's in a lot of tubers, jicama is a great example. And you can grind up some flax seeds, you can grind up Sesame seeds, and it's an easy way to get these prebiotic fibers.

SHAWN STEVENSON: Perfect, perfect. So again, this is for... And you shared some great stories in your book as well, having two patients. And this is the remarkable thing about you as well, again, even when I saw you last time, you were in between... You were seeing patients seven days a week during all of the COVID mayhem, and just... You're like... You're just on a different level. And in this, you have this database of patients who you're even seeing as far as COVID, and you were at the forefront of vitamin D. And that by the way, we won't get into it today. But it was just like, "It's all panned out," what you said.

DR. STEVEN GUNDRY: Yup.

SHAWN STEVENSON: Being able to see this database of folks, and you give examples of... Now, I've got this patient here who's absolutely thriving on this ketogenic protocol, and all of the metrics, they're hitting right on the money. But then I've got another patient who's doing, essentially, the same thing, but her results are not speaking to the same results that this other person is seeing. And so, paying attention to these markers, because there are some diet frameworks and protocols that are also saying, fiber is going to kill you, fiber is the problem. And I've seen more of those folks... These are my friends and colleagues moving more towards, even if they're doing a carnivore protocol, bringing in fruit, right? This could be blueberries and papaya and these different versions of plant fibers and polyphenols and these other compounds, that again, we evolved having these foods, by the way.

DR. STEVEN GUNDRY: Yeah.

SHAWN STEVENSON: And these plants are making these compounds for themselves, in a sense.

DR. STEVEN GUNDRY: They are.

SHAWN STEVENSON: It's just circle of life thing, so remarkable. And I want to ask you about this... Just to go back because I don't want to move too far away from this... The mitochondria

strategies like... You mentioned how ketones are involved in this process of helping our mitochondria to become kind of, "less efficient and wasting fuel," right?

DR. STEVEN GUNDRY: Yeah.

SHAWN STEVENSON: But part of this process... Part of the evolution is creating more mitochondrial biogenesis.

DR. STEVEN GUNDRY: Correct.

SHAWN STEVENSON: Creating more mitochondria and helping our mitochondria to repair themselves. What are some of the things that we can look towards? What are some of the things that we can do to support that process besides just this protocol, trying to hit ketosis per se, but just overall? Because one of those things... We can lean more into producing ketones if we're fasting, for example, but the picture is so much bigger than that. Is that one of the things that you talk about?

DR. STEVEN GUNDRY: Yeah. As we go into later parts of the book, we... All of us have a maintenance schedule. If you buy a car, you have a scheduled maintenance interval that you got to bring it in, and get an oil change, etcetera, etcetera. And we actually have warning lights on our dashboard, and the modern cars actually calculate how abusive you are to the car. Whether you're really accelerating rapidly or whether you're coasting or whether you're in smog or not. And it calculates the service interval, say, Better bring it in early. Well, we have actually scheduled service interval, and it turns out our schedule service interval's every 24 hours. We have to undergo mitochondrial service every 24 hours, or believe it or not, our warranty expires very rapidly. And we actually have tons of warning lights on our dashboard: Hypertension, diabetes, cancer... Guys, erectile dysfunction, that's a warning light, says, "Check engine." And it turns out that these are all warning signs of mitochondrial dysfunction. As I talk about in the book, every 24 hours, if we have metabolic flexibility, and that's a whole another subject that you and I have gone into, and we can spend the next hour doing that.

But if we have the ability for mitochondria to change how they create fuel energy from fats or sugars... If we have mitochondrial flexibility, about eight hours after we stop eating, we will begin to generate ketones. And about 12 hours after we stop eating, we're at full ketone production, a normal human being, every 24 hours. So, let's say that you stopped eating at 6 o'clock at night, and you began eating again at 6 hours in the morning, you would actually have about a 4-hour ketone production, if everything was correct. And you would use those ketones to send a message to your mitochondria to protect themselves, make more of themselves, and waste some energy. What's really cool is that if you extend that time period of not eating for another 4 hours, then you're looking at a 16-hour window of not eating. Now, you've got

another full 4 hours of telling your mitochondria through ketone production to do more cleaning, do more housekeeping, build more of them. And that's why in the study that I refer to with "The Italian Cyclist"... It's so hard to believe until you see the data.

