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Introduction and Guest Background

– Hello and welcome to this episode of the Environmental Toxicants Autoimmunity and Chronic Diseases Summit. I'm Dr. Wendie Trubow, your host today. And I'm super excited this about everyone.

I'm super excited to be interviewing Ari Whitten today. Ari is a natural health expert who focuses on taking an evidence based approach to human energy optimization. Through his work with many of the top scientists and physicians, he developed a world class program on the science of overcoming fatigue and increasing energy. And he developed this program called the Energy Blueprint, which has transformed over 10,000 people's lives.

He's also the best selling author of the Ultimate Guide to Red Light Therapy along with a number of other books. So he's super accomplished. I'm wicked excited. I can say that cause I'm from Boston.

I'm wicked excited to have you here today. Ari, thank you for joining the show. – Thanks so much for having me, Wendie. It's a pleasure. – So great. So we're going to talk about resilience and stress and how do we make ourselves more resilient?

But first tell me, how did you get into this? Is it personal? – Yeah, it's deeply personal. Well, you know, health science has been my lifelong passion. So this has been something for me that I've been studying since I was 12 years old. – Why, what, what, what drew you into it? – Typical teenage boy stuff.

When I was young, I was interested in biceps and abs and you know, having a good body to get girls. I was an athlete, I was a soccer player and a martial artist. So I was interested in athletic performance.

So my world was very much centered around body composition, fat loss, muscle gain, fitness, athletic performance. And you know, that, that was a big focus of mine for many years.

I was an aspiring bodybuilder. My older brother was a bodybuilder and a personal trainer. He was being mentored by a professional bodybuilder. So I was kind of growing up, you know, little brother wanting to be like big brother athlete, you know, all that kind of stuff. I went on to do a degree in um in kinesiology and exercise science. I went on to do another degree, a masters of science and human nutrition and functional medicine.

And I went on to, prior to the, prior to that, I went on to do all up to become a personal trainer and a nutrition coach and all these kinds of things.

And so I was doing all that. And then in my mid twenties, I got very sick with mononucleosis from Epstein Barr virus. And, you know, there was an acute illness period that was, that was pretty awful and debilitating. I had two big golf balls of pus in the back of my throat. That, that made it so painful to eat food that I was living off broth for several weeks. I lost like £40 of muscle in the span of about a month. And, but the worst part was that I was left with chronic fatigue for about a year after that.

And that really rocked my world coming from being always healthy and super fit and an athlete and kind of the paragon of fitness and health for most of my life prior to that.

And I was having tons of energy and taking it for granted and all of a sudden it was taken away from me. And then I went to see lots of conventional doctors who basically have nothing to offer people with chronic fatigue.

We can, we can talk details of that if you want. – Were you depressed? Ari were they like you're just depressed for some medicine? – In my case, they didn't really say anything but certainly lots of people I think especially women get that. And then I saw a lot of alternative natural health practitioners and functional medicine doctors.

And for the most part, they were kind of obsessed with this model of adrenal fatigue. And um even though they tested me and my cortisol levels were perfectly normal.

They still tried to diagnose me with adrenal fatigue. And there I spent a lot of time on that. I spent about a year of my life actually just looking into the literature on that topic alone.

Personal Health Crisis and Chronic Fatigue

I think I've probably looked at more research on that topic than maybe all but a handful of people on the planet. And suffice it to say the research doesn't support the notion of adrenal fatigue and, and it certainly doesn't support the idea that it's present in the vast majority of people with chronic fatigue.

So I came out of that years of kind of trying to be helped with the realization that nobody seems to really understand what actually regulates human energy levels and why some people are fatigued and how to get your energy back.

And So at that point, I was, you know, 13 plus years into studying health science and nutrition and lifestyle and exercise physiology and all these things and natural health more broadly from an evolutionary perspective and ancestral lens.

And I thought, well, you know, maybe I could, you know, devote my energy and focus my, this sort of lifelong passion and obsessional energy focus of mine too of on health science instead of body composition and fat loss and muscle gain and athletic performance, maybe I'll shift it to energy.

And so that process kind of happened naturally and being sick with mono was the catalyst for that. And that's really what I've been doing for the last 10 years. And I can tell you a lot about what's happened in the last 10 years, but suffice it to say, the last decade of my life has gone to building out a scientific framework for understanding what controls and regulates human energy levels.

And how do we go from chronic fatigue to high energy levels or how do we go from normal to extraordinary energy levels? – I'm much more interest and how do we go from normal to extraordinary. But I know that there's a lot of this is the Auto Immunity and Chronic Diseases Summit. And so there's a lot of people on that spectrum of maybe not normal to extraordinary, but just really would like to be able to get through a day without needing a nap and without feeling as though they're just pushing through.

So, it sounds like certainly for you, there was an inciting event, like there was something that just triggered you and, and put you from healthy to unhealthy. Have you found essentially that there's often an inciting event for people? – Certainly. Yeah. And in my case, what was able to do that with a healthy robust fit guy in his mid twenties was a mix of a few things. I was living in Israel at the time, I was working on what's called the Kibbutz uh communal farm.

I was doing extremely hard manual labor as my job working in the, on a fish farm actually. And I had a job. It was the, it was called in Hebrew, the wilderness crew.

