Introduction to Ari Whitten and Mitochondrial Health

Well. Hello, everybody. Welcome back. You guys buckle in. Don't go anywhere. This is a Reverse Heart Disease Naturally Summit Joel Kahn, medical doctor.

Because we have such an amazing topic to cover today with one of the most amazing, functional medicine experts on the planet. I don't say that lightly.

So everybody meet Ari Whitten. Ari is a master's in science and natural health researcher, devoted the last 25 years of his life to studying cutting edge science and health and energy enhancement.

I'll tell you, that's all absolutely true. I am his student. He is my master. He holds a bachelor's in kinesiology, which is exercise science, a master's in human nutrition.

Deep expertise in something we're going to talk about right now. Mitochondrial, circadian rhythm and sleep nutrition, gut health. A great book on light therapy.

I'm holding it right here. Red light therapy, exercise physiology. What you got to do is tune into his podcast, The Energy Blueprint, which I love listening to it.

I usually text him afterwards with all that I learned. His website, The Energy Blueprint, author of The Ultimate Guide to Red light Therapy, and another book called eat for energy.

His most recent book, How to Beat Fatigue. Are you tired? If you're tired? If you've ever been tired, you better listen to this lecture because we're going to learn how to supercharge our mitochondria.

Ari, did I say enough? Welcome. I'm excited. That was great. Thank you so much, Doctor Kahn. It's it's a pleasure. An honor to call you a friend. And I always love receiving texts from you. After you.

You listen to some of my podcast episodes, and, in fact, I worked one of your questions into what you did recently. You know, part two of three with Marley, I heard. That's right.

Thank you for that. I listened to that long segment that was very interesting. But you know, we are talking heart is is launching heart month. A heart is the number one killer of men and women.

We've had so many tragic heart related deaths in the last 12 months. I don't need to go down that road because it's just been upsetting. But we only brush the surface on where energy is made in the body and the word mitochondria and the word ATP.

So why don't I just hand it to you and just give us a little primer on how the body makes energy, because people listening are tired and fatigued and worn out.

And then you're going to tell us how to grow those mitochondria back to youthful ones. Yes, absolutely. Well, first I want to just sort of speak to the heart aspect of all of this.

So the there are two tissues in the body that are the densest in mitochondria, which are cellular energy generators responsible for generating the most of the energy in virtually all of the trillions of cells in our body are these mitochondria.

They're at the core of it all. Okay. In two organs in our body are extraordinarily rich and dense in mitochondria. And those are the brain and the heart, and for obvious reasons, right.

They're extremely energetically demanding organs. The heart, the tissue of that that comprises our heart is actually 35% mitochondria by mass. 35% of that is actually composed of mitochondria.

That's how dense it is in mitochondria, and that's how much energy it needs. And of course, there's a vast amount of research that has tied mitochondrial function or mitochondrial dysfunction to, a plethora of different heart diseases, certainly heart failure, as well as myocardial infarction and atherosclerosis and other types of heart dysfunction, as well.

We know that mitochondria are extraordinarily important to having a healthy heart. So I just want to say all of that upfront. And then we're going to go do a deep dive into mitochondria and how to keep them strong and healthy.

How Mitochondria Power the Heart and Body

So mitochondria again, as are cellular energy generators responsible for generating 95 plus percent of the total energy demands of our body are extraordinarily important as energy generators.

But there is actually another role of mitochondria that is just as important as their role as energy generators. And that is their role as cellular defenders.

So they are actually involved in the process in coordinating the metabolic response to different threats that the body might have. Okay. And this is this is mostly thanks to the work of Doctor Robert Navajo, who published a paper many years ago called the Cell Danger Response.

And basically he runs a lab for mitochondrial medicine at the University of California, San Diego. And he pulled together not only his or his own research, but decades of research on mitochondria to sort of let the world know that mitochondria are much more than just these mindless energy generators that sort of just take in carbs and fats and pump out energy in the form of ATP, but that they are actually, in his words, the central hub of the wheel of metabolism.

They are very, very much at the center of our metabolic health. You are metabolically healthy to the extent that your mitochondria are healthy. Now, these mitochondria in that role are coordinating whether your body is going to be predominantly in energy mode or predominantly in defense mode.

