Introduction and Guest Background

Welcome to another episode. I'm your host, Laura Frontiero, and bringing you experts to help you boost your energy and fix your health so you can build the life you love.

Today, my special guest is Ari Whitten. We're bringing you back again. Hi, Ari. Welcome to the summit. Thanks so much for having me, Laura. For the second time. It's always a pleasure. Yes.

I wanted to have you back again because, I mean, quite honestly, I could probably do all the talks on the summit just talking to you and picking your brain because you are the mitochondria expert.

But today, I think we're going to talk about a really, really important topic for me. I know it's one of your most favorite things to talk about, and we can I have a mitochondria summit without this very important topic.

So thank you for for doing this again for those of you who don't know. Ari, you're the founder of the Energy Blueprint System. It's a comprehensive lifestyle and supplement program which has helped more than 2 million people and counting.

What Causes Fatigue and Mitochondrial Stress

That's impressive. Every time I see that, I mean 2 million people. That's insane. But you help them experience optimal health, better performance, and more energy.

You're the bestselling author of The Ultimate Guide to Red Light, Red Light Therapy and the host of the popular The Energy Blueprint podcast, which features the world's leading natural health experts.

We can find your podcast programs and supplement formulas at the energy blueprint dot com. So in this talk about hormones today, it's really important that we start the conversation by talking about what is the biggest cause of fatigue.

Let's start there. We'll get into the hormones piece, but let's set us up for this conversation. I would actually argue that or misuse is arguably the most important thing for mitochondrial health, and it's something that most people in the natural health space and functional medicine experts either don't even know about or don't talk about.

And, you know, ten years ago, when I started beating the drum on or misuse, I was looking at many of our friends and colleagues. And I would mention that word or MREs or medic stress.

And people would kind of cocked their heads to the side and look at me like, what the hell is that? You know, and nobody knew what it was. And I was looking at, you know, this huge body of literature that was saying that was basically making the case that me MREs is the single most important thing when it comes to disease prevention, longevity and energy, because the the effects of it, the way that it works, center around our mitochondria.

So when it comes to when it comes to understanding fatigue, energy production, I like to to break it down into two fundamental things, two fundamental factors that control how our body is regulating energy levels, whether we are producing lots of energy, like a typical young kid bouncing off the walls with energy, or whether we are chronically fatigued and have no energy to do anything.

Mitochondrial Decline, Aging, and Recovery

And and those are number one, total body stress load or alo static load, which is basically a combination of all of the different stressors in your life.

They could be nutritional stress stressors, everything from eating a poor diet with lots of processed foods to nutritional deficiencies, to many other aspects of nutrition, to circadian rhythm and sleep disruptions, to psychological stress, to environmental toxicants, to light deficiencies and toxicities, to pathogens, you know, respiratory infections, for example.

Everything goes into this bucket of total body out of our static load. And I believe in the in the first interview that we did, I talked a lot about this sort of dual role of mitochondria as either energy generators or cellular defenders.

So they're either in energy mode or defense mode. We talked about that, right? Yeah. And you talked about how that's been a relatively new concept in the last ten years.

We used to think in the old days that all our mitochondria did was make energy. But now we know there's a lot more to the story. So viewers, make sure you go back if you didn't see Ari's talk on day one.

Do you go back and listen to that? Because it really shed some amazing light on what your mitochondria are doing. And the other thing I wanted to say, Ari, is it's interesting.

So if you go to PubMed now and you search in your business, it's all over the place. There's all kind of articles and research on premises. So it's interesting. Ten years ago, nothing.

Now it's one of the most widely looked at topics. Right. Yeah, absolutely. Okay. So brief summary of this dual role of mitochondria. Basically, mitochondria have been taught to us as these mindless cellular energy generators.

They take in carbs and fats. They pump out energy. In fact, they have a second role that's just as important, which is in cellular defense. They're basically environmental sensors that are that are constantly taking samples of the environment and asking the question, is it safe to produce energy?

And the way they determine that is picking up the signals from these various stressors that I just mentioned. They can pick up every signals from every type of stressor imaginable, whether it's a pesticide residue or heavy metals or psychological stress or sleep deprivation or nutrient deficiencies or any other type of stressor you can imagine.