And it was, um, it was a lot of, like, real badass guys who were former Special forces and, you know, these were my coworkers and bosses and, um, and they were no nonsense, extremely hardworking, like, real tough badass guys. And that job was known as the most difficult job on the whole, on the whole kibbutz.

And it was very difficult. And in addition to that, I was doing tons of exercise apart from all that, you know, six or seven hours a day of hard manual labor, often in like 100 10 degree heat.

So I was trying to do tons of exercise. I was playing sports and then the worst, what really did it was, um, I was kind of also living a party lifestyle and probably sleeping four hours a night and sleeping in a room infested with mold and so, like burning the candles at both ends, you know, I could always deal with that extreme level of physical activity, but when I started to not sleep and when I started to sleep in a toxic environment and then all it took was then getting exposed to Epstein Barr virus.

And unfortunately, I was one of the unlucky segment of the population, the minority of the population that didn't get exposed to it as a kid where it manifests as a common cold. When you get it at older ages.

As a young adult, it manifests often much more extremely as mononucleosis. So yeah, the combination of all those variables was able to take down a healthy fit guy in his mid twenties and – That's a perfect storm.

Truly. A perfect storm. You didn't talk about food. What was your, what was your eating? What did you eat like at that point? – Well, in general, I would say I was health conscious.

However, I had some very, I had some very bad habits and like and bad belief systems that were the result of following the bodybuilding industry in particular, consuming huge amounts of sugar before and after exercise.

And based on the belief that um it's really important for muscle building to spike insulin as much as possible. So that was a belief in that community for a long time.

It is still quite prevalent actually. But it was common for people to consume 75 to 100 g of just pure sugar in liquid form before during and after work out. So, you know, I was out doing tons of hard manual labor and then I'd go to the cafeteria and I would get, I would fill up on tons of sugary drinks thinking of course that I was doing a good thing for my body by helping to support muscle building in response to all that exercise.

I now of course, know much better that what I was doing was, was not very smart. And harmed my health probably quite a bit and depressed immune function. So, yeah, I would say that I was eating a lot of protein but still, you know, not, not a particularly healthy diet by what I now understand to be a healthy diet. – So, really the imperfect storm.

Okay. So this, you're in your mid20s, this sets you off on this whole exploration and you get two ways to fix chronic fatigue. So I guess the first question is, are there any other major things? Well, obviously, what else in addition to an inciting factors going to set someone down this path or is it always an inciting factor?

– Let me answer this in a broader way. And I'll tell a little bit more about my story from, from that point on and then this will answer your question in a sort of roundabout way. And then I'll set a context to help explain everything else. So, 10 years ago when I started this journey of sort of devoting myself to, to building out a scientific framework of energy enhancement, I didn't have everything figured out, you know, but I did have a strong enough background in many aspects of nutrition, exercise physiology, you know, basic understanding of things like circadian rhythm and sleep and some idea about toxins and gut health and, and things like that. And psychological stress and I started to basically just go, well, I know sleep is related to energy when we sleep poor leave, you don't feel very energetic the next day. But what, what are the physiological mechanisms that underlie that?

And I know nutrition, you know, is related to energy. So what, but what are the physiological mechanisms that, that link nutrition to our energy levels?

Mitochondria, Energy, and the Cell Danger Response

And I would, and then exercise and I would, I would go into each one of those and I would spend three months or six months just reading literature trying to figure out how they're linked to energy. Energy is this very subjective thing that you can't take a blood test and measure energy levels.

Um So it's not something we have a lot of literature on and certainly not a lot of literature on the physiological mechanisms that mediate someone feeling a subjective sense of energy. So there was a lot of detective work, a lot of understanding of physiology and mechanisms to piece together an understanding of what's going on. And I spent years doing that with these different topics. Um just delving into the literature trying to figure things out how this whole energy thing works in the body.

And at the end of years, I had this list of like 150 mechanisms that were either directly or indirectly involved in energy, you know, everything from testosterone to thyroid hormone to melatonin, to cortisol, to um norepinephrine

and epinephrine to dopamine to a rexon, a wakefulness neurotransmitter in the brain to pathways like M tour and A M P K and you know, circadian rhythm related clock genes and, you know, all these and oxidative stress and insulin and like, you know, on and on and on all these layers.

Um And so I had a, you know, a lot of layers of mechanisms but not a clear coherent framework, like it's sort of analogous to if you look at a car, um we could say there's many, many different components and mechanisms of how that car works that are necessary for that car to function. So if you remove the spark plugs, the car is not gonna work. If you remove the pistons, the car is not gonna work. If you take off the wheels and the tires, it's not gonna work. If you remove fuel, it's not gonna work.

Um You know, and, and on and on and on, you could do that with 50 different things. Um But none of those things I just mentioned are actually the thing deciding Whether or not that car is at a standstill or whether it's driving down the road at 60 mph and so there's a difference between something that is necessary to get a car functional and is required for it to work versus what is actually regulating whether or not it's working and how well it's working in a similar way. What I had with the human body was a long list of all these different parts that were involved in energy production, but didn't necessarily regulate it.

So I was still interested in what, what is the most upstream thing? What is of all this 150 these 150 mechanisms? What is the thing or the things, let's say that are actually controlling, that are deciding whether or not the system of the body is going to be in a high energy state or low energy state.