And the way that they do that is they function as environmental sensors. So basically, it turns out that mitochondria, in addition to being energy generators, are essentially like canaries in the coal mine.

They are the most sensitive little creatures inside of us, little sensing organs that are the first to detect when something is wrong in the body. And they can detect this for virtually any type of threat or danger imaginable.

From from poor nutrition to psychological stress to sleep deprivation to exposure to toxins, to you name it, any type of stressor that you can think of physical trauma, respiratory infections.

They can detect all of those because for the most part, all of these different types of threats are ultimately being condensed down into a few different molecules, biochemical sort of dysfunction that is sensed by mitochondria one is increased oxidative stress, one is increased inflammatory cytokines, and the other is certain molecules that are present as a result of actually physical damage of the tissues.

So any type of stressor that is resulting in one or more of those three things, those signaling molecules get sensed by mitochondria and detected as a threat.

And in response to that, to the degree that they are detecting a large amounts of threat or dangers or stressors present, they are turning down the dial on energy production and shifting resources towards cellular defense.

And to the extent that they are chronically doing that, chronically turning down energy production and shifting the body's metabolic resources and functions towards cellular defense rather than abundant energy production.

The cells, for example, that make up your muscles, your brain, your heart, your other internal organs become they start to operate in an energy deficit.

And to the extent they are operating in an energy deficit, they tend to become dysfunctional. In addition to that, at the same time as turning down the dial on energy production, many of these things are physically damaging mitochondria as well, which is another source of how they become dysfunctional.

And a third way is something that I hope to talk a lot about in this interview, because I think is very, very important and very neglected, is that over time, for various reasons, we can talk about mitochondria atrophy just like a muscle atrophies through disuse.

Mitochondria inside of our cells atrophy. They shrink, they shrivel, they can die off. And we end up with far fewer mitochondria and that is actually, in my opinion, probably, you could say arguably the single biggest driver of many disease epidemics, including certainly heart failure and many other aspects of heart problems, many other chronic diseases are largely driven as a result of the mitochondrial dysfunction that comes from loss of mitochondria.

Wow. So that's a lot to, you know, integrate and unpack, that we have these powerhouses in our body, and 35% of the heart is made up of mitochondria. And they produce energy called ATP.

But, they share the responsibility with the rest of the body. And when stress comes in a variety of packages, they may not function as well. What I'm thinking of in clinical medicine, that's an extreme example, right?

I've seen many patients during an episode of bacterial sepsis, the evidences of severe heart dysfunction. And then when the sepsis resolves, the heart returns to normal.

Fortunately, and I don't know that all of it, but I can easily contemplate that there's a shift to, immune response and white cell energy production instead of cardiac muscle production.

Maybe in people that are nutritionally fragile to begin with. And they actually their heart basically like falls apart in terms of function, but can recover once you can resume the main role of mitochondria, which is to produce energy.

Resilience Threshold and Mitochondrial Decline

But this this is so unique that few of us have heard of this sensing mechanism and balance mechanism. Now we have had the wonderful honor of interviewing an expert on resilience, Doctor Stephen Sitter Off, PhD from UCLA.

Well, mainly approaches resilience from a psychological standpoint and has authored several books on the topic. You use a term about resilience resilience threshold.

Is that right? Yeah, yeah, I tell that. Tell us a little about your concept of that because it's a little more biochemical than maybe psychological. That's how we're going to both increase and strengthen our mitochondria.

And we'll talk about breathwork maybe towards the end because I know you're an expert there. Okay. Beautiful question. This I think is a perfect set up for what I was hoping to get into. So when we talk about this word resilience, we are generally trained to think about this in terms of psychological resilience, in terms of how well we can essentially bounce back through adversity, through challenges, through trauma, through, you know, psychological adversity and emotional difficulty.

However, there is a very, very real and very important physiological cellular basis for our physical resilience. And different people have different capacities physically, bio energetically to recover from stresses and challenges.

And this is a critically important piece of this resilience story that I think we need to integrate into our understanding of, of this word and this concept of resilience.

So it's not purely psychological. It's not purely the result of psychological traits. Certainly that's a component of it,

but there is a physical basis for it.

And here's here's what it is. So. When we are when we are undergoing stress of basically any type, the mitochondria in our cells are tasked with increasing their energy supply.