You take Italian cyclists, trained athletes. You take 3 months, put them on a training table, where they all have to eat the same food. One group does a 12-hour eating window, eat breakfast at 8 o'clock in the morning, and they finish lunch at 1 o'clock in the afternoon, and they finish dinner at 8 o'clock at night, 12-hour eating window. The other group, the same food, they have breakfast at 1 o'clock in the afternoon, they have lunch at 4 o'clock in the afternoon, they finish dinner at 8 o'clock, 7-hour eating window. They follow them for 3 months. Eating the same food. Only the athletes with the shortened eating window lost weight. The athletes with a shortened window preserve their muscle mass, preserve their athletic performance, but the coolest part... Besides the weight loss, was that the athletes on a shortened eating window plummeted their insulin-like growth factor, IGF-1. And right now, IGF-1 is probably the best measurement we have of longevity of activating mTOR, the signaling molecule. And if you look at my patients who're in late '90s, early '100s, and I have slew of them, these people run very low insulin-like growth factors. So, imagine, just by manipulating the time of eating, you're giving your mitochondria more time to repair themselves and make more of themselves.

And who wouldn't want to do that? The other thing I think is imperative, and I talk about this in relationship to melatonin, we think of melatonin as a sleep hormone. Oh yeah, your melatonin goes up when you go to sleep. Well, association does not mean causation. So, what melatonin does is when you're sleeping, you're not eating, and you should be undergoing mitochondrial repair. So, if melatonin is one of two critical factors to repair your mitochondria, then son of a gun, maybe melatonin's rising during sleep for a totally different purpose, and that's to repair your mitochondria. And son of a gun, some of the healthiest cultures in the world eat huge amounts of melatonin-containing plant foods. And the Mediterranean diet, as I write about in the book, probably one of the biggest benefits of the Mediterranean diet is the amount of melatonin and uncoupling polyphenols that it contains.

SHAWN STEVENSON: They call it beauty sleep for a reason.

DR. STEVEN GUNDRY: Bingo! It's the down time that you repair your mitochondria. And one of the reasons that this crazy... Oh, you only need four or five hours of sleep, just keep driving through it. Sorry, you're not keeping your car warranty intact, you're not adhering to the prescribed service...

SHAWN STEVENSON: So remarkable. So, to recap, we've already hit a couple of these points, but part of unlocking the keto code and leveraging the system, we just hit intermittent fasting.

Again, data to affirm all of these things, and again, humans have been doing these things throughout our evolution, polyphenols...

DR. STEVEN GUNDRY: Yeah, we wrote the science for it.

SHAWN STEVENSON: Polyphenols, the fiber aspect, you even dropped in a little nugget about fermented foods being in the mix, but again, just to reiterate this fact, if we're talking about the real value here with ketones helping to stop the damage that occurs from our mitochondria making energy, again, it's just... It's like a workout that's taking place and they need that support for rest and recovery. But the other part is sharing the load which is helping to make more mitochondria, and the other part is helping to repair existing damage. And this is where melatonin even comes into play as well, when you're literally resting and recovering and having your body to secrete melatonin is helping in this process in a whole different dimension, and this is getting into the realm of circadian medicine, and I've been saying this for years. This is one of the things that I just feel a kinship with you because we're like kind of out in the front with some things, and a lot of my friends and colleagues were... They had the idea that taking supplemental melatonin could potentially downregulate your body's production of melatonin.

It kind of seemed like a little bit of a possibly logical thing, but that's not what the data showed, what it showed was taking too much melatonin or in the wrong... Kind of the wrong times and doing it for long periods of time in high doses, you can suppress your receptor sites for melatonin. So, your body's still making it. It's one of the things you just make, but cells being able to recognize that can start to downregulate. So we got to be careful with that, and now we're opening the door and say, "Hey, we've got a ton of high quality foods that not just have a source of melatonin, but they help with so many other parts of your health that you can be including," Improving your sleep hygiene overall is going to be the key if we are looking into supplementation, because again, folks I'm saying... Bringing this up to Dr. Gundry to say, folks might want to run out and take a melatonin supplement and miss the point here. And so, it's more about what can we do to facilitate what's already possible for us, and so if you want to say something more about melatonin and... Or I want to... I'm not going to let you go, when you brought up melatonin, you also mentioned glutathione too.