And the big breakthrough came with the work of Dr. Robert Naviaux, who runs a lab for mitochondrial medicine. And he published a paper called the cell danger response about 10 years ago.

And that paper I think is one of the most important papers in medicine in the last 100 years. And it basically revolutionizes our understanding of mitochondria. These are these, these things that were all taught in high school and college and graduate school, biology and physiology courses. There, everybody remembers their, the powerhouse of the cell. But we're kind of, we're kind of taught to think of them as these sort of mindless energy generators that just take in carbs and fats and they pump out energy.

And in fact, the big revolution is that we've had from many, from studies from all over the world is the understanding that mitochondria actually have a second role beyond their role as energy generators.

They are danger sensors. They are these exquisitely sensitive environmental sensors like the canaries in the coal mine of our body that are constantly taking samples of what's going on in the body and asking the question, is it safe for us to produce energy?

And they, because they are the most sensitive thing and they are these, they're in charge of sensing the presence of danger. They are the most upstream thing that is regulating what is what the other responses are going to be. Hormonal responses, other biochemical pathways. Um And it turns out that these mitochondria can sense virtually every type of stress or imaginable.

Whether we're talking about poor nutrition, whether we're talking about sleep deprivation, circadian rhythm, disruption, toxin, exposure, toxic exposure, um poor gut health, you name it, um infections, physical injury, physical overtraining, they can sense all of these different types of stressors.

And when that stress load exceeds their capacity to handle the stress, they engage what Dr. Naviaux calls the cell danger response. And what that means is they turn down the dial on energy production and they shift the body's resources towards cellular defense to fend off the threat.

So it's sort of like if you were in your kitchen, preparing dinner, chopping vegetables and so on and, and a burglar walked in and put a gun to your head and said, you know, give me all your money.

It would, it would be a mistake. To just carry on doing what you're doing, chopping the vegetables, preparing dinner, you have to deal with that threat and, and mitochondria do that. They are in charge of sensing that and then

directing the body's response and the body's resources to handle that threat.

And as that role as those, those canaries in the coal mine, those danger sensors, they are the most upstream thing that is deciding whether or not you are in a high energy state. So your subjective state of energy is ultimately largely a reflection of whether your mitochondria are in energy mode or defense mode.

– So we were going to talk today about stress and resilience, but it really feels like if we're talking about environmental toxic and sought immunity, chronic disease, we really need to talk about mitochondria. – That's right.

And actually cellular resilience revolves around mitochondria. – So what upsets the mitochondria other than anything else other than what you mentioned or can you review it like? – Yeah, so there's two layers to this story.

Okay. One is the one I just explained, which is mitochondria are either going to operate an energy mode or defense mode to the extent that they are perceiving, they're either in a safe environment or to the to the degree that they are sensing that they are in a in a dangerous environment in a stressed environment or overly stressed environment. When that stress level exceeds their capacity to handle the stress load and maintain health and homeostasis.

They, they say okay, we're under a severe enough attack that we're going to turn down energy and shift the body's resources towards cellular defense. Dr. Naviaux calls mitochondria the central hub of the wheel of metabolism.

– What's so crazy? I'm sorry to interrupt you. But what's crazy about this is mitochondria are not part of us even though they are part of us, their symbiotic. So they, they work in conjunction with our system, but they're so now ingrained an integral in the process that we can't do without them and they run the show, but they're not actually part of us.

– Yeah, I mean, it, it becomes, becomes like a semantics issue at that point. But certainly they, you know, the theory is, of course, that they did not originate as part of us. They have their own D N A that is separate from our D N A. They have mitochondrial D N A.

And there's a number of characteristics of mitochondria that resembles sort of primitive propio bacteria. Um So the idea of course, evolutionary is that, you know, ancient, you carry a sort of um yeah, like alphago sanitized, you know, these, these ancient propio bacteria and then incorporated them and they formed a symbiotic, symbiotic relationship.

Sort of like maybe this won't resonate with a lot of people. I was very into marine biology and coral reefs when I was young and um like studying coral reefs, most of these corals, all these beautiful colors, these pinks, these purples blues, all these beautiful colors are actually from, not from the coral itself but from an algae that lives inside of the coral animal.

That is called Zoe's Santelli. And that algae is actually another organism, but it lives inside of the tissues of the coral. And they are, they have a mutually beneficial relationship. Xanthou performs uh photosynthesis from the energy of light and then provides energy and nutrition to the coral.

And so it's two organisms that literally exist inside one another. You know, we also this is not so hard to swallow. We have this microbiome, we actually have more bacteria living on.

And in us, we have more in terms of numbers than we do actually have our own human cells. So, um you know, we, we have, we were very much an ecosystem and mitochondria can be seen as part of that too. But you know, the old central dogma of biology was that D N A is the big boss, right? The nucleus of the cell has the D N A and it issues the orders about what the body's doing. And we now know that through um the science of epigenetic that environmental signals get translated by elements of the cell and then communicated back to the nucleus that influenced gene expression, what what genes are being expressed and therefore what proteins are being created.

