



Episode 245: Ari Whitten on Fighting Fatigue and Anxiety With Sauna, Hormesis, NRF2, & Sun Exposure

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Katie: Hello and welcome to "The Wellness Mama Podcast." I'm Katie from wellnessmama.com, and I'm here today with a much requested return guest. Ari Whitten is a best-selling author, a nutrition and lifestyle expert and the founder of The Energy Blueprint. And he's also a good friend of mine. He has been studying and teaching health science for over 20 years, he has a Bachelor of Science in kinesiology, and he recently also completed the coursework for his PhD in clinical psychology. For the last five years, he has teamed up with world-renowned scientists and physicians to develop The Energy Blueprint system which is a powerful evidence-based system for overcoming fatigue and increasing energy levels. It is amazing and you guys should check it out. We are gonna delve into that today along with some other topics. But, Ari, welcome and thanks for being here.

Ari: Yeah, thanks so much for having me, Katie. It's always a pleasure to hang out and talk to you.

Katie: Likewise. And you are one of the most popular guest of all time, so I figured it was past due time to have you back on and to have another conversation. And I love that there are so many topics that you can speak to. To start off, I'd love to touch on one that you and I talked about, last time we saw each other in person, which was sauna use. This is something, obviously, growing in popularity right now. Lots of research and things being written about it, I've seen a lot of articles on so many sites right now about saunas. And it's top of mind for me because I just got back from Finland where there are almost half as many saunas as people and it's very much a part of their culture. So to start off, I'd love to hear your take on what you see as the biggest benefits of saunas.

Ari: So yeah, it's a great question. And by the way, I saw your pictures from your trip to Finland, and it looked amazing. The place that you stayed in with the glass domes and looking at the Northern Lights, I've always wanted to go there.

Katie: It was incredible, yeah. It's on my list to go back, for sure.

Ari: Nice. Yeah, so saunas are a fascinating topic. I'm of the opinion that saunas are literally one of the most powerful medicines available to us. The way I like to sort of explain that is there are some studies that have looked at the association between sauna use and several different things. There's lots of things we can talk about. There's research on depression, there's research on neurodegenerative disease, cardiovascular disease, recovery from exercise, and fat loss, and, you know, all kinds of different topics, subtopics within there. But I'll just speak to a few studies.

So there's some studies where they've looked at the relationship between frequency and duration of sauna use and things like neurodegenerative disease, so the risk of dementia and Alzheimer's disease. And they've showed that, in people using the sauna 4 to 7 times a week, as opposed to 1 time a week, there is almost a 70% reduction in the risk of these neurodegenerative diseases, dementia and Alzheimer's disease. There's also similar research...and actually one more point I'll emphasize is that's comparing four to seven times a week of sauna used to one time a week, the difference would be even greater if they compared it to people not using a sauna at all. There's also research showing sauna used four to seven times a week, as compared to one time a week, dramatically reduces cardiovascular-disease mortality. Dramatically reduces it. So again, we're talking about 60 plus percent reductions in mortality risk from things like stroke and coronary-artery disease and other forms of heart disease.

They've even looked at studies...there's even research showing the reduction in risk of all-cause mortality, that is the potential to die from any cause is dramatically reduced by a huge amount. So, you know, if we had a visual for this, I'd like to show the actual screenshot from the study, but what it shows is a very direct correlation between, "Hey, if somebody's using the sauna two to three times a week, their reduction goes up this much. If they start using the sauna four to seven times a week, it goes up this much. If the average duration of sauna use is 10 minutes, they get this much benefit. If their average duration is 20 minutes, the benefit goes up tremendously. If it's 30 minutes, it goes up tremendously." So there's a very, very direct and strong correlation between the frequency and duration of your sauna use and your risk of, not only neurodegenerative disease, not only heart disease, but your risk of dying from basically anything goes down dramatically.

