Introduction and Ari Whittenu2019s Background

– Well, hello everybody. Welcome back you guys buckle in. Don't go anywhere. This is the 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 bachelors in Kinesiology, which is exercise science, a masters in human nutrition, deep expertise and something we're going to talk about right now, mitochondrial health, 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 gotta do is tune into his podcast, The Energy Blueprint, which I love listening to and 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 your mitochondria. Ari did I say enough, Welcome. I'm excited.

That was great. Thank you so much. Dr. Kahn, it's it's a pleasure and honor to call you a friend and I always love receiving texts from you after you listen to some of my podcast episodes and in fact I worked one of your questions into. Part two of three with Morley. I heard that.

Thank you for that. I listened to that long segment. It was very interesting. But you know we are talking heart is is launching heart month. 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've only brushed 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. And 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 there extremely energetically demanding organs.

The heart, the tissue of that that comprises our heart is actually 35% mitochondria by mass.

Mitochondria, Heart Health, and Cellular Energy

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 um there's a vast amount of research that has tied mitochondrial function or mitochondrial dysfunction to a plethora of different heart diseases. Um certainly heart failure as 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 wanna say all of that up front and then we're gonna go do a deep dive into mitochondria and how to keep them strong and healthy. So mitochondria again as our 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 Dr. Robert Naviaux who published a paper many years ago called the Cell Danger Response and basically um he runs a lab for mitochondrial medicine at the University of California San Diego.

And he pulled together not only his 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 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 um you you 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 uh condensed down into a few different molecules, biochemical sort of um 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 dialogue energy production. Many of these things are actually um 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 ourselves. Atrophy they shrink, they shrivel they can die off and we end up with far fewer mitochondria.

Resilience Threshold and Mitochondrial Aging

And that is actually in my opinion probably you could say arguably the single biggest driver of um many many disease epidemics uh including certainly heart failure and 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 uh you know integrate and unpack that we have these powerhouses in our body and 35% of the heart is made up of mitochondria uh and they produce energy called ATP But uh 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, it's an extreme example. But 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 you know, I don't know that all 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 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. 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 a expert on resilience. Dr. Steven Sideroff, PhD from U. C. L. A who 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. – Tell us a little about your concept of that because it's a little more biochemical than maybe psychological and 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 setup for what I was hoping to get into. So when we talk about this word resilience um 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.

Um 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 resilient 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.

Um 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're, when we are undergoing stress of basically any type, the mitochondria in ourselves 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 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 what this means is We we can think of it like this. Um if there is a building on fire, let's imagine Dr. Kahn that you and I are physically in the same room with one another? There's a building on fire uh 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 10 other people helping us out.

It's a lot easier if we got 10 other people. The same thing is true when it comes to mitochondria and let me add a layer to the story and then 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 the atrophy. Okay.

There is research showing that The typical seven. Well, let me explain this later. 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 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 Dr. Navio calls defense mode and they turn down the dial on energy production and they turn on defense mode they shift resources towards 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.

Okay. And 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 psychological stress, to poor nutrition, too sleep deprivation to all of the stressors of life to respiratory infections and to bounce back from it physiologically for ourselves. 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. This is a result of modern lifestyles and specifically it is a result of lack of Hormel thick stress, which is something we'll 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.

Hormetic Stress and Zone 2 Training

So that tells us that this is not our biological fate. This is not just 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 hormedic stress.

– So let's jump in there. I mean, you're right, you drag us down, we're getting older or 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 have not yet said the word hore missus in any of the interviews that I can recall. What doesn't kill you, makes you stronger. Everybody's gonna wanna listen now about this concept and you know now a few practical ideas of that you're going to share with us right now and then we'll talk about breath work as another one.

Yeah. How can we keep strong? Of course everybody should read eat for energy, how to beat fatigue and supercharge your 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 the interview.

– Yeah, absolutely. So here here's the how that works. Okay, why do we lose mitochondrial capacity as we age? Why do most people? Um The answer is if you've ever broken a bone and you got a cast on and you wore that cast for six or eight 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. 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 the 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 the cellular energy generators that are at the core of our metabolic health and are at the core of disease prevention and longevity.