DR. STEVEN GUNDRY: Yeah. So, glutathione is the only other antioxidant used in mitochondria and glutathione is... There's a few ways to produce glutathione. Glycine and acetylcysteine are two of the best ways to produce glutathione. You can also use alpha-lipoic acid as a precursor for glutathione. One of the interesting things about vitamin C, vitamin C is not an antioxidant for our mitochondria sorry it isn't, but vitamin C actually is useful for recycling glutathione. So glutathione oxidizes, and it's actually vitamin C that actually re-establishes glutathione into its original compound and then act as an antioxidant. And one of our sad designs is, as you and I

know, we're one of the few animals that don't manufacture our own vitamin C, and we did that actually for a good reason. Vitamin C is actually made from glucose, and there are five genes that make enzymes to convert glucose into vitamin C. We actually carry all five of those genes, but the fifth one is turned off. It's called a ghost gene. We can see it's there, but it doesn't work. And we think that's because manufacturing Vitamin C is expensive, and we would have to convert glucose to it.

So, if you got a lot of Vitamin C in your diet, if you're in the jungle eating lots of fruits and eating lots of leaves, great apes don't make Vitamin C, guinea pigs don't make Vitamin C, then it's silly to make Vitamin C 'cause it's right there. Unfortunately, we know that Vitamin C is essential really for rehabbing glutathione. And this was brought home... It was a fascinating experiment a few years ago done in rats. And you can take rats and genetically engineer them so that you make the fifth gene in the Vitamin C-making cycle, a ghost gene, so that they no longer can manufacture Vitamin C. And they're no different than the other rats except that ghost gene. Those rats only live half as long as the rats who are not genetically engineered, who are making Vitamin C. Half as long. Now here's the best of the punchline. You can put Vitamin C in the water of the rats that are genetically engineered not to make Vitamin C and they will live as long as their counterparts who make Vitamin C.

So, the take-home point is that, okay, it's really too bad that we don't make Vitamin C, but Vitamin C needs to have a fairly constant level throughout a 24-hour cycle to, among other things, rehabilitate glutathione. So, it's really easy to do. I have all my patients take time-release Vitamin C twice a day, 1000 milligrams. If that's a pain in the neck, get yourself some of these chewable Vitamin Cs, 500 milligrams, and put them in your pockets, chew one four times a day and you'll be fine. And that's just one silly little step that we can make up for a really important deficiency that... A rat study is pretty interesting. If you actually extrapolate from the rat study in humans, it would actually mean if we had Vitamin C in our water and we were drinking that 24 hours a day... And put some Vitamin C in there, Shawn, right now.

We would actually live the equivalent of 270 years old if we extrapolated from that experiment.

SHAWN STEVENSON: That is true longevity right there. That's becoming an immortal. Oh, man.

DR. STEVEN GUNDRY: Now we're talking Methuselah, right?

SHAWN STEVENSON: So cool, so cool. I immediately thought about even in these rat studies, like these rats are becoming like Master Splinter, like Teenage Mutant Ninja Turtle level lifespan and just tying all of this together because I'm going to say something that isn't said enough, which is we tend to become... And I'm a nutritionist, so my tunnel vision was immense.

We become so hyper-focused on the food that we're putting into our mouth, the substances we're putting into our mouth. We don't understand that diet is much bigger than the food we're putting into our mouth. We have a diet of exposures, environmental exposures. And you talk about this as well because when folks think about generating more mitochondria potentially and in particular, this activation of our brown fat, they think about cryotherapy today. Cold thermogenesis is really, really a big thing, but again, humans have been doing these things for quite some time, having these different exposures. So, we know that cold therapy can boost your body's production of brown adipose tissue, but you also talk about hot temperatures as well. How does that play into it?

DR. STEVEN GUNDRY: Yeah, it's actually the same thing. Back in my research years in heart surgery, we were very interested in a compound called heat shock protein and we knew that exposure to heat shock protein was very protective to cells who we were about to injure by cutting off the blood supply to the heart for an hour or 24 hours. And so, we would activate heat shock protein by heat exposure and we could show that these cells were really pretty immune from some pretty toxic damage once they had that. And that then explains... So how does it happen? It turns out that heat shock protein un-couples' mitochondria and it basically does what all of these other things do. It tells mitochondria potentially bad times are coming and prepare yourself, protect yourself, and here's how to do it. And so, this is all just signals. And when you look at all of these various things like cold therapy, like hot therapy, like sauna, intermittent fasting, it actually all comes down to the same mechanism and that is telling mitochondria to un-couple to survive. And Martin Brand was right 20 years ago.