Now to sort of frame that, I'll say this. If there were a pharmaceutical drug created by a pharmaceutical company, just a drug, a pill that you could take every morning, that showed even half of those effects, like even half of those effects in terms of, "Hey, this pill not only reduces your risk of neurodegenerative disease massively, not only reduces your risk of cardiovascular disease massively, not only reduces your risk of dying of any cause massively but, hey, it also fights depression, it helps speed up your recovery, it boosts your mood, it has all of these other amazing benefits. Oh, it also increases detoxification and will literally cause your body to purge out accumulated heavy metals, and phthalates, and BPA, and all kinds of other nasty chemicals," if there were a pill that could do all of those things basically without side effects, your doctor would literally look at you like you're insane if you're not taking that pill. I mean, it would be the most successful drug in the history of the pharmaceutical industry and it would be prescribed to basically every person on the planet and you would be considered totally mentally unhealthy by your physician if you refused to take that drug. So hopefully, that gives people an idea of how strongly I feel about the benefits of sauna use.

Katie: Yeah, definitely. I'm curious because I've seen some of those studies as well, and definitely the frequency and duration seems to matter. Have you found any kind of gold standard for optimal case scenario? I know we're gonna get that question, like how much should a person use a sauna, how long? What would be the gold standard to aim for?

Ari: Yeah. That's a great question. And the answer is that it's totally individual at first. So, at first, it needs to be in proportion to the individual's tolerance for it. So this actually...let me sort of digress into another topic to frame what sauna use is actually doing. So a lot of people look at sauna use and just see the sweating aspect of it, and then, they say, "Hey, saunas are good because of detoxification." And that is true and there's research showing that the act sweating does indeed purge toxins from our body, our body literally pumps out things like lead, and mercury, and aluminum, and BPA. I mean there're studies where they've analyzed the sweat from people and they've found those substances, so just, you know, kind of wrap your head around the idea that your body can pump out those heavy metals through your sweat, which is a pretty amazing thing.

Now, I would say, the popular sort of thinking by a lot of people in the natural health space around saunas right now is that the benefits of sauna use revolve around that detoxification aspect. My personal opinion is I think that the detoxification aspect, while important, is probably less than maybe 30% of the overall benefits of sauna use. So then, the question is what's the other 70%, that I think is really important that I think not many other people are aware of or talking about? And that is hormesis. So hormesis is the concept of transient metabolic stressors that actually stimulate your body to make adaptations that, ultimately, confer health benefits, that ultimately make the system, your body, your cells, stronger and more resilient and more resistant to a broad range of other stressors and, ultimately, disease, more broadly. Now, we can talk about the cellular mechanisms of what's going on to actually do that but if that concept sounds like a weird idea to people listening, especially because we have this negative association with stress, so people are probably listening and they're confused as to how I'm talking about this beneficial metabolic stress. Well, exercise is actually a type of hormesis. Exercise is not intrinsically helpful, it is something that is actually toxic in large doses, and it is the reason that it actually is beneficial is by being very slightly toxic. So you create a very slight metabolic stress by subjecting your body to physical exercise and, in response to that, you actually get a very strong spike of free radicals or reactive oxygen species at the cellular level.

Now most people think of free radicals as bad, free radicals, or oxidants, or reactive oxygen species, that's all the same thing. The typical thinking on this is, "Oh, free radicals are bad, antioxidants are good. Free radicals cause damage, we need to take antioxidants to neutralize those things." Well, it turns out that a lot of aspects of that whole line of thinking are actually not correct. We can get into more details of that but the key point here is that reactive oxygen species, or free radicals, have actually been found to be responsible for creating a signaling cascade, at the cellular level, that actually makes our cells grow stronger. It stimulates adaptations mainly in a system called the ARE, that's the antioxidant response element. And that is basically our internal cellular antioxidant and anti-inflammatory defense system which is, ultimately, hundreds or thousands of times more powerful than any antioxidants you could take through supplements. So by building up that system, at the cellular, at the mitochondrial level inside of our body, we ultimately make it so that system is more capable, is stronger, is more robust, and is more able to neutralize any burst of free radicals that it encounters in the future.

So that's the fundamental reason why we have this huge body of evidence on exercise, not just, you know, for example, creating more strength or endurance in our muscles or, let's say, making our cardiovascular system work better because, you know, hey, our heart pumps hard while we exercise, but also doing all of these other things like, for example, fighting depression, fighting anxiety, fighting dementia and neurodegenerative diseases. So all these different brain benefits. And then, you know, there's a body of thousands of studies showing that doing exercise can fight against all kinds of different diseases. So the reason for that is fundamentally because exercise is a hormetic stressor that is building up our internal...it's building up our mitochondria and it's building up our internal antioxidant system.