So will… – Give me 56 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 the muscle bigger. We lift weights right well. Um basically we use for medic stress. There are many different types of for medic 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.

Um 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 um decreasing overall calories and experimenting with fasting, which is something you're you're big on and the fasting mimicking diet.

This is a type of horror medic stress that strengthens our metabolic health strengthens our mitochondria. Um We

have breath holding practices and what's called intermittent hypoxic training.

Uh and there's amazing research on this in in relationship to cardiovascular disease as well. Um 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. Um It's less work, but a lot more expensive and we also have things like light therapy. Certain types of light can act as for 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 Zeno hermetic stressors which are phytochemicals from plant foods that are sometimes called exercise. My medics because they stimulate a lot of these same biochemical pathways, these or medic pathways at the cellular level as exercise does now. Um there's lots of places we could go there.

All of those things I just mentioned are important. Um but I'll focus on a couple things here. Number one, the single most important type of hore medic 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 gonna 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, um 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 to 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 five or six 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. Okay, 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 um 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 switched over into predominantly carbohydrates for fuel.

That is called what they call an exercise physiology or fat max. And um a rough approximation of this, of how you can arrive at this optimal zone to level, you can do it through measuring blood lactate levels their 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 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 gasp for air in the middle of that. Okay. Um I find that a kind of a poor way of doing it because what I find is many people underestimate how high of an intensity that they actually need to be at. So I prefer using heart rate um during exercise as a way to track this. And the rough way to approximate it is to use um 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 it's just a formula. It may, it's, you know, it's plus or minus 5% for the most part. Um 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 2 20 minus my age, I get to about 1 80 60 to 70% of that puts me at 1 31 45 ish. Somewhere in that range. So if I exercise at a steady pace where I'm at uh roughly 1 40 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 me 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 it 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 big, your mitochondria bigger and stronger. In addition to that, it actually increases your mitochondrial efficiency, their capacity to produce energy efficiently. Especially from fact, which is very, very important. So that is number one, we want to engage in um 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, 10 minutes of zone to work.

Exercise Mimetics and Plant Compounds

And then over the course of several weeks you progress up to 20 minutes, 30 minutes and so on of zone two training per session. So baby steps of course we don't jump into multiple hours of a week of high intense 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. Yet our zone to intensity dialed in – 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 therapy. I've heard about hot therapy, sauna. I've heard about exercise particularly Fat Mac zone to training um that you've mentioned as ways of counteracting the otherwise decrease in mitochondrial density with age and are kind of biochemical resilience to feel energetic and good through the day.

Um I know you're an expert at um when you use the term but there are exercise mimetic, 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 uh three hours a week of exercise. So I know you created a supplement I'll promote for you called energenesis.

It has pomegranate, green tea, ash, Lagonda, ginseng, P. Q. Q. Along with others. But those are the mitochondrial biogenesis factors in it. Tell us just a little bit about that. How how can you get a Hormel thick response and kind of whip your mitochondria back to a youthful Moroccan L 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 uh some have become popularized in recent years.

Things like curcumin things like resveratrol. Uh taro still being uh 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 uh and these compounds as well as many many others. We were talking about olive oil.

Before this interview. You know hydroxy tyrus all um P. Q. Q. As you just mentioned alagic acid from pomegranate E. G C. G. From green tea is an amazing one huge amounts of research on that and supporting um mitochondrial health and and optimal mitochondrial function and mitochondrial biogenesis. Um But many colorful plant foods.

I'll mention maybe one more spirulina has c. Fico sinan. Absolutely amazing amazing compound from 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 an N.

R. F. Two pathway. 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 hormedic stress are one of the most essential practices for disease prevention and longevity. Okay and that is actually how a lot of these hormedic stress benefits are mediated their 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 to for them to stimulate mitochondrial biogenesis and for them to increase what's called the A.

R. E. And this is the part largely mediated from this Nrf two pathway that these phytochemicals stimulate the A. R. E. Is the antioxidant response element and it is our internal occident or free radical neutralizing system.