SHAWN STEVENSON: So, this is a super simple thing, which is, we love our creature comforts today, but we're missing out on the creature part. We're still creatures. And so proactively just allowing... We don't even have to proactively do this, allowing ourselves, allowing our bodies an opportunity to adjust to temperatures. So, when it's cooler outside, just get in some time, maybe open the windows, allow your body to adapt whether... Same thing when it's hot. My wife... And by the way, first to the caveat, she is perfect. There's not a single...

DR. STEVEN GUNDRY: I know your wife. Met her... She's perfect, so just don't mess with her.

SHAWN STEVENSON: Thank you. And what I'm about to say, it's basically a ghost gene, alright? She's perfect. This is a ghost gene that exists within her and that is constantly her temperature has to be regulated. We live in LA. It's not really cold here, but when she's working, she has a space heater right by her. Of course, she's from Kenya, that's the story. More than half of her life she's been in the Midwest in Saint Louis, Missouri. Of course, our genes do expect some different temperatures than what she has, but she never allows herself to adjust to temperatures. And when we went hiking the other day, she got a little hot. She's the first one to take off the hoodie. She's constantly wanting to be in this... Quickly adjust to the

temperature instead of just letting your body get used to it a little bit, again, but she's perfect, babe, if you're listening to this, this ghost gene stuff. Alright.

DR. STEVEN GUNDRY: We'll delete that part. It's okay. But you know, it's interesting, as you know, I live in Palm Springs and also in Santa Barbara where my offices are, but in Palm Springs in the summer, it can get to 120 and the German Tourists just... They flock to Palm Springs in the summer, and they take the heat and so... And you look at them, and you're like, you guys are crazy, no they're not... They're sitting around uncoupling their mitochondria and come on down, you want to uncouple your mitochondria come and visit me in August in Palm Springs, we'll un-couple together. I promise you.

SHAWN STEVENSON: I love it, I love it. So first of all, again, thank you so much for putting this book together and putting your wisdom, your research, I know what it takes, these books, these projects are a labor of love and digging in questioning things and re-calibrating and creating a formula that's more inclusive, ultimately. On the surface, it might be a little irritating, like what? But when it gets to the heart of it, you are bringing more people in and including more folks and saying, hey, whatever diet framework that you are subscribed to, here are some principles and some tools that ring true across the spectrum. And this is what we need a lot more of. And so, as of this recording, your book is about to drop, it's going to fly off the shelves. Folks need to go and pre-order this book ASAP, make sure that you get yourself a copy. It's actually... Of all your books, this is like the quickest read and the stories and the way that you wrote it was just like... It was a page turner. And so, it's a really wonderful read, and I think it's an important part, especially in the diet... The diet culture that we have today that we exist in because this is a...

Your book is a mighty clarification for things, and I think it's much needed. So, they can pop over to Amazon, Barnes & Noble wherever you buy your books from, pre-order it like yesterday and Dr. Gundry, is there anything else? I mean, what drove you to actually write this particular book right now?

DR. STEVEN GUNDRY: Well, it's funny when I was writing *The Energy Paradox*, my last book, and I was trying to explain how ketones created mitochondrial efficiency, how they created you to become this efficient fat burner, and I like to document everything with research, and so... I'm looking through the research that I had, all the things, I go, Wait a minute. This isn't adding up. This is exactly opposite of what I've been taught, what I've been teaching. This doesn't make great energy production; it actually makes you waste energy. And it's like, no, no, no, that can't be right. And so, I just started... I got every research paper that was ever done on ketones on humans and in animals and went... Holy cow! This was known about. In 2004, Owens proved this in humans. 2004 wasn't long ago.

And it's like, I got... What else is going on? So, then I just started looking at, Okay, well, I know polyphenols are really good for you, but what? Polyphenols are un-couplers? What? And you're right, I was excited as a kid and I actually, true story, we had to convince my publisher to let me write this book... "No, that's not where you're going." I said, "I got to write this story," and I think it's a page turner, but I'm really excited about this book because you're right, I'm known as a disruptor, I was a disruptor in heart surgery, boy did I turn things on its head in heart surgery, and as you know, the Plant Paradox, now, we're celebrating our fifth anniversary, that was a disruptor, and I think I wrote this to disrupt our complacency about how ketones work, and our complacency about how these various diets, how the components in these very wildly different diets may have an actual component that makes sense. And it's those components, if we look at this from a broad spectrum, maybe unite us in the nutrition community rather than divide us.