Okay. And we can think of this in many different contexts depending on the type of stressor. But basically the strain on mitochondria is increased. They are the ones bearing most of this burden to increase energy demand in response to whatever stressor the body is under that is true of psychological stress.

It's true from the cliche of running from a tiger. Certainly it's true of exposure to toxins. It's true of exercise. It's true of respiratory infections.

It's true of many, many different types of stressors. Now, when that happens, the extent to which or the capacity that you have to meet that demand will determine to a large extent how resilient you are in the face of that stressor.

Okay. So basically what this means is we can think of it like this. If there is a building on fire, let's imagine, Doctor Kahn, that you and I are physically in the same room with one another.

There's a building on fire next door. Is it easier for you and I to go put that fire out alone, dumping buckets on there and, you know, using a hose to spray down.

Or if we have ten other people helping us out, it's a lot easier if we got ten other people. The same thing is true when it comes to mitochondria. And let me add a layer to this story and then I'll, I'll come back to this.

I'll pick up where I left off. So I'll leave that as a little open loop for now. So I mentioned earlier that mitochondria can shrink, shrivel, they can die off, they atrophy.

Okay. There is research showing that the typical seven. Well let me explain this layer first. People lose on average about 10% of their mitochondrial capacity with each decade of life.

Maybe it doesn't sound like that much, but the average 70 year old has lost 75% of their mitochondrial capacity, 75%. So that means that your heart, for example, which is this super energetically demanding organ, is only capable at the age 70 of producing 25% of the energy it did when you were a young adult.

Okay. And we know this from many different studies that have done, muscle biopsies where they basically take a big hollow needle, they jab it into somebody's body and they take out a chunk of tissue, and they look at it under a microscope, and they examine the mitochondria.

And what they find is that people, on average, who are 70 years old, have lost 50% of their mitochondria. The actual number of mitochondria has decreased by half.

And the mitochondria that are present there have have shrunk and are damaged and dysfunctional to the extent that they only have about half the energy production capacity per mitochondria.

Okay. So if you do the math on those two factors, that leads to a total 75% loss of overall mitochondrial energy production capacity at the cellular level. Now, given what I said before, that.

Our ability to respond to physical stressors that we are exposed to depends largely upon our mitochondria, that a depends on our mitochondrial energy production capacity to meet that demand.

What it means is, if you've decreased your mitochondrial energy capacity by 75%, you have now massively decreased your ability to respond and handle stressors while maintaining health and homeostasis and high energy levels.

And in other words, what that means when our mitochondria the capacity, what I call their resilience threshold,

when their energy production capacity to meet the demands of life is exceeded, what happens is they shift into what Doctor Navias calls defense mode, and they turn down the dial on energy production and they turn on defense mode.

They shift resources toward cellular defense. Okay. So your capacity to again, remain in a high energy state in health and homeostasis. Handling that stress while maintaining health depends upon your mitochondrial capacity to the extent that it's exceeded mitochondria shut down.

You go into defense mode to the extent that your brain and your internal organs and your muscles are turning off energy mode and going into defense mode.

Your body is not resilient. Your body is not going to bounce back easily. What it means is that essentially, it's a physiological trauma. It's something that has shut down your internal engines so that the body is basically just trying to protect itself.

Okay. Now the the so basically the goal is to maintain health homeostasis, high energy levels okay. Our ability to do that in the face of stress depends upon our baseline mitochondrial status.

Do we have cells that are filled with tons of big strong mitochondria, healthy mitochondria and lots of them? Or do we have cells that are filled with very weak, shriveled, shrunken down mitochondria and very few of them?

And to the extent we're on one or the other of those extremes, that is our physiological resilience, that is our capacity to handle exposures to toxins, exposures, exposures to two psychological stress to poor nutrition, to sleep deprivation, to all of the stressors of life, to respiratory infections, and to bounce back from it physiologically for our cells to switch back into energy mode after the infection, after the trauma, after the toxic exposure, and turn us back into healthy energetic mode.

Now, the one little piece that I want to add to this, because some people who maybe are 70 years old might be a little bit depressed, based on what I said there is, you might be thinking, well, you know, that that really sucks that we lose so much of our mitochondrial capacity as we age.