And actually the mitochondria as these sensitive little danger sensors, environmental sensors are constantly in in

charge of signaling. This is a process called retrograde signaling signaling back to the nucleus of the cell and influencing what genes are being expressed. So the mitochondria are actually which as you pointed out are the almost these other organisms living inside of us are actually now communicating to our D N A about what genes should be expressed or turned off.

– So let's transition then to, to the things like stress that would cause the mitochondria to react in a way that we don't want them to react to essentially put you into danger mode instead of thriving mode. What, how bad does it need to be or is it all stress?

– Let me, let me add another wrinkle to this story. Okay. That that will make this even more fun and complex. It turns out that your mitochondria mitochondria also require stress to express optimal function. Okay. – Okay. Say more.

Tell me more. – Okay. So imagine. So our mitochondria are dynamic and they are in directly involved in handling the body, the stress load on the body. Okay. And if you, if you've ever broken a bone, if you've ever broken an arm or a leg, okay. And you've got a cast on and you, you put that cast on for eight weeks, eight weeks later, you go to the doctor, you get your cast on off, you look down at your leg and it's half the size of the other one.

It's half the size as it was eight weeks prior. Why? Because all that muscle atrophied as a result of not being stimulated and challenged, what challenges it use using it, challenging the muscle tissue, engaging those muscle tissue to handle a certain demand or stress load or mechanical load, whatever you want to frame it. Um But if you do not challenge that muscle tissue, if you don't stimulate it and use it and challenge it to do work.

It, atrophies shrinks it shrivels and dies off. Okay. The same exact process happens at the level of the mitochondria. And it turns out that humans are required to have a certain level of stress. Certain and particularly certain kinds of stressors are uniquely good at this, which we can call hore medic stressors.

And those stressors challenge our mitochondria and by challenging them and actually temporarily stressing them, temporarily causing an increase a spike in reactive oxygen species or free radicals or oxidants and even potentially creating a small amount of damage to them, they actually engage a response that makes them grow bigger and stronger and more robust and also increases their own what's called the A R E the antioxidant response element. And that's their own internal supply of critically important antioxidants and detoxification compounds.

Enzymes, okay. Things like glutathione and cattle A's and super oxide disputes. And it turns out that in order to keep the mitochondria big and strong and to maintain lots of them and to maintain that A R E the antioxidant response element, this internal antioxidant and defense detoxification system to maintain it in a robust way requires regular exposure to stressors to these hore medic stressors mainly things like physical exertion exercise, thermal stress, heat and cold, things like fasting or occasional food shortage, things like hypoxia, either from altitude or breath holding or combined with, with exercise. And certain kinds of chemicals, especially what are called Zeno hermetic phytochemicals.

These are certain compounds from plant foods, things like curcumin and resveratrol and taro still being and different flavonoids and polyphenols and um and, and a few other compounds and all of these compounds act in this Hormel thick fashion.

They temporarily stress the mitochondria by causing an increase in free radicals.

Hormetic Stress and Building Resilience

And in so doing at low doses, those, those um those stressors actually stimulate uh not only the mitochondria to adapt to handle that stress load, but they actually have a um a response that goes beyond that, they actually increase their capacity even beyond what's needed to handle that stress load, creating a buffer. And so this process is, is fundamentally where cellular resilience comes from. And, and, and we often think of resilience as this purely psychological phenomenon of, you know, what, what traits make somebody resilient or not. And you know, like this person went through this, this hard experience and they were very resilient, but there is actually a

physiological resilience that that um to a large extent, dictates how well our body can cope with everything from psychological stress, to poor nutrition, to sleep deprivation to environmental toxicants.

And this what I just explained is the basis of that process. And if sorry, go ahead. – No. So I have, I want to want to recap it to make sure that it's crisp crystal clear one, the mitochondria thrive on things that stress it enough to make it reproduce and, and grow and you, it sounds like you also get a bank almost, you can bank it for times when you might need it.

Is, did I hear you properly? – To some extent, you could say that, but the time frame is really important because the effect is relatively short, live on the order of days, two weeks. – So the mitochondria are trainable to grow and expand and get more resilient and powerful, but that doesn't last.

So either you maintain it or it goes away and is there a limit to how much your mitochondria can continue to grow? Is it exponential or do you hit a peak performance where that's it? You don't get any more?

– Okay. So let me answer this with a few specific numbers and all I'll introduce the other. So the other. So layer one is basically the extent to which your stress load, toxic load is exceeding your mitochondrial capacity to handle that stress load. And if it, if it exceeds it, they're going to operate more in defense mode than energy mode, they're gonna turn down the dial in energy production.

So your energy is largely a reflection of that. The second layer which I've kind of alluded to in which your question gets at is not what our mitochondria doing.

Are they in energy mode or defense mode? But what is the status of mitochondria in your cells? Meaning how many of them do you have? How big and strong are they? Okay. Do you have a leg muscle that's weak and atrophied from eight weeks of disuse and being in a cast or do you have a big strong leg muscle that is built up and has high strength and fitness and endurance because it's been challenged in a robust way.

Now, some specific numbers, We have a number of lines of data that show that on average, most humans lose about 10% of their mitochondrial capacity with age, maybe doesn't sound 10% with each decade of life.