Hormesis, Stress, and Building Resilience

And in response to picking up those stress stress signals, they're turning down the dial on energy production and shifting resources towards cellular defense.

Okay. So that that total body stress load or alo static load from all of those different sources of stressors is determining the degree to which your mitochondria are basically deciding whether they're going to be in energy mode or defense mode.

Now, since we talked about that in the first interview, there's a second big key to this puzzle. And this is the part that is not widely understood within the natural health and functional medicine community, the a the capacity of your body, your cells to handle a certain amount of stress, load something I call the resilience threshold is determined by your mitochondrial capacity.

First and foremost, how big and strong are your mitochondria and how many of them do you have in your cells? And this gets at a very important point. That is that is not widely known, but one of the most important factors in physiology when it comes to disease prevention, longevity and energy.

And that is research has shown that every decade of life, typically for most people, corresponds to a decline in mitochondrial capacity. You can think of that as the number of mitochondria you have in your cells of about 10%.

Maybe doesn't sound like much, but here's another way of stating that the typical 70 year old person has lost 75% of their mitochondrial capacity compared to what they were a 20 year old.

When you put it that way, it's it's profound. So, wait, are we stuck like that or can you get it back? Can you can you bring back your mitochondria? So that's the good news.

You can bring back your mitochondria. This process is dynamic. Okay. So first, let me let me explain this loss of mitochondrial capacity. Okay. So it's been shown the typical seven year old has lost 50% of their mitochondria by number.

Types of Hormetic Stressors

And of the the mitochondria that are left in the cell, they have only about 50% of their energy producing capacity. So if you do the math on that, you've lost 75%.

Now, to put that in in a different way, this is like essentially like going from a Ferrari engine to like a moped engine. Okay. This is a big difference in your.

You're not even in the car class anymore. Now you're on a moped. Exactly. Okay. So this is a big difference in your cellular energy producing capacity.

And the critically important thing to understand from this fundamental insight before we get into the question you just asked, is it's important to understand that if that's the case, if you've lost 75% of your engine at the cellular level, the solution cannot simply be the removal of stressors in your life.

Like, you know, you meditate to to ease the psychological stress load. You improve your diet to get more nutrients in, to, you know, get lower the toxic burden to help detoxify your system.

You go on detox protocols. You know, you support the antioxidant defense system with glutathione and AC and coke ten and acetyl l-carnitine for your mitochondria and B vitamins and all these other kinds of things.

Breathwork and Hypoxia Training

None of those things fix the fact that your engine is still at 25% of capacity, and that is the core insight that is widely not understood within the natural health community.

Let me ask you this if that's all you're doing, can you maintain the 25%? Maybe you're just maintaining and not losing more function, but you're not building back.

Would that be a true statement? Sure. I'm not saying those things don't have any benefit, but I'm saying they are of limited strategies to improve energy and and also getting into anti-aging longevity.

Disease prevention strategies are of limited benefit if you do not address the fundamental factor that you've lost 75% of your your cellular engine. Okay.

Because every tissue in the body, whether we're talking about the brain, we're talking about the heart, we're talking about the intestines, we're talking about our muscles, almost our hormone producing glands, our liver, almost everything relies almost exclusively on mitochondria for their energy to do the jobs they do and to do their job well.

Whether it's your thyroid producing thyroid hormone or your liver helping to detoxify or whatever it is, your muscles performing work in order to do their job effectively, they have to have adequate energy supply.

And if you've lost 75% of your energy supply, your your energy producing capacity to guarantee they do not have adequate energy supply to do their job well.

Okay. Got it. So if you get to get to the answer to your question, the good news is that it doesn't have to be this way. It's actually been shown that in lifelong athletes, people who continue to do sports continue to do exercise into their seventies, they actually have the same mitochondrial capacity as a young adult.

So they don't lose 75% of their mitochondrial capacity. That's the really good news here.

Antioxidants, Timing, and Final Takeaways

And what this tells us is that this loss of mitochondria is not something that we're destined to have as a result of this natural process of aging, where, you know, aging just destroys our mitochondria.

It's not like that. It it actually is the case that our mitochondria are in very dynamic relationship to our lifestyles and to our environment. And if they are being stimulated and challenged, they stay big and strong and robust and you keep the same amount that you had when you were a young adult.