SHAWN STEVENSON: There's more than enough of that... And I appreciate you so much for hanging out with us and sharing your wisdom. Is there anywhere else that folks can pop over and check you out and get more information?

DR. STEVEN GUNDRY: Yeah, so you can find me on my podcast, the Dr. Gundry podcast, we've had the pleasure of having you on there, you can find me on YouTube, you can find me on Instagram, come to drgundry.com, but if you go over to gundrymd.com, your listeners can apply the code Gundry30 and get 30% off their first order, no matter what, and I got news for you, it's a really good deal. So Gundry30 over at gundrymd.com, 'cause I appreciate you and your listeners so much, and thanks for having me again. Always good to see you. Next time we got to be in person again, right?

SHAWN STEVENSON: Definitely, definitely. And by the way, you guys always send me great stuff, your olive oil, so definitely folks take advantage of that and Dr. Gundry, you are one in a billion, you are a superhero for us, and I just appreciate you.

DR. STEVEN GUNDRY: Alright, keep up the good work.

SHAWN STEVENSON: Alright, talk soon. Appreciate you.

DR. STEVEN GUNDRY: Alright, take care.

SHAWN STEVENSON: Thank you so much for tuning in to the show today. I hope you got a lot of value out of this. This is expanding the conversation, we have so many wonderful diet frameworks, but life really exists within the nuance. It exists within the personalization of the information that we learn, because no two people are the same. And so, this is why I'm such a huge fan of Dr. Gundry and his work and just being a pioneer... Somebody who's just a disruptor

who's taken conventional wisdom and questioning things and sharing the data that he comes up with in a way that's palatable, in a way that's engaging, and most importantly, in a way that makes sense. Because again, this conversation is about inclusion and getting our citizens educated. This is a little bit more advanced of a conversation because we're talking about how can we perform at our highest level, whereas for the average person, we're just trying to get them out of the drive through, so I love having conversations like these because these are the things that I would love to focus more on and talk more about because I'm already on...

Andre 3000... I'm going to Shawn 5000; I know some stuff. But to be able to get that out at mass scale that superhuman stuff, we got to get this basic stuff out then, and get our family's healthier, get our communities healthier, get folks walking, get folks just eating real food, and then we can advance the conversation from there. But some of us... I know you're listening a lot like me; I want to be on that, I want to be a leader and a model in this and demonstrate what's possible in being super human. So, this why we dabble in some of this as well, and so again, but it's learning from somebody who's walking the talk. Dr. Gundry, now in his 70s... He just wrote another book, come on... He's out... Even in this recording, he's out skiing with his lady, just come on, this is what we all should be aspiring to be in a new definition of what aging can look like and longevity can look like. And so, when he's talking the talk, he's not just talking to talk it, he's talking because it's facts, it's real.

And he's a demonstration of this and he doesn't come from... His health was not in this state, he was fluxed up himself, he was metabolically fluxed, it's F-L-U-X, metabolically fluxed up himself, and he was able to transform his own health in his, "Middle-age." and from there, just keep building and building, and getting better and better as years have gone on. So, thank you so much for tuning into the show today, I hope you got a lot of value out of this, and this is one to share with your family and friends, especially moms, dads, grandparents, sharing this up and saying, hey, this fella is rocking it in his '70s. What do you think about this? What do you think about some of the things that he's sharing, it's pretty interesting topics, like just sharing this in an inquisitive and non-confrontational like "listen to this guy, you're going to die" kind of way in being inviting and inclusive? And again, just supporting the people that we care about, providing resources, providing different voices.

Often at times it's said that you can't be a profit in your own land, alright, and so be able to share other voices and perspectives with the people that you care about, it can land another leverage point for people to really focus on getting themselves, healthy. I appreciate you so much for tuning into the show today again. Make sure to share this out with the people that you care about, we got some epic shows coming your way very, very soon, so make sure to stay tuned, take care, have an amazing day and I'll talk with you soon.

And for more after the show, make sure to head over to themodelhealthshow.com, that's where you can find all of the show notes, you could find transcriptions, videos for each episode, and if you got a comment, you can leave me a comment there as well. And please make sure to head over to iTunes and leave us a rating to let everybody know that the show is awesome, and I appreciate that so much. And take care, I promise to keep giving you more powerful, empowering, great content to help you transform your life. Thanks for tuning in.