So we don't rely just on taking uh supplements taking vitamin C. Or the foods we eat. We don't rely on just getting antioxidants from there. Um It turns out that our cells 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. Um Exogenous means out from outside your body taking like supplemental or dietary antioxidants. Um It's it's way more critical to do the things that build a robust internal antioxidant response element.

And we do that through your medic stress exposures and through Zeno hermetic. So things like curcumin things like sulforaphane, things like Fico sign in E.

G. C. G. They act on this system and they keep our internal reserves of these antioxidants like glutathione and cattle A's and super oxide dis mutates they keep that system charged up so that when it's exposed to stressors um 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 high energy levels.

– Great to know we have our own antioxidant system that's additional to eating strawberries and raspberries and blueberries and turmeric. So just maybe as we wind down because I do want to leave people wanting because you and I could talk for hours.

You I think you briefly mentioned I. H. T. Breathing and I just want you to give us two minutes on the role of breath in optimizing mitochondria. And a tool maybe even teach us right here one single skill that you know can optimize

our mitochondria that happens to be free. It's just a skill.

– Yes. Yeah. Absolutely. So um intermittent I. H. T. Stands for in 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 pharmacologic 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. 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. Um 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 hermetic stress.

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

So even within the hormedic stressor, let's say the category of exercise.

Breathwork, Hypoxic Training, and Closing Remarks

The adaptations that you get from weight training are way different than what you get from zone to cardio. So these are radically different types of adaptations.

That's also true fasting of Zeno hermetic phytochemicals of light exposure of breath hold training Now with with breath hold training, intermittent hypoxic training you get a unique set of adaptations in the respiratory system and in the cardiovascular system especially um you actually through through stressing the system in this way you alter what 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 feel stressed when you lift a heavy weight or muscle feel stressed or your heart feel 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 and 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 um, what what this does is it's training um what they call in some research hypoxic preconditioning or ischemic preconditioning and this is actually used in many cases before different kinds of surgery where they intentionally engage in this type of harm is is to expose the cells to lower blood supply or lower oxygen levels. Uh, as a result in an effort to stimulate these for 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 to 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 you know there's certainly other aspects of that but we know that we can use these types of training to help increase the resilience of ourselves and their their ability to handle stressors where hopefully

hopefully we never have an event like that.

But if we did um we would we would likely suffer a lot less cellular death of those cells in the heart as a result of that ischemia uh lack of blood supply and lack of oxygen if we engage in this type of training. So um with that said there's many different types of of breath hold training that we can use to engage in these adaptations.

Um anti aging adaptations, energy increasing adaptations as well as exercise performance enhancing adaptations. – I do and I do know that uh 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 dot com.

Where people listening who want to have more energy want to feel better, want to use a simple hormedic strategy to optimize your mitochondria. They just sign up for your breathing for energy program at the Energy blueprint dot com and they can learn about I. H. T. And other forms of breathing.

That 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 um 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 um or very very old in age.

So um the breath hold practices can be done um 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 um 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, um 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 exhale out all your air and hold. And while you can do these breath hold practices on an inhale and for example, like um free divers will will do that. Um blood oxygen levels are lowered more effectively. If you practice the breath hold after an exhale rather than on the inhale. And 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 previously described.

Fantastic. So I don't think there's anybody that's been listening or watching or both. It hasn't, you know, probably written down 5,6,7 pages on illegal path of amazing ideas.

Again, theenergyblueprint.com would be the central site to learn more about your brilliance, your supplements, your books, the new book, Eat 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 their 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 a wife and occasional great pictures of you, um 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 to 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, being a participant of it, so I can tell you, I've looked at it and it is quality. So thank you so much. Ari. Yeah, my pleasure. Thank you so much Dr. Kahn, it was, it was a pleasure. And if I can just add one little bit, I would say 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, um, other chronic diseases, to the high performance athlete.

Everything from intermittent, we progress you all the way from intermittent hypoxic training with 15second breathholds. 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 you knew, or aggressive breathing techniques, but how simple to use a pair of gym shoes and your breath. And other ways to optimize your health.

So thank you for educating us. It's all good and new information. Thanks so much for having me. Dr. Kahn was an absolute pleasure.