Okay. However, if you don't if like most people, you are not adequately and regularly stimulating and challenging your mitochondria, they atrophy, they shrivel and they shrink and they die off.

Just like if you put a muscle in a cast, if you break a bone, that muscle atrophy is the same exact thing happens and an internal level with the mitochondria.

Okay. And I think what you're about to say is the stimulation of the mitochondria does not happen from those other healthy lifestyle factors. So, yes, meditation is important.

Yes, eating healthy is important. Yes, moving your body is important, but it takes a little bit more than that to stimulate that mitochondria muscle. So I think that's about what you're about to tell us.

Right. Exactly. Exactly what what we want one critical aspect to optimize our health is that we need both. Most people in the modern world need to do two fundamental things to improve their health.

They need to increase. This is going to sound really counterintuitive. They need to increase the amount of good stress in their life. Mm hmm. Okay. Spikes, transient spikes of intense stressors of specific types to increase the stress load the metabolic stress load on their mitochondria.

Okay. And they also need to intensely do the reverse of that. They need intense dips into recharge, purging and recovering. Okay. And most people living in the modern world are terrible at both of them.

They're sort of flat lining where they're in this middle ground of sort of this constant low level stress. But stress is not good when it's constant. Mm hmm.

And they don't have adequate recovery, and they're missing the spikes of the more intense kinds of stress that will actually stimulate mitochondrial growth and stimulate your body to keep your mitochondria.

Yeah. So we want this oscillation built into our life of spikes of water, medic stress and dips into recharging and recovering our bodies very intensely as well.

You know, it's coming to mind what an influencer in the business world once told me that balance is not possible. And what I'm hearing you say right now is balance is actually critical. Hmm.

So you have to have both. You have to have those intense good stressors and those intense recovery periods. Mm hmm. Exactly. So just to to circle back to what I was saying, you know, your your first question was, you know, what are the big factors that control fatigue?

So you have this this first bucket total body stress load. Second bucket bucket is is what is the status inside of yourselves as far as how many mitochondria you have?

How big and strong are they that determines your resilience threshold, which is your cellular capacity to tolerate those various stressors in your life while maintaining health and high energy levels?

Okay. And without. And as soon as that threshold is exceeded, that's when mitochondria shift out of energy mode into defense mode. And it's where you start to get symptoms.

The mitochondria start throwing off lots of reactive oxygen species or free radicals. They start producing much less energy. And that drives disease processes and it drives fatigue.

So ultimately what we're talking about here is we want a combination of reducing total body stress load in tandem with building up our cellular engine.

So we build up our resilience threshold so that our body has more buffering capacity to handle stressors because we can't eliminate stress. Stress is ubiquitous in the modern world.

We can't eliminate it totally. So we build up our buffering capacity to allow our body to handle stress while maintaining health homeostasis and high energy levels.

Okay. So I know our viewers right now are going tell me, tell me, tell me what is it I have to do? What is the hermetic stress? We're going to get into that, too, in just a second.

But what I'm hearing you say is that mitochondrial size and number actually relates to your body's capacity to handle stress. So that is really critical and so interesting.

And I agree with you, this is so missing in the functional medicine world because we do put a lot of emphasis on handling your stress and, you know, trauma release and really bringing that down.

But what's not focused on is the fact that your mitochondria has suffered and you still need to build that back up in order to handle because stress is still going to happen, right?

It's impossible not to. Something else is coming. Something else is coming. Exactly. And if I can add one, one more layer before we move on just to what this stress is actually doing at the mitochondrial level.

So one is it's building the mitochondria bigger and stronger, and it's also stimulating something called mitochondria or biogenesis, the creation of more mitochondria from scratch.

So on average we have somewhere between 500 to 2000 mitochondria. Pacelle That loss of 75% of my mitochondria with aging that typically happens to most people means that if you previously had 2000 mitochondria.

Pacelle Now you've only got 500. Okay? So the goal is to. To build back in the other direction. Mm hmm. Now, the other important thing that it's doing is those stressors.

This is something we can talk about in much greater depth if you want to do a deep dove here. But the quick treatment of it is these stressors. This, again, is counterintuitive.