Well, here's the good news. This is actually not a natural, normal byproduct of the aging process itself.

Hormetic Stress and Zone 2 Cardio

This is a result of modern lifestyles, and specifically it is a result of lack of hermetic stress, which is something more we'll talk more about. But basically, the reason we know this is because when we look at 70 year olds who are lifelong exercisers, they have the same mitochondrial capacity as young adults do.

They haven't lost 75% of their mitochondrial capacity. So that tells us that this is not our biological fate. This is not just, oh, this is the human aging process, and it's just genetics.

And it's just that's how aging is. It just destroys our mitochondria as we age. It's not that at all. We can maintain youthful mitochondrial capacity throughout our whole lifespan as long as we have regular exposure to or stress.

So let's jump in there. I mean, you're right. You drag us down, we're getting older, our mitochondrial density is diminishing, and when we're exposed to stress, we're not as biochemically resilient and energy resilient as we were younger in life.

But we've not yet said the word or me says in any of the interviews that I can recall. What doesn't kill you makes you stronger. Everybody's going to want to listen now about this concept.

And, you know, now a few practical ideas, that you're going to share with those right now. And then we'll talk about breathwork as another one. Yeah. How can we keep strong?

Of course, everybody should read eat for energy, how to beat fatigue and Supercharge you mitochondria, your book that came out in 2022. And they can take their time but give us enough that we get you know, we're back up in a smiling place at the end of this interview.

Yeah, absolutely. So here's the the how that works. Okay. Why do we lose mitochondrial capacity as we age? Why do most people. The answer is if you've ever broken a bone and you got a cast on and you wore that cast for 6 or 8 weeks, then you went back to your doctor.

They saw off your cast, and you look down at your leg and you went, oh my God, my leg is half the size of my other one. It's half the size as it was eight weeks ago.

And the reason why that happens is because the body is merciless about getting rid of energetically costly tissue that is not needed for survival. So the reality of what it does is as soon as you stop using that muscle tissue and challenging it and stimulating it, the body goes, I guess we don't need that for survival anymore.

Let's get rid of it because it's just a survival liability. It's just consuming all this energy unnecessarily without contributing anything valuable. Now, mitochondria are exactly the same thing internally, and it's just that we can't see it as well.

But the same basic process happens if you are not challenging them and stimulating them. And giving your body a signal that we need those mitochondria to maintain a high energy production capacity, the body will cause those mitochondria to shrink and shrivel and die off, and you will lose your mitochondria.

And that is a direct result of not challenging them to think of it like a muscle we challenge, a muscle grows bigger. You put it in a cast and don't use it.

It shrinks and atrophies. That's exactly what happens internally at the mitochondrial level as well. And that's how we need to think about our mitochondria.

This these cellular energy generators that that are at the core of our metabolic health and are at the core of disease prevention and longevity with give me five, six things that whip those mitochondria back into, you know, stress mode.

But in this case, stress and recovery mode. Exactly. So how do we build them bigger? Like the way we build a muscle bigger. We lift weights, right? Well, basically we use hermetic stress.

There are many different types of hermetic stressors. One is exercise and there are many different types of exercise and nuances to exercise. I want to talk more about that in a minute.

We have things like fasting. We have things like nutrient cycling. You can temporarily remove, for example, carbohydrates from your diet and deplete the glycogen stores, the stored carbohydrate in your body.

And that can be a form of hermetic stress decreasing overall calories and experimenting with fasting, which is something you're you're big on in the fasting mimicking diet.

This is a type of hermetic stress that strengthens our metabolic health, strengthens our mitochondria. We have breath holding practices and what's called intermittent hypoxic training.

And there's amazing research on this in relationship to cardiovascular disease as well. Different types of of intermittent hypoxic training can be done with breath holds, can be done by much more expensively putting people in chambers where you alter the oxygen concentration of those chambers.

It's less work, but a lot more expensive. And we also have things like light therapy. Certain types of light can act as horror medic stressors. We also have heat exposure like saunas and cold.

There's amazing research on saunas, sauna exposure, sauna use in relationship to cardiovascular disease, dramatically lowering rates of cardiovascular disease among people who are frequent sauna users.