Now, tying this back into sauna use, sauna use is another type of hormetic stressor. It's called heat hormesis. And there's very well-defined mechanisms of how this actually plays out in our body through, for example, heat-shock proteins and stimulating, what's called, the Nrf2 pathway, and that relates to that ARE, that antioxidant response element that I mentioned before. So we know all the different sort of mechanisms or we know most of them. And sauna use works primarily to give us benefits, all those benefits that I mentioned before, through hormesis, through basically being a transient metabolic stress and stimulating our cells and our mitochondria to grow bigger and stronger and building up the antioxidant-response element to be more resistant to all exposures of any future stressors that it may encounter. Not just heat, or not just exercise, but also things like toxins, emotional stress, sleep deprivation, poor diet, all of the things that we know are key drivers of aging, fatigue, and disease. So hormesis is really a critical aspect of why saunas are so beneficial that very few people are aware of or talking about.

Katie: That makes perfect sense. When it comes to hormesis, like you mentioned exercise as well, it would seem like there is kind of a dose-dependent criteria there. So how can a person know where are you in hormesis, and then, where is it too much? Because even exercise that you do too much, it's actually harmful to the body. So is there a way to gauge that or is it very individualized?

Ari: Yes, thank you for reeling me back into the original question. So now that I've provided all of that context, here's the important part to understand. Just as every individual has a very different tolerance for exercise, like, for some person, they can go out and run a marathon this afternoon and be totally fine and that's just like a normal thing for them, that's because they've conditioned their bodies and that network I just talked about, the antioxidant response element, among other systems of the body, they've conditioned themselves to be able to handle a stressor like that really without much of a problem and they can go do that. Now, someone else might literally have a heart attack and die if they'd go try to run a marathon this afternoon. So the point is that there's a very, very different level of tolerance for different kinds of stress loads, especially at the beginning.

So when it comes to saunas, it's exactly the same thing. Someone who is extremely fit and healthy and regularly exposes themselves to a wide variety of hormetic stressors, exercise and sauna being just two of several that we could talk about, they're going to have really robust mitochondria and a really robust antioxidant response element and they will be able to handle a much, much higher level of sauna exposure, higher temperature, longer durations, than somebody who is, let's say, sedentary, has been junk-food eating for a long time, and has not been exposed to much in the way of hormetic stress and their mitochondria are shrunk and shriveled down and weak, and their antioxidant response element is not robust at all and not capable of handling much stress. So what that person might start with is something like maybe 105 or 110

degrees for 3 minutes or 5 minutes. Whereas, you know, I just got out of the sauna half an hour ago and I was in there at 210 degrees for almost 40 minutes. So, you know, there's a very big difference there and basically you have to start slow and start small, and then, sort of work your way up according to your body's tolerance.

Katie: That makes perfect sense. And I know another question that's often asked when it comes to sauna use is infrared versus traditional saunas and if there's additional benefit. And most of the studies, I've seen at least, are actually done on traditional saunas and they're looking at the heat component. But then, we now have all these infrared saunas and claims that they, for instance, penetrate more deeply into the body and increase detoxification. So I'm curious if you've seen any data that would indicate one way or the other on that.

Ari: Yeah, this is a really good question, and I remember that we talked about this in person when we were in Cabo. And you really impressed me with your level of knowledge on this because this is something that very few people are aware of or talking about. And it's exactly right, what you said is that the majority of studies on sauna use, really on any kind of health benefit, are actually using traditional saunas, not using infrared saunas. There are definitely some studies on infrared-sauna use but I would say, at least probably 80% of the studies, are on traditional saunas. So that's one thing. And now, given that, it is actually kind of a bizarre thing that most of the conversation that's become popular in the natural health world, right now, has really fixated on infrared saunas and there's sort of a narrative that infrared saunas are superior and that they're just sort of better in every way and that nobody should use a traditional sauna because infrared saunas are so much better. Here's why I think that's a bit mistaken. So what I said before is that a lot of people have centered on detoxification and the act of sweating as being the central reason why sauna use is beneficial. I don't think that's correct, as I said before. What I think is that the act of the hormetic stress aspect of it, which is actually like heating your body up to a very high degree, to the point where you are uncomfortably hot, is actually probably, in my view, responsible for at least 70% of the benefits associated with sauna use.