These stressors actually create a transient spike in free radicals in in oxidants or reactive oxygen species, which we're all totter. Oh, those are bad.

And got to avoid the oxidants. We got to take our antioxidants. But actually the the way that the one of the primary mechanisms arguably the most important mechanism of how hermetic stressors work to benefit our health is by creating a transient spike in oxidants.

And those oxidants serve as a signal at the mitochondrial level for mitochondria to grow bigger and stronger. So in the same way that if you lift a weight, you're you're challenging that muscle and you're stimulating it to grow bigger, to adapt to that stress.

Reactive oxygen species do the same thing at the mitochondrial level. It's also been shown that if you, for example, take antioxidant supplements in tandem with doing exercise, that you reduce or eliminate the benefits of exercise.

Oh, no. So so researchers many years ago thought, you know, well, we have all this data showing exercise reduces rates of disease and extends longevity, reduces brain disease and heart disease and all these other diseases and cancers and so on.

But the problem with exercise is that it creates all these free radicals, and therefore, if only we can just take antioxidants to to eliminate those free radicals that we get from from exercise.

We can get all the benefits of exercise without the harm. And what they found when they did those studies is that by supplementing antioxidants, they negated the benefits of exercise.

Oh, my gosh, that is horrible news. So what does one do with antioxidant supplements then? Is there a time and a place that it is good to take them? Okay.

So that's a bigger, more complex question. Let me before we get there, Will, let me just wrap this up. Okay. So this hermetic stress, by creating this transient spike in free radicals is stimulating again, the mitochondria to grow bigger and bigger and stronger, stimulating mitochondrial biogenesis.

And it's also doing something very important. It stimulates something called the Air E, the antioxidant response element inside of mitochondria. And this is our internal antioxidant and detoxification defenses stem and this includes powerful antioxidants like glutathione and catalase and superoxide dismutase.

So by engaging in hermetic stressors, we are not only building physically the mitochondria that that engine, we're building it bigger and stronger, but we are also building the the antioxidant and detoxification defense system inside of mitochondria so that it can can have its own reserves to handle exposure to oxidants.

And that that mechanism is vastly more important as far as neutralizing oxidants at the cellular level then is taking external antioxidant pills. And we know that because we have lots and lots of research showing taking antioxidant pills like vitamin C and vitamin E and vitamin A and things like that are in most studies not linked at all or very weakly linked with disease prevention and longevity extension.

Whereas where medic stressors which build up the internal antioxidant defense system are very strongly linked with huge effect sizes as far as disease prevention and longevity lifespan extension.

So that makes sense. It does. Is now the time to start talking about some of those hermetic stressors that we set the stage? Yes. Okay. What are the biggest ones? How do we do it?

What's how long do you do it? This is really important information right here. So everybody get your pens out. If you haven't already, you want to write this down?

Okay. So the most obvious or emetic stressor that people are familiar with is, of course, exercise. Exercise is really its own category unto itself. There are many different subtypes of exercise.

So we have resistance exercise, weight training, we have high intensity interval training or sprint interval training, and we have endurance exercise, which is lower intensity for a longer duration in a steady state.

So all of these different types of exercise actually have their own unique fingerprint, essentially, of the specific adaptations they're stimulating in your body.

And they're all good, but they do things in different ways. I don't know how deep of a dove we should go into exercise, but there have been studies where they've looked at both in and trained, meaning people who are very fit and used to doing lots of exercise and untrained individuals.

As far as which specific types of exercise were able to stimulate the most robust increases in markers of mitochondrial growth and biogenesis, I would say in general, maybe a very quick summary of that is in untrained individuals, it doesn't really matter.

Any type of exercise will stimulate increases in mitochondrial biogenesis and growth. And the more highly trained you are, the more that you might require novel training methods to create further stimuli.

But one of the key and there's also some evidence to suggest maybe high intensity interval training and sprint interval training have a unique benefit in that regard, potentially amplified when doing it in a fasted state or combining it with certain phytochemicals and things like that.

So I'd just venture to say that most people viewing this summit are probably not professional athletes and highly trained individuals. They're probably more in the untrained category.

Would you say? Possibly. I mean, you might have a lot of very health conscious people who are listening to this, who are already eating very healthy, already exercising multiple times a week.