And we also have what are called xeno or medic stressors, which are phytochemicals from plant foods that are sometimes called exercise medics because they stimulate a lot of these same biochemical pathways, these hermetic pathways at the cellular level as exercise does.

There's lots of places we could go. There's all of those things I just mentioned are important, but I'll focus on a couple things here. Number one, the single most important type of hermetic stress for disease prevention and longevity.

And I would say heart disease prevention or reversal is what's called zone to cardio. And we used to talk about these zones, heart rate zones in in fitness largely with the context of sort of wanting to be in this optimal zone where you burn the most fat, and with the idea that you're going to lose more body fat as a result of that kind of training.

And for the most part, we now largely know that that's not true, that you don't necessarily lose more body fat or change your body composition better by being in that heart rate zone, as opposed to, let's say, using high intensity interval training, which is a much higher heart rate zone.

But leaving that aside, what we know from a longevity perspective, and especially from a mitochondrial function and mitochondrial health perspective, is that zone two cardio is the single most powerful thing you can do for your mitochondrial health.

And since they're at the core of disease prevention and longevity, one of the most important things that you can do for that now, basically, the very short version of this is we have these different heart rate zones there.

It's it's actually kind of convoluted and confusing because many different people have created their own zones, their own system of zones. But the most accepted one is either a 5 or 6 zone training system.

And what zone two is, is what's called your fat max. This is the highest intensity of exercise that you can operate at, at a steady pace, where you're still using predominantly fat for fuel before the intensity increases to the point where your cells start using predominantly carbohydrate for fuel without getting too detailed on that.

Basically, the higher the level of exercise intensity, the more that your body shifts towards using carbohydrates for fuel, because it burns faster, you can produce energy more quickly through those pathways using carbohydrate to power high intensity activities, whereas lower intensity activities predominantly use fat for fuel.

Now what? What zone two is this particular zone that I'm talking about? Is the maximal intensity possible where you're still right on the threshold, where you're still predominantly using fat for fuel before it's switched over into predominantly carbohydrates for fuel that is called what they call an exercise physiology or fat Max.

A rough approximation of this of how you can arrive at this optimal zone two level. You can do it through measuring blood lactate levels there meters.

You can do it. But it's a little bit complex. And there's two easier ways. One is heart rate, which I prefer the most. The other one is you can approximate it based on subjective perception.

And the way you do that is the highest intensity you can exercise at at a steady pace. While still sort of being able to hold a conversation. Some people say being able to say a 12 word sentence without having to gasped for air in the middle of that.

Okay, I find that a kind of a poor way of doing it, because what I find as many people underestimate how high of an intensity that they actually need to be at.

So I prefer using heart rate during exercise as a way to track this, and the rough way to approximate it is to use 60 to 70% of your max heart rate. And one formula is you can estimate it by going to 20 minus your age is your max heart rate.

It's just a formula. It's plus or -5% for the most part, depending on the individual, but it's a good way to approximate it. You want to be at 60 to 70% of that.

So for me, I'm about 40 years old. I take 220 minus my age. I get to about 180, 60 to 70% of that puts me at one 3145 ish. Somewhere in that range. So if I exercise at a steady pace where I'm at, roughly 140 ish beats per minute, that's a good zone to intensity for me.

And that approximate that correlates with my fat Max, this highest intensity that I can use while still tapping into predominantly fat for fuel. And what that's doing, that intensity basically is the way to put the maximum amount of stress on your mitochondria possible.

The maximum amount of stress on your mitochondria possible means the maximal amount of adaptations. So what do they do in response to that? They, number one, grow physically much bigger.

Number two, they stimulates mitochondrial biogenesis. The creation of more mitochondria, new mitochondria from scratch. And that's how you reverse that age driven process of loss of mitochondria that I described before.

You engage in practices that create more new mitochondria and grow your mitochondria bigger and stronger.

Plant Compounds and Internal Antioxidant Defense

In addition to that, it actually increases your mitochondrial efficiency, their capacity to produce energy efficiently, especially from fat, which is very, very important.

So that is number one. We want to engage in ideally 3 to 4 bouts of zone two training per week and ideally optimally if we're saying what's optimal. First we we want to be doing 45 to 60 minute sessions and ideally somewhere in the neighborhood of about three hours ish or maybe four hours per week of that.