Excuse me, it maybe doesn't sound like that much. But here's another way of stating that the, the average 70 year old has lost 75% of their mitochondrial capacity. Okay. This is like going from a Ferrari engine in your cells to a moped engine. And that fact doesn't only relate to how much energy you can produce, but it, it does relate to that in a massive way of course, but that fact of how big and strong that cellular energy that cellular engine is and how much energy it can produce is also a huge determinant of your resilience and your capacity to handle stress.

– So, I mean, the thing that's so striking is as your mitochondrial amount and numbers go down, you're also accumulating environmental toxins. You know, it's almost like the, this is the, the point, the data point at which they intersect because that's when you start to have disease because your mitochondria can't handle it, but you continue to be exposed and you don't have the resources to deal with it.

– That's right. That's right. So a couple of little other numbers I'll add to this one is people might be thinking, you know, that, that really sucks that we lose so much of our mitochondrial capacity with, with age. That aging does that to us.

But in fact, it's actually not the aging process per se. This is not a normal natural process that results from aging. And we know that because when we look at seven year olds who are lifelong exercisers, they have the same mitochondrial capacity as young adults do, they do not lose 75% of their mitochondrial capacity.

We also know um there's an exercise physiologist named Inigo San Milan who he studies a few different populations in his lab. He studies different kinds of athletes and with an emphasis on endurance athletes.

And he studies the what he terms as the opposite end of the spectrum of metabolic health, which are obese diabetics. Okay. So what does the metabolism and the mitochondrial function look like of an obese diabetic?

What does the metabolism, mitochondrial function look like of an endurance athlete? He frames these as one is the optimum optimal metabolism that we should all strive for.

One is a dysfunctional metabolism and these are sort of the ends of the extreme. Now, the ends of the extreme ends of the spectrum. Now, Um one of the striking things that comes out of his work is that those endurance athletes have 300-400% more mitochondria per cell in their muscles. Okay, then the obese diabetics.

So I wanted to give these specific numbers so people can get a sense of this and, and this actually is one of the big problems with what's going on right now in the natural health and the functional medicine community. As more people are sort of waking up to the importance of mitochondria and more people are talking about it.

You still have the vast majority of people operating in a paradigm that's sort of like, we'll run a, you know, an organic acids panel or some other tests to try to assess mitochondrial function. And you know, then we'll identify, you need to take B vitamins, you need to take a little l carnitine, you need to take CO Q 10 some D ribose, you know, things like that.

But taking all those mitochondrial supplements while it can correct nutrient deficiencies and help the mitochondria function better. Doesn't take you from a moped engine in yourselves to a Ferrari engine, it doesn't actually rebuild the engine. And that, that is fundamentally, uh that's a process that can only be accomplished through exposure to Hormel thick stress and by rebuilding our mitochondria back into a more youthful state where we're building bigger, stronger mitochondria and we're building more of them. We and we are in, in.

So doing these for medic stressors also interact with this antioxidant response element and build that internal antioxidant and detoxification system more robust.

And by, by doing all of those, that is how we increase resilience at the cellular level. – I'm so glad you gave a message of hope and possibility because I was going to be very upset.

If you said that's it, you're done, you cannot rebuild yourself, but it sounds like you can. So be specific with me when you talk about hermetic stress or you're saying if you're currently sedentary, go for a walk or are you saying like, how does it look like? And is there too much of a good thing?

So can you obviously you can put too much traumatic stress on the system and then the mitochondria experience its danger? So where's the line? – Yeah, great question.

It turns out that and then this might be hard to believe. I don't know how much you've delved into this research, but almost everything can actually be beneficial in low doses. There's certainly some exceptions to this.

But there's lots of research on, for example, ionizing radiation exposure or even certain heavy metals like arsenic or cadmium in very low doses, actually promoting lifespan extension. Most of that research is, of course, in animal models where they can test things in a precise way, but the effects are consistent, very, very consistent across many different organisms.

Now, of course, when you're using stuff like that, that is very toxic. The the the goldilocks zone, the dozing range where you have a safe level that will provide benefits versus uh getting into the range where it just becomes very toxic and damaging is very, very tight and very hard to precisely mitigate. And we don't even have the human research to be able to direct any sort of dozing guidance on that front.

– Alright. Just need to jump in. Don't try that at home. Okay. That's not the thing to experiment with because that's not, that doesn't fall in like you can't hurt yourself wrong.

So talk to me about the stuff that most people would encounter on their daily life. – So the principle is what I'm getting at here and, and, and there's what's called the biphasic dose response to this.

And what that means is if you don't do any, there is no benefit. If you do some, there is a benefit. And if you do a lot

more, you might completely negate the benefits and just cause harm.

And that is even true of things like exercise. It's true of sun exposure. It's true of every type of harmonic stress. Um where you know, it look, some exercise is amazing for you. And it's one of the best ways to increase your energy, increase your mitochondrial health, improve your longevity, resistance to disease. So many benefits throughout the body.

But if you go start, you know, running ultra endurance races, 100 mile races, frequently, you, you, you're going to massively exceed the optimal dose NG range, the goldilocks zone where you're getting mostly benefits and you will start creating mostly harm. And that's why there's so many of those athletes who cause calcification of the arteries die from heart attacks and things like that. So even with exercise, which is a harmonic stressor that humans are extremely well adapted to, which has a massive goldilocks zone where you know that, that it's hard to overdo it, it's hard to like do so much of it that you just create harm because your body will, you know, if you're unfit, your, you will have a low capacity for, for doing exercise.