And so what what would be just real quick, what would be trained in your I mean, you have a whole background in physical training as well. So how many times and hours a week would you consider somebody to be trained versus not?

Because this is a big question to me, because I always wonder, like, what really makes somebody when do they cross that threshold of being athletic versus not?

I don't think there's any consensus answer to that question. I think it's largely semantics and it's probably defined differently in different studies, you know, different research groups are saying, oh, you know, this group does at least two bouts of exercise a week for half an hour.

Therefore, they're the trained group. Oh, wow. And and, you know, as an example, and maybe another research group says does at least half an hour a day of exercise, who knows?

But untrained is easy, you know, doesn't engage in any sort of moderate, moderately intense or vigorous exercise on a regular basis. They're, you know, relatively sedentary people not engaging in any exercise program who maybe just do some walking here and there, but beyond that, don't do much.

Okay. So yeah, so I would say, you know, maybe just to go on to the next topic and then we can circle back if you want to do a deeper dove here, the probably for for people who are already doing some types of regular exercise.

Well, actually, I'll say two things. If you're not already doing any exercise, doing something is great. So fine, whatever type of exercise you will actually do consistently.

That's step one. If you're already there, you're doing some type of consistent exercise, try to incorporate a different type, number one. So if you're doing weight training, try to also engage in some steady state or some high intensity interval training.

If you're doing high intensity interval training style group fitness classes, maybe try also doing some steady state or doing some more resistance training.

And number two, probably the bigger, bigger thing is that in order to create a horde medic effect, it's critically important to understand that you have to be pushing the boundary of what your body is currently capable of.

You have to challenge yourself and if you're not crossing into that territory where you are uncomfortable and it's really hard for you, then you're not creating a stimulus for adaptation.

So you want to be doing that on a regular basis, and that applies across the board to every type of one message. That's such a good pearl. Everybody can gauge their own level of discomfort in exercising. Yes.

So some of the other types of homedics, stress, breath, work, breath holding is a wonderful form of automatic stress, and it's called hypoxia, where me says there's various ways of doing it.

You could step into a low oxygen chamber. It's a very expensive way of doing it or you can do breathless, which are free. And I have a program about this called Breathing for Energy.

It's one of my absolute favorite ways of doing automatic stress, particularly for people with chronic fatigue or chronic fatigue syndrome, because it tends to be a much better place to start than exercises as far as automatic stress, because you're stimulating a lot of these mitochondrial adaptations without actually exhausting your pool of energy like exercise does exercise uses a huge amount of energy, whereas breath holding does not.

So that's something we can circle back to. Thermal stress, sauna and hot baths and cold, cold baths. Ice baths have become popular in recent years. Both types of stressors are wonderful for mitochondrial health and profound benefits for both.

I'm a huge fan of sauna, in particular for people with chronic fatigue, fasting and intermittent nutrient cycling is another great approach to where medic stress and there are certain kinds of chemicals that act, as were medic stressors.

And there's a whole class of hermetic stressors called Xeno or mutants, which is which are phytochemicals from plants that act on the same pathways as romantic medic stressors.

And, and there's also some other types like light, for example, UV light red and your infrared light also act as romantic stressors. So that's a that's a brief overview of kind of the different types.

Okay. So let's pick a couple of these to dig into. But before we dig into him, can you explain how? So you've just given us a whole bunch of information.

So how do we use that to rebuild our mitochondria? Where do we start? And let's pick some two to dig into. And I and I really want to dig into your breathing one because I know you have this excellent reading for energy and I really want to highlight that on this talk as well.

Yes. So there's an individualization component that makes this a little bit difficult to answer. But here, let me let me start with sort of what the ideal is, and then we'll come back to where one might need to start.

That's far away from the ideal if their body can't yet handle that. Okay. So the ideal is that you're regularly incorporating almost every category of hermetic stressor that I just mentioned.

That's three one. Oh, I got. Like almost everyone. Okay, so some some of this, some of this is easier than it might seem like if you are engaging in the right things.

I'll give you an example. I go surfing in the morning some days when the surf is good cold, I'm exposing myself to cold water. I'm exposing myself to sunlight.

And I'm doing exercise and I'm doing breath holds on the same activity. Well, that's impressive already. Everybody should pick up surfing. Indeed. And there's more actually there too.