That's optimal. Now, if you're taking somebody who's in heart failure or who's got severe heart disease, who's older, who's in poor fitness, poor metabolic health, obviously you start slower.

You build a foundation of zone one if needed. Then you start moving slowly into doing five minutes, ten minutes of zone to work, and then over the course of several weeks, you progress up to 20 minutes, 30 minutes, and so on.

A zone two training per session. So, baby steps. Of course, we don't jump into multiple hours of a week of high intensity, moderate intensity activity if we're not fit enough to do that.

But that is, I think, one of the single most important longevity anti-aging, heart protective strategies we can possibly engage in. Get our zone two intensity dialed in.

Once you're giving every secret out here, I want people to be left wanting a little bit. I heard, and I'm learning. I've heard about cold. They're being heard about hot therapy, sauna.

I've heard about exercise, particularly fat Max zone two training, that you've mentioned as ways of counteracting the otherwise decrease in mitochondrial density with age and our kind of biochemical resilience to feel energetic and good through the day.

I know you're an expert at when you use the term, but there are exercise, mathematics, everybody listening who hates exercise. You still got to do it.

But there are some natural substances that mimic, to some degree, the biochemistry and the mitochondrial,

response to three hours a week of exercise. I know you created a supplement I'll promote for you called Energy Genesis.

It has pomegranate green tea, ashwagandha, ginseng, PCA along with others. But those are the mitochondrial biogenesis factors. And it tell us just a little bit about that.

How how can you get a heart attack response and kind of whip your mitochondria back to a useful, more optimal shape through supplements? Well, you eat lots of those colorful plant foods that you're always talking about.

That's that's the basic of, recommendation of how you do it. But there are many specific compounds. Some have become popularized in recent years. Things like curcumin, things like resveratrol.

Tara still being sulforaphane is a big one, which is an amazing one that we can get for pennies a day by growing broccoli sprouts in our home. And, and these compounds, as well as many, many others.

We were talking about olive oil before this interview. You know, Hydroxy Tiraspol peak as you just mentioned, ellagic acid from pomegranate, EGCg from green tea is an amazing one.

Huge amounts of research on that in supporting mitochondrial health and optimal mitochondrial function and mitochondrial biogenesis. But many colorful plant foods.

I'll mention maybe one more spirulina. Has C5 cosign an absolutely amazing, amazing compound from split spirulina. So much research around supporting overall metabolic health.

And these compounds literally act on the same basic pathways as what exercise and many other hermetic stressors act on, predominantly in Nrf2. Now, what this does is this is an oxidative stress mediated pathway.

So basically what happens is when we're exposed to stressors from most types of stressors, including things like exercise that creates a transient spike in reactive oxygen species or free radicals.

Now, we were all taught for many years, many decades to think antioxidants good, free radicals bad. I got to avoid those free radicals and take lots of antioxidants.

But there's a really critical piece of that story that's missing. Transient spikes of free radicals via medic stress are one of the most essential practices for disease prevention, and longevity.

Okay. And that is actually how a lot of these hermetic stress benefits are mediated. They're mediated by temporarily stressing the cells and stressing the mitochondria via a spike in free radicals.

And guess what happens in response to that? Just like a muscle grows stronger when it's challenged with lifting a heavy weight, mitochondria grow stronger when exposed to oxidative stress.

That oxidative stress is actually a signal for them to physically grow larger for them, for them to stimulate mitochondrial biogenesis, and for them to increase what's called the tree.

And this is the part largely mediated from this Nrf2 pathway that these phytochemicals stimulate. The area is the antioxidant response element, and it is our internal oxidant or free radical neutralizing system.

So we don't rely just on taking supplements, taking vitamin C or the foods we eat. We don't rely on just getting antioxidants from there. It turns out that ourselves and our mitochondria produce massive amounts of their own internal supply of antioxidants.

And it's that piece of the puzzle that is actually far more critical in disease prevention and longevity than taking exogenous antioxidants. Exogenous means out from outside your body, taking like supplemental or dietary antioxidants.

It's it's way more critical to do the things that build a robust internal antioxidant response element. And we do that through hermetic stress exposures and through xeno hermetic.