So here's the critical distinction, traditional versus infrared. Infrared saunas operate at a much lower air temperature in that room and they work through the mechanism of basically emitting far infrared rays, or far infrared energy, from these usually carbon fibers or ceramic emitters. Those rays enter into your body and they sort of heat you up from the inside. They heat up the water that they're contacting inside of your cells, and then, they sort of heat you up from the inside. So they create a sweating effect at a much lower air temperature in the room, in contrast to traditional saunas which don't emit far infrared energy, they rely on convection and basically heating up the air in the room, and then, by virtue of you sitting in a very hot room, just being in that hot air heats your body up. But the difference is this. So the infrared saunas may operate at a temperature somewhere around 130 to 160 degrees Fahrenheit, somewhere in there is pretty typical, and the traditional saunas usually you're talking about a range of 170 up to like 210 or 220 degrees. So there's a very sizeable difference in terms of the temperature in that room.

Now, in an infrared sauna...and this is actually billed as part of the benefits of why infrared saunas are superior. And the thinking behind it is sort of, "Hey, you can get the sweating benefits and all that detoxification," which they're saying is where all the benefits are coming from, "you can get that while being much more comfortable, while not being as uncomfortable as you would be in a traditional sauna because it's much lower air temperature." So the part of that that's true is that, yes, you can sweat very effectively in infrared sauna at a much lower temperature. The part of it that I think is misguided is that because I believe

that most of the benefits, or a large portion of the benefits of sauna use, are coming from heat hormesis. I actually don't think it's necessarily that smart to try and avoid getting uncomfortably hot because I think it is that very act of getting uncomfortably hot that is responsible for creating a lot of benefits here.

So now, the other layer of nuance to this is that the way I typically break things down... So hopefully, you can see that I'm not necessarily an advocate of infrared saunas over traditional saunas, I actually think traditional saunas are great. Now having said that, I will say that for the majority of people, especially the majority of people that I work with, like people with chronic fatigue and who, oftentimes, have serious health problems and are just in a weakened state, those people tend to do better in infrared saunas because, oftentimes, the highest temperature that they can even tolerate is 120, 130, 150 degrees maybe. And they might go into a traditional sauna at 190 or 200 degrees and actually be wiped out from it, and it's just too intense for their bodies to handle. It's sort of like that previous example I gave of the sedentary person going and trying to run a marathon. Not a good fit at that point. So the way I sort of break it down is, "Hey, are you a young, very healthy, high-energy, very resilient person who's also very fit and used to doing lots of exercise? Well, then you may actually find that an infrared sauna is too low of a temperature for you and doesn't really ever make you uncomfortable hot and that you may wanna go more in the direction of a traditional sauna." On the other hand, if you're somebody who's got some serious chronic fatigue or health problems and you're just in a weakened state and you find that your body has a hard time tolerating any bit of stress or any bit of exercise, then you're probably almost certainly gonna do better in an infrared sauna. So that's kinda how I conceptualize that whole space of infrared versus traditional.

Katie: Yeah, I think that's so important. And I agree with you that research really seems to indicate the benefit of that uncomfortable hot, which isn't very fun but it brings me to another question. So when I was in Finland, we spent some time in a traditional sauna that got up to about 210 degrees. And this one actually was the size of a small cabin, it was huge and it had a wood-burning stove with rocks on top that it was literally as big as a car. And then, it had this upper level where you would all go sit like sandwich between some old Finnish guys and you would sit there and just like completely drip sweat. I think that's why they had the second layer so you could like drip sweat underneath. But they also then have a cold plunge outside in basically an Arctic lake. And I know that this is also becoming more popular to do, that contrast therapy between hot and cold. And I've looked at the research here as well, and I love your take on it because it seems to me like there's benefits of heat on its own, there's benefits of cold on its own, and the benefits are actually somewhat different when you combine them. So I'd love to hear if you have an opinion on this. And then, if you implement that at all, how do you do it?