But this outside the scope of this talk. But I'm also getting light in my eyes, setting my circadian rhythm, which has an impact on mitochondrial function and many neurotransmitters and hormones.

And I'm playing I'm having fun, which is also something that's important for energy. So but yeah, you can find ways of, of stacking these together. So for example, let's say you want to get a tub to do to do cold baths as an example.

Well, you can pair that with breathing exercises. I wouldn't say submerge your head if you're doing breath holds in water. I don't want to recommend that because there's an inherent danger in that.

But just as an example, you can do that. You can do you can pair them together in the sense of like breath holds for 10 minutes, then get in your ice tub while you're outdoors, getting light in your eyes, for example, or getting sun

on your skin, if it's maybe it's cluster in the middle of the day and then you're getting some of those wavelengths of sun, maybe you're in a fasted state, maybe you're doing another another way of doing breath holds another variation on the theme we can talk about.

It's actually pairing it with physical activity. So you can do breath holds, either in a stationary stage or sitting still or or laying laying still, or you can do them while moving or while exercising, and they create slightly different effects so they can be stacked together.

Is my point in a way that's more time efficient. And you can accomplish, let's say, three different types of hermetic stress, all in the span of 15 or 20 minutes.

I got a good stack. We were. So if you live in an urban area and you can have access to a health center or some kind of health spa, we have them in San Diego where they have cryo chambers, infrared saunas, red light therapy.

And so I would go in and I would cryo red light sauna. There you go. I'm done. Three hermetic processes all complete within a 40 minutes and on with my day exactly as I do it.

Yeah, that's the way to do it. So, so yeah. So that's basically that's the ideal is we're looking at incorporating at least, let's say five or six of these categories of automatic stress built into our lives on an ongoing basis in a systematic way, where we are also paying attention to what is our personal dose that's appropriate for us, what's our Goldilocks zone, which differs dramatically between individuals, somebody with debilitating chronic fatigue syndrome might only be able to tolerate 2 minutes of of exercise before they're wiped out.

And somebody else might be able to tolerate hours of exercise in a given day. Right. I sometimes go surf for 2 hours. I might rock climb, I might lift weights all in the same day.

I might go ride bikes with my kids all in the same day. And, you know, I might do three or four exercise hours of exercise, either moderate to intense exercise in the same day.

My body can handle that because I've built up the capacity so individualizing that what does that look like? So somebody who is chronically ill or chronically fatigued has to start slow and start small.

You start with one type of formative stress and the types of automatic stress that I favor the most for people with chronic fatigue are breath holding intermittent hypoxia.

In other words, hypoxia is low oxygen levels in the blood. So by holding our breath, we are creating a transient, low oxygen state in our body and sauna.

So those are my two absolute favorites and part as I mentioned before, we're not exhausting our pool of energy in our body as we're doing it, but we're creating a really strong stimulus for adaptations now, breathing in particular.

So we could talk for an hour just on breathing alone. But as far as this hyperx wick training, breath, hold training, it's stimulating many, many different types of adaptations in our system.

And again, just I meant I mentioned with exercise there's this sort of unique fingerprint of adaptation, depending on what type of rheumatic stress you're doing and with breathing, you get a really unique, beneficial finger of adaptations that this type of hermetic stress is stimulating in different ways from other automatic stressors.

So one is that it's very cardiovasc ocular and pulmonary lung centric. So you know, it and research has actually shown this where stimulating structural changes in the interface between the alveoli, the little sacs of air's air in the lungs and where they meet the capillaries, the blood vessels.

And this is where gases are exchanged. This is where CO2 is dropped off in the lungs, where oxygen is dropped off into the blood, where it can then be delivered to the cells.

So that that's the actual physical interface between the lungs and the blood is changing to help facilitate more efficient gas exchange at that level, ultimately helping oxygen be delivered to your cells more efficiently.

In addition, it's doing the same thing at the interface of the capillaries and the cell to get more oxygen into the cells. And it's doing the same thing between the at the at the mitochondrial level.

We are stimulating structural adaptations in the mitochondria to themselves so that they can more efficiently consume oxygen and use it to produce energy.