So things like curcumin, things like sulforaphane, things like phi cosine and EGCg, they act on this system and they keep our internal reserves of these antioxidants like glutathione and catalase and superoxide dismutase.

They keep that system charged up so that when it's exposed to stressors, whether it's toxins or sleep deprivation or psychological stress or poor nutrition or anything else, or respiratory infections, when you get that exposure, when that system is topped up, those cells are going to be resilient.

They're going to be able to handle that stress load and maintain health and high energy levels, or quickly bounce back to health and I energy levels. Great to know we have our own antioxidant system.

That's additional beating strawberries and raspberries and blueberries and, tumeric. So just, maybe as we wind down because I do want to leave people wanting because you and I could talk for hours.

I think you briefly mentioned IHT breathing, and I just want you to give us two minutes and the role of breath in optimizing mitochondria and a tool maybe even teach us right here, one single skill that you know can optimize your mitochondria that happens to be free.

It's just a skill. Yes. Yeah. Absolutely. So intermittent IHT stands for intermittent hypoxic training. This is something as I mentioned before, there's a lot of research on.

For example, there was a great 2016 study called intermittent hypoxic training as non-pharmacological therapy for cardiovascular diseases. So this has been studied in the context of cardiovascular disease extensively.

It's been studied in the context of respiratory infections and Covid 19.

Breathwork, Hypoxic Training, and Closing Advice

It's been studied in exercise performance and enhancing performance of elite athletes and many, many other contexts. In Russia, there's a huge most of the research actually comes from Russia.

They've been doing it for decades over there, and only recently as that research been translated into English. But they find that it creates a whole set of anti-aging adaptations to engage in this type of somatic stress.

And with that in mind, I should say to some extent, there is overlap of some of these pathways that all hermetic stressors act on certain pathways. But it's also the case that different types of hermetic stressors have their own unique fingerprint of specific adaptations that they're stimulating in the body.

So even within the hermetic stressor, let's say, the category of exercise, the adaptations that you get from weight training are way different than what you get from zone two cardio.

So these are radically different types of adaptations. That's also true of fasting and xeno hermetic phytochemicals of light, exposure of breath, whole training.

Now with with breath hold training and intermittent hypoxic training, you get a unique set of adaptations in the respiratory system and in the cardiovascular system, especially you actually through through stressing the system in this way, alter what you're doing is lowering blood levels of oxygen.

Okay. That's fundamentally what you're doing with breath hold training. When you lower blood levels of oxygen, you stress out your mitochondria in all of the cells through your body because those mitochondria require oxygen to to combine with carbs or fats and produce energy.

So if they're being deprived of oxygen temporarily, they feel stressed by that. The same way a muscle feels

stressed when you lift a heavy weight, or a muscle feels stressed, or your heart feels stressed when you do exercise.

So when you're challenging it in that way, there are certain adaptations that take place in the mitochondria level. You're also challenging the respiratory system as well.

And what what what they've shown in response to breath hold training is that you actually alter the structural interface, the physical structure between the alveoli, the little sacs of air in the lungs and where they meet the capillaries, these tiny little blood vessels where this gas exchange takes place.

So the physical interface starts to be altered to enhance gas exchange, to be able to drop off oxygen into the bloodstream more efficiently. In addition, the physical interface between the capillary and the cell starts to, all be altered in a way where oxygen delivery to the cell can be, can happen more efficiently, and mitochondria, become more efficient at taking in whatever oxygen is present and utilizing it to produce energy.

In addition, there's, what this does is it's training, what they call in some research, hypoxic preconditioning or ischemia preconditioning. And this is actually used in many cases before different kinds of surgery, where they intentionally engage in this type of where misses to expose the cells to lower blood supply or lower oxygen levels, as or in an effort to stimulate these were medic adaptations to that.

And basically what happens is the cells become more resilient in the face of being exposed to low blood supply, being exposed to low oxygen levels. The cells can cope with that stress much more efficiently if they've been trained too.

Now, what's a great example of cells? For example, in the heart being challenged with ischemia and hypoxia, of course, is heart attacks, you know, and there's certainly other aspects of that.

But we know that we can use these types of training to help increase the resilience of our cells and their their ability to handle stressors, where hopefully in hopefully we never have an event like that.