Unless you, you, you're a freak of nature in terms of your mental fortitude to just force yourself to do something that's unbelievably painful and just push your body into the ground when your body's said no, a long time ago, you know, for the most part, it's sort of self regulating. You, you will, your body will kind of start to give you signals that you're doing too much.

And all of that is, of course, very personal. Everybody has a different threshold if somebody is totally unfit, Running five miles is way too much lifting, you know, £300 on the bench press is really excessive.

Maybe they start with a five minute walk, right. So that goldilocks zone is changes according to the individual and even within an individual, it changes over time, it's highly dynamic and as they do more, they condition their body to handle more and then the the optimal dose to stimulate greater benefits increases.

But of course, you can do too much of anything. Now to the point of, you know, this, this research looking at different kinds of poisons and radiation and things like that. There's people who even will use like snake venom, snake venom or bee venom and, and things like that.

And these are all forms of harmonic stress. Bee venom actually has quite a bit of research to support it. But what we want, we can think of every type of hermetic stressor as having its own unique sort of profile of potential benefits and potential for harm. And what we want is to engage with your medic stressors that have a very high potential for benefit and very low potential for harm.

So, not a good idea to go play with heavy metals and ionizing radiation and radioactive materials and, and mercury and, and, and things of that nature and pesticides.

There's even research on low doses of pesticides and things like that. We, we don't want to start playing with those kinds of things, but exercise, breath, holding sauna exposure, cold baths, fasting Zeno hermetic phytochemicals. You know, these are all amazing tools that we can start playing with to get these different kinds of for medic benefits in a very robust way with very little risk of creating the kinds of massive harms that are present with things like radioactive materials and heavy metals.

– So how often are you talking about exercise and how is there a duration? That's the magic number or the minimum viable product? – Yeah, there certainly is. But again, it depends on the individual.

So the optimal dose for somebody who's been sedentary for the last 20 years is very different from my optimal dose. I do many hours a week of, of surfing and rock climbing and weightlifting, and jogging and tennis and, you know, all kinds of things. And you know, so that, and then there are other people who are fit, you know, we're running 20 miles is no big deal for them, you know, whereas that would be brutally hard for me.

I'm not conditioned for that particular type of activity in that, that length of time. So we have to find a dosage. That's right for us at our given level of fitness.

Now, having said that there are some guidelines of how to optimize the structure of your exercise routine. One, there was one phd thesis done by a guy named Nicholas Islander where he looked at the many different, they did like five or six studies that were part of this thesis and they examined different questions related to the types of exercise that would still maximally stimulate mitochondrial biogenesis.

And they did it in both untrained people and highly trained people like endurance athletes. And the very, very short version of this, I'm not doing quite doing it justice, but an oversimplified version of this is in untrained people who are not used to doing exercise. Basically, any type of exercise will stimulate robust adaptations at the level of mitochondria in people who are already highly trained. We, we see that more endurance exercise and high intensity interval training stimulates more adaptations at the mitochondrial level.

Now, thanks to the work of that exercise physiologist I mentioned before, Inigo San Millan, he's really figured out that something called zone two cardio, which is Um a function of the intensity level of that, that activity. And zone two is a reference to certain heart rate zones.

Exercise Zones and Mitochondrial Adaptation

And this corresponds to basically the it corresponds to how should I phrase this the the highest level of intensity that your body can handle while still staying in predominantly a fat burning state before it switches to mostly a car burning state. So at higher levels of intensity, the body switches over to energy systems that burn predominantly carbs rather than fat.

So this is the highest level of intensity right before that switch happens. And um It corresponds to roughly in the neighborhood, depending on your age, your maximum heart rate, your fitness level in the neighborhood of about 122, let's say 150 beats per minute. Um depending on the person and it's about 60 to 70% of your max heart rate. Your max heart rate can be found by roughly an estimation of it can be found by taking the number 220 subtracting your age.

So if you're 40 years old, you'd arrive at 1 80 then you would take 60 to 70% of that zone to cardio. So being in that heart rate zone is where you and doing exercise in that heart rate zone for prolonged period of times prolonged period of time while staying there um is where we see maximal adaptations of the mitochondria in terms of building bigger, stronger mitochondria and stimulating mitochondrial biogenesis.

And, and the most robust increases in this internal antioxidant defense system. The A R E. So we ideally for, for health longevity for increasing cellular resilience, we ideally want to spend at least about two hours per week in that heart rate zone.

– That doesn't seem like very much when you really sort of drill into it. – Yeah. So like I, I spend more like five or six in that heart rate zone. So at least two hours and that can be divided into, let's say, 20 minutes a day, you know, 20 to 30 minutes done several times, let's say five times a week, which is not very much.

Now, in addition to that, I would also recommend incorporating other types of exercise, um particularly some resistance exercise and some bit of high intensity interval training at least once or twice a week done for at least five or 10 minutes.

So when you have a structure like that, you know, let's say five days a week of zone two cardio, 3 to 5 times a week, you could say, um 3 to 43 to five times a week of resistance exercise. These things can be of course paired together.

Um and then 1 to 2 times a week of a quick bout of high intensity interval training. Um And, and when you have a blueprint like that, that's how you're going to sort of create the most the largest improvements and all the adaptations that will help with resistance to disease, mitochondrial adaptations and longevity.