At the same time, you're also bullet proofing your mitochondria against hypoxic states, against low oxygen state. So you're building up that internal air antioxidant response element so that that buffering capacity to deal with oxidative stress is now increased at the mitochondrial level.

So we're stimulating all of those things and we're building up the physical engine of our mitochondria. At the same time, there's research showing that this type of training can actually increase it.

It increases your work capacity so your capacity to do exercise even without doing exercise. But if you subject people to this type of breath, hold training, and then you have them do a pretest on a bicycle, on a stationary bike called an ERGOMETER in research.

And then you do like eight weeks of breath or training. Eight weeks later, they've increased their capacity, how long they can ride that bike for at a certain intensity by 27%, just by doing holds.

Well, now, in addition, it increases heart capacity. Blood flow capacity. How much blood the heart is pumping with each pump by about 15%, and it increases lung capacity by 40% in untrained people.

So if you take untrained people, you subject them to breath, hold practices, you get these massive alterations, adaptations in many different layers of the body from your heart to your lungs to your mitochondria.

And all of them are profoundly beneficial for helping your body produce more energy and have more stamina. This is such supportive information. I mean, I feel like you could be doing breath hold while you're sitting, working at your desk, even if you had to stack, you know, your day that way.

Like, okay, I've got these hours and hours of work to do it. I'm going to be sitting here. I can do breathing exercises. Anybody can do it. That's an amazing thing.

Absolutely. And it's free. Yeah, I love free love. You can you can for for for the record, you can do hot and cold for free. Two showers, cold showers, ocean lakes.

Yeah, you can't. You'll be. Yeah. I mean, at a certain point you need to get the temperatures right to get in that Goldilocks zone, you know. So initially if somebody is untrained and if somebody not had any exposure to automatic stressors in many, many years, then very mild, gentle states of cold, gentle states of heat, gentle states of exercise, gentle breath holding.

Things like that will all provide an adequate stimulus. But the more that you regularly engage in these practices, the more that you will have to get dialed in with the right dosage to push you into discomfort and challenger mitochondria to grow stronger.

So good, so good. There's another way to level things up even further. I briefly mentioned this earlier, which is you can start to combine breath, hold practices with physical movement.

It doesn't need to be really aggressive exercise because then you won't be able to hold your breath for more than five or 10 seconds. But if you start playing with low to moderate states of intensity on physical movement, this could be things like yoga, or it could be other mobility practices.

It could be walking, it could be I don't recommend swimming by virtue of breath holding and water. Don't mix well as far as risk unless somebody is watching you and other low intensity states of exercise and you start to combine them together, you know, now someone like me in my maximal breath, all time stationary might be three and a half minutes, but if I combine it with moderate intensity activity, maybe I can only hold for 20 to 40 seconds.

And that is giving a different stimulus and a unique stimulus actually to the working muscles. So, for example, if I'm walking uphill, I'm stimulating certain muscles to work hard doing that.

Or if I'm on my surfboard and I'm swimming, I'm stimulating my paddling muscles and you can literally feel it. You can feel those muscles go into the hypoxic state where they go into this low oxygen state and they start you can feel them burning as a result of being deprived of of oxygen.

You can feel that that lactic acid production. And and that, too, is another method of training. It's actually been tested in numerous studies, for example, in Elite swimmers, where they either have the swimmers do the standard swimming program or the swimming the same swimming program, but combined with breath holds and they find many different, unique adaptations.

When you integrate the breath holds into the training, you increase lactate threshold and you you actually improve your times as a result of increasing your lactate threshold beyond what the people who did the standard training program without the breathless.

So yeah, many, many different variety of ways that you can approach this and get unique benefits with it. I'm laughing right now inside because I'm feeling really good about myself right now because every physical trainer I've ever worked with or every exercise class I've ever gone to, I constantly get told from the trainer or the facilitator, Laura, breathe.

You're not breathing. You're holding your breath. And I think I'm a natural breath holder when I'm working out. And now I'm thinking, Well, that was helping me.

Well, yeah, that's somewhat of a different thing. You know, there's also something called I think it's called email apnea. Yeah, yeah. Some people just working at their at their desk on a computer will have a tendency to sometimes hold their breath.

I do that. I do. Fortunately, it's not quite the same thing. You're not you're not going to get the same kind of action by doing it throughout the day.