But if we did, we would we would likely suffer a lot less cellular death of those cells in the heart as a result of that ischemia, and lack of blood supply and lack of oxygen.

If we engage in this type of trainings. With that said, there's many different types of of breath hold training that we can use to engage in these adaptations.

Anti-Aging adaptations, energy increasing adaptations, as well as exercise performance enhancing adaptations. All right, so I do and I do know that you have gone deep into this and, you know, you have a wonderful course called breathing for energy program at your website, the Energy blueprint.com for people listening who want to have more energy, want to feel better, want to use a simple hermetic strategy to optimize your mitochondria?

They just sign up for your breathing for energy program at the Energy blueprint.com, and they can learn about IHT and other forms of breathing. That's a good place to go.

Absolutely. Yeah. And and you asked me to teach one thing. So I'll deliver that very briefly. The one thing that I will say is that before doing any breath, hold practices, somebody needs to speak with their physician because some people are not physically in a condition where they're going to tolerate these kinds of practices.

There are gentler approaches to doing that, what we call air hunger practices, where basically you work on slowing down your breathing and making your breathing much lighter and gentler and taking shallower breaths while still breathing very gently.

And though that's a much better place, those air hunger practices are a much better place to start with if you're currently in poor health. If you have, for example, heart failure or other heart disease, or you're in poor fitness or very, very old age.

So the breath hold practices can be done. In many different ways. There's many different permutations of this, but the basic gist of them is we use hyperventilation, we breathe faster prior to them for 30 or 50 breaths usually.

And by doing that, we're rapidly clearing carbon dioxide levels from our bloodstream. And what that allows us to do is that when we go into the breath hold, we can hold the breath hold much longer and tolerate lower levels of oxygen as a result of sort of pre, you know, doing this pre hyperventilation, pre breath hold hyperventilation so that we don't have to have the urge to breathe quite as quickly.

We can tolerate lower oxygen levels in the blood and therefore we can stimulate greater adaptation. So there are many different ways that you can do the breathing practice.

But the basic gist of it would be something like. For 30 or 50 breaths, then you'd exhale out all your air and hold. And while you can do these breath hold practices on an inhale and for example, like free divers will will do that, blood oxygen levels are lowered more effectively if you practice the the breath hold after an exhale rather than on the inhale.

And by doing that, by getting into those dips of lower oxygen levels in the blood, we can create that stimulus that stress, that stimulus for adaptation on the mitochondria and the respiratory system, the cardiovascular system, in the ways that, I previously prove it.

And test and think. So I don't think there's anybody that's been, listening or watching or both. It hasn't, you know, probably written down five, six, seven pages on a legal pad of, amazing ideas.

Again, that Energy blueprint.com would be the central site to learn more about your brilliance. Absolutely. Your supplements, your books, the new book, each for energy, of course.

And, I would endorse everybody get on his podcast and hit that little subscribe point and listen because, they're fascinating and they're a whole range of topics.

But I want to thank you for taking time out of, you know, a very busy life. You have and children and, wife and occasional great pictures of you surfing and having fun that we only dream about here in Michigan during the winter.

But, good for you for finding a beautiful piece of the world to live in. But thank you. We will learn. And, you know, so many people are going to feel better because of it.

And I think a lot of people want to go over your your course and really learn formally, at their own pace, breathing for energy program. It's all there and easy to sign up.

I have, you know, been a participant of it. So I can tell you I've looked at it and it is quality. So thank you so much. Yeah. My pleasure. Thank you so much, Doctor Carney.

It was a pleasure. And if I can just add one little bit, I would say that the breathing for energy course has three different tracks in it depending on where you're at.

So there is everything from a track from people dealing with severe chronic fatigue and very poor fitness levels, other chronic diseases to the high performance athlete.

Everything from intermittent. We progress you all the way from intermittent hypoxic training with 15 second breath holds all the way up to four minutes and beyond.

So there's the whole track of progression for everybody, regardless of their health and their fitness level. And I do like your advice. Everybody talk to your medical health care team before you engage in some of these.

Perhaps you know more new or aggressive breathing techniques, but, how simple to use a pair of gym shoes and

your breath and other ways to optimize your health.

Thank you for educating us. And all good and new information. Thanks so much for having me, Doctor Kahn. It was an absolute pleasure. You bet.