– And how long till people start to notice an improvement in either their energy or their ability to tolerate more exercise. What's that runway for people?

– Oh, pretty quick within a couple of weeks. For sure. You know, the body, the body is a highly adaptive machine. Just, just think about um you know, the example of that, the, that muscle atrophy in the cast, you know, your leg shrinks to half the size in eight weeks. That's how dynamic our, our system is, our body as a system, it is constantly adapting to the environment it's being exposed to and the demands placed on it or lack of demands placed on it.

If you don't expose your body to hermetic stress, the mitochondria shrink, the muscles shrink, right and, and all those systems go away just as fast. And if you do expose your body to those things in a systematic way and the appropriate dose, then you start to see very quick robust increases in these systems.

There was a study. Um Let me see if I can find the name of this particular drug. Um its a chemotherapy drug Doxil, a Ruby Sison. Okay. And it, it has a well known cardio toxicity.

So um it's, it's toxic to the heart cells. And within a single dose, you can see these very significant decreases in blood pressure and the amount of blood being pumped from the heart. That's how, how toxic this drug is.

Um And it was, it was established that doing exercise regularly um protects against the um that the toxicity, the cardio toxicity of this drug. So literally, but through the mechanisms that I described, right, you're building up that internal A R E of the mitochondria and they can now detoxify this chemical and prevent the damage from occurring.

And um that effect, they wanted to see if it also holds up acutely. Meaning if is this just an effect that takes months and months of regular exercise to build up or will, what will one single bout of exercise too? And they actually found that doing one bout of exercise was enough to completely negate the cardio toxicity of this drug.

So that's, that's how quick these effects happen. There's a number of other um studies like this, they call it preconditioning hore Medic preconditioning. And so, for example, um there's a number of studies where they expose the body, the blood to low oxygen states prior to going into a heart surgery and they find that the heart, uh that survival rates are increased from that heart surgery and that people recover faster with what's called ischemic or hypoxic preconditioning. So, one little bout of hore medic stress in this way, um is enough to create very quickly uh an increased resilience at the cellular level that allows you to handle whether it's chemical exposure, a toxin exposure or surgery, you know, physical trauma.

So yeah, the effects start happening very quickly. – It's amazing. All right, like I just think about all these ways that we can support the system. You know, as you were talking, I was thinking, you know, hyperbaric oxygen and sauna and I think Red Light therapy also helps with the mitochondria. I mean, you wrote a book on this, right. – Red Light therapy also acts through hermetic mechanism. So does UV. – Yeah.

So is there anything I didn't ask you about that? Would that would round this out and make it like, oh, I didn't talk about that. You, we should add that in.

– I think if I can offer an analogy, um, you know, just to help people picture what I'm talking about. Well, you know, actually, yeah, there's, there's so a couple of things, let me complete the thought that I just started there and then there's one more thing I'll add.

If we think of so to offer this analogy, um, let's imagine that, you know, there's were physically together right now. There's a building on fire next to us.

You know, is it easier for me to go by myself and try to put that fire out or with your help? Right. Certainly. Going to be easier with your help if we're working together. Is it easier if it's just us two or if we have 10 other people helping us? Right?

Like, and so this is fundamentally the task of mitochondria in how they are being, um, how they, how they have to answer to stress and it doesn't matter whether we're talking about poor nutrition or sleep deprivation or psychological stress or environmental toxicants exposure, there's an increased demand placed on the mitochondria to handle that stress load. And if those mitochondria are weak and debilitated and there's only very few of them, they're not going to handle that stress in a, in a good way and their, their threshold, their capacity to handle that

stress, what I call the resilience threshold is much lower.

Okay, as compared with, if they have lots of their buddies to help respond to that threat, The stress load on each individual Mitochondria is much lower in the same way that me and you have much less stress load, much less total work to do to put out that fire.

If we've got 10 people helping us, they said this 200 years ago, many hands make light work. That's exactly right. That's exactly right. So we have to understand that this, that fact directly relates to the resilience threshold to the capacity, our physical resilience capacity at the cellular level.

And what that means is, um two people can have, can be exposed to the same stress load. Let's say it's an exposure to a small amount of chemical toxin, environmental toxicants. One person might be debilitated by it and have extreme symptoms. The other person might be perfectly fine and not notice anything. And that is a difference of their physical cellular resilience and their mitochondrial capacity to handle stress load, which is largely a function of all the things I just went over.

So I want to just allow people to picture it in that way. Hopefully that's helpful. Now I'm forgetting the other thing I wanted to add, but maybe we'll leave it there.

Mindset, Stress Perception, and Practical Takeaways

I remember now. Okay. Um Sorry. So, um the last thing I want to say is we have to understand that our mind interfaces with all of this as well. And actually, there's a whole field called um mitochondrial psycho biology. And we know that the mind directly interfaces with the mitochondria. Um And, and so perceived stress can actually directly affect mitochondrial function. And so it ties into this whole story.

We, we also know of course about the placebo effect and then we also need to be aware of the other side of it, which is the nocebo effect. And so we need to be aware of our belief systems about stress and stress ores.