And like not breathing properly, you're actually just all you're really doing is just kind of putting your your physiology into a chronic stress. Okay. So this brings up a point.

There is a technique and there is a proper way to do this and a way not to do this where in the last moments of this interview, I want to bring us back to one thing.

Just we have a closed loop on this. And it was that comment that I asked about antioxidants. If you can give us the Cliff Notes version of if it's okay for people to keep taking their vitamin C and Vitamin K and those antioxidants where we just kind of left that little thing dangling there.

Okay. Well, promise me you'll ask me one more question after this, because I would love to give you a really emphatic answer. But the truth is, this is a very complex and nuanced area.

And I people might be disappointed in my answer. It's complex in the sense that many of these different compounds, which are labeled antioxidants, some of them don't even function in vivo, they function in vitro in a petri dish as as antioxidants.

Some of them don't function as antioxidants in the human body. Some of them actually function as pro oxidants. For example, I mentioned this category of zino were means phytochemicals, things like egcg from from turmeric,

epi catechin, curcumin, sulforaphane many, many compounds like that, resveratrol, things like that.

Many of these things are commonly referred to as antioxidants, but in vivo they actually function as pro oxidants as more medic stressors. They stimulate hair, medic pathways and for that reason, some of these compounds are called exercise medics because they literally stimulate some of these same or medic pathways as exercise.

So, you know, the first part of the answer is that many people who think of certain compounds as antioxidants, they're just simply wrong. And those compounds aren't actually antioxidant.

But some things are true. Antioxidants probably the most well established, of which is something like taking glue to thiamin, taking Vitamin E, for example.

However, there is a proper range, there's a proper dosage. And going back to when we were talking about this earlier in the discussion, one of the things that I was emphasizing is that this paradigm of oxidants, bad antioxidants, good is is simply wrong.

It's way overly simplistic. And as I illustrated that when I gave you the example of using antioxidant supplements, pairing it with exercise as a romantic stressor, and by taking those antioxidant supplements, you're actually doing something that's counterproductive in that context.

So one piece of advice that I have for people is don't take any antioxidant supplements, whether it's vitamin E, C or any, include a thigh bone and a C and Coke.

You ten any other antioxidant supplements that could feasibly be in that category? Don't use them within 2 hours of doing hermetic stressors. Okay. Okay. That is a huge tip.

And 2 hours is my some logical speculation. This hasn't been tested precisely yet in the research where they've gone, you know, they tested 15 minutes versus half an hour versus an hour versus 3 hours.

We don't have that research yet, but 2 hours is a rough estimation of the time I think is necessary for the automatic stress to stimulate the adaptation and get that effect without negating it by by taking the antioxidants. So and then and then keep in mind that what I said earlier, that that building up your internal antioxidant defense system is actually much more than using external antioxidant supplements.

So yes, there's a time and a place where it may be appropriate in certain contexts. Somebody has got an infection, acute or chronic, somebody has got mold illness, and it sapped their internal antioxidant reserves things, things of that nature, chronic, complex illness.

There's absolutely an appropriate context where one might want to use many different types of exogenous antioxidants. But in the healthy state, it's much more important to build up your your internal antioxidant defense system than to chronically be popping antioxidant pills.

That was a perfect answer, I think. You. Okay, so one more question as we wrap up here. You know, there's an entire summit for people to watch. There's a lot experts on here.

And, you know, there's a lot of incredible information. Can you leave our viewers with some hope and and some words of wisdom from you and then finally tell us where we can find all your other work.

Yeah. You know, I mentioned briefly that this process of atrophy of the mitochondria is similar to muscle atrophy. When we break a bone, you get a cast on.

Eight weeks later, you get the cast off and you look down at your arm and it's half the size as the other one. Those muscles shrank in just a few weeks from being from not being used.

And the same process is happening at the mitochondrial level. But the good news is, just as a few weeks of using

those muscles, after you get the cast off causes them to rebuild and go back to normal.

The same thing can happen internally at the mitochondrial level, and that is a function of the degree to which you integrate. These were medic stressors in your life.

Thanks, Ari. Thank you again for always. Just being here steady and strong, teaching us all about energy and mitochondria. Thanks so much for having me. It's absolutely a pleasure.

You take good care now. Bye.