Um As far as the harms they're creating, if you have a large exposure to, let's say arsenic, um Of course, there's a very real harm that's going to occur from that irrespective of anything that might be going on in your mind.

But if you have a belief that arsenic is highly, highly toxic and terrible for you, it's going to be even more harmful because of that belief – Is this the impact on what happens in your adrenals when you set off a cascade of stress and then you shut the system down or is this independent? – I don't, I doubt it could be reduced to the adrenals. Um, I don't know if anybody understands exactly how this nocebo effect is mediated, but there's a famous study that, that took place with about 30,000 people in the US and they tracked their stress level and then they tracked their all cause mortality rate, um in relationship to that. And what they found is that um high levels of stress of perceived stress were related to a very significant increase in overall mortality.

And this is like, this is not asking people, what is your, what are your hermetic stress habits look like? Like what, how often do you exercise or how often you do sun exposure?

This is asking people, how stressed are you, how stressed do you feel? Do you feel like you're chronically mostly psychologically stressed from work from relationships from financial stress, those kinds of things?

And what they found is that the people who were highly, highly stressed had the highest stress load had about a 43% increase in all cause mortality relative to the people who reported virtually no stress. Okay. But the effect was only present when people also believed that stress was very harmful to their health.

And in the group that had, that also reported very high levels of stress but did not have a belief that stress was very harmful to them. They actually had lower 17% lower rates of all cause mortality relative to the group that reported almost no stress.

Okay. So we need to understand that our mind is a very powerful thing and that it's interfacing with the stress. So

we have the actual physiological stressors, sort of the true effect of just purely what's being mediated biologically. And then we have our minds and our belief systems that are interfacing with this. So we, we have to do this very complicated thing of being aware of things that genuinely are harmful to our body. Like for example, many environmental toxicants and working to lower our exposure to those things while also trying to operate our mind in a way that's conducive to that, that doesn't add fuel to the fire, so to speak, that doesn't amplify the harms that are, that are being done and hopefully to use our mind in a way that um actually makes us healthier and more resilient and we can if we reframe stress and hopefully this, this talk of hore medic stress has allowed people to do that.

Um by seeing that many types of stress are actually healthful and create increased resilience, increased resistance to disease um and make our mitochondria more robust.

And so if we change our relationship to stress as far as our belief systems and how we operate our mind, um I think that would be also massively beneficial for us.

So that's the last thing I'll say. – I'm really glad you brought that up because at one point while you were talking, I was thinking about as you expect to age, you do things differently because you think, oh, well, I'm older.

So older people don't do that, but then you don't do it as much and you get weaker. And so even just changing the brain and the expectation alters our ability to do things.

So that ties in it's not exactly what you were saying, but I'm glad you brought that up because, you know, I think I, I won't speak for you. I'll speak for myself. We work really hard to make a profound impact on the lives of others and in doing so that often leaves me less time to run, work out. Actually, I never look for time to run.

Honestly, I look for time to move my body and dance and walk. And so I sometimes think, oh jeez, you know, making this huge difference, but then I'm not taken care of.

And even that thought is worse than just saying, oh my goodness. Look what a great difference I can make and then I'll get to move when I can. You know, it's just the way we think about it makes a difference.

– I'll actually add one quick study on that front. Speaking to what you just said. There, there was a, I don't remember all the details of this but there was a study on, made home cleaners. I don't know what the proper term is for the – Housekeepers. – Housekeepers. Thank you.

And what they did was they trying to remember some details here. They basically had one group that they, they found a large portion of these, these, these people didn't think of their work as a form of exercise and they took one segment of housekeepers and basically, uh explained to them that they were doing uh physical work and that they were doing a form of physical exercise and that here's all the benefits of physical exercise. And then I think 12 weeks later, they measured all these different health parameters.

And the group that was educated on the fact that all the movement that they were doing was a form of physical activity of exercise, um showed reduced blood pressure, reduce, you know, improvements in insulin sensitivity, reduce cholesterol and, you know, a number of weight loss and all these other improvements in, in objective markers of health, whereas the other group didn't have any change.

And so again, you know, we can see our beliefs interact with us in a, in a profound way and we need to use that to our advantage. – Yeah, I think that's really powerful. I mean, all right. So what I want to say is you're a great teacher and you've presented all this in a beautiful way.

And now I know that people are gonna want to find you. How can they find you? What do you want them to go to? What can they follow you on? Tell people how to reach you?

– Yeah. So my websites, theenergyblueprint.com and I have a wonderful webinar that we can link to called breathing for energy. And it goes over a lot of work around breath, work and using breath holding as which is a type of hermetic stressor to increase, improve mitochondrial health, increase our energy levels and also reduce our

perceived stress.

So it's a wonderful tool and I have a lot of cool science to share on that. – Alright. That's awesome. Thank you. So, first off, thank you for being here.

This has been extremely educational and interesting, not just educational but presented in a beautiful way. So thank you and then to the listeners. Thank you for joining us for another episode of the Environmental Toxicants, Autoimmunity and Chronic Diseases Summit. I'm your host, Wendie Trubow, MD.

And our guest today is Ari Whitten who's just done a fantastic job of explaining mitochondria hermetic stress and the impact it has on longevity really.

So Ari, thank you for being here. – Thanks so much for having me, Wendie. It was a pleasure.