Ari: Yeah, that's a great question. I think there's a very minimal amount of actual data, as it stands right now on the contrast aspect of things, as far as going from heat to cold. I know there's been some...you know, I've seen varying kinds of speculation, one is like, "Hey, both heat and cold are types of hormesis, so maybe if you alternate back and forth with them, they will amplify each other," or, you know, just the act of sort of making your body cold, "now you can get back in the sauna, you can have more time in the sauna. And so, maybe that leads to health benefits." I've also seen speculation in the other direction that says, "Hey, maybe you're stimulating opposing pathways in the body. Even though they're both types of hormesis, they don't stimulate exactly the same mechanism so it's possible maybe there's some sort of opposition effect." I'll give you one example of that. Exercise actually does not seem to combine that well with cold exposure. There's some research showing that if you do like ice baths right after you do a weight training workout, that it can actually blunt some of the adaptations that you're getting from the exercise. In other words, it can actually make it so

you don't gain quite as much strength or as much muscle size in response to that weight training session. Now, as far as the heat and cold contrast, I really haven't seen a lot of data, as far as like actually looking at health outcomes. So mostly what I've seen is speculation. My personal opinion on it is that I think it almost certainly is a good idea and is beneficial to the extent that you can do it and you have that option available. And I know you do that, Katie, so I absolutely think it probably is a good idea and will eventually be shown to have some unique benefits. But as it stands right now, I'm not aware of any research that has really looked at that in-depth. Have you seen much in the way of that, Katie?

Katie: Unfortunately, no. That was kind of my take on it as well as I think it seems like the benefit...and, in Finland, how they use the cold is certainly to be able to stay in the heat longer. And they can last a couple of hours even, their heat tolerant is very high, especially when they punctuate it with cold. But it seems like it would be logical that they would potentially activate opposing pathways, like you mentioned. So what I personally do, one day a week, we do the contrast just because it's fun and it feels great but, the rest of the week, I will typically pick hot or cold. So most days at sauna. But then, non-weight training days, I might just do cold. Figuring that if there's an alternating effect there that I'd prefer to separate them.

Ari: Yeah, yeah. That's interesting. Yeah, like I said, I think it almost certainly will lead to health benefits, especially just by virtue of the fact that it's prolonging the amount of time that you're gonna stay in the sauna. So yeah, I think it's a good idea. I've done a little bit of it, I have kind of a very ghetto set up here. I have two different saunas, so I have like a solo infrared sauna that gets actually quite hot, it's unique in the realm of infrared saunas in that it really heats you up very effectively, and then, I have a traditional outdoor barrel sauna as well. So when I use my outdoor barrel sauna, which is what I used this morning, oftentimes, I'll get out mid-session and go over to my backyard garden hose. And right now, we're in the middle of the winter, so I just take out the garden hose and I just give myself a shower. It's not quite like an ice bath but, you know, you definitely get the effect, and then, I hop back in the sauna. So just the fact that I do it myself, at least sometimes, tells you that I think it probably has some unique benefits.

Katie: Definitely. And we have, ironically, the exact same setup. We have a traditional sauna outside, and then, I have a personal like solo sauna inside that's infrared but your head is out, which I think does let you stay in potentially a lot longer. And that's the one I'll go if I feel like I'm gonna get sick or something, I will go in there for over an hour and I will actually see a noticeable rise in core body temperature, so basically inducing a fever. And then, typically, I won't get sick after that. But yeah, it's interesting. And I know, in our last conversation in person, I mentioned this to you. But I'm doing kind of a long-term couple year study on this because you always hear people say that infrared saunas help you detox more and get more BPA out and heavy metals. But there's not a single study I'm aware of that actually has looked at this. So I've been doing blocks of time, both in the traditional one, and then, in the infrared one, and then, taking sweat samples and testing them, so it's not certainly an exact science but I'm really curious in, at least my own situation, if that's actually true. So I love that you use both as well.

Ari: Yeah. So I remember you telling me that, "I'm curious to hear what your results have been." There is actually one study, to my knowledge, that has tested the concentration of various toxins in sweat from people in infrared saunas versus traditional saunas. And I actually think, if I remember correctly, they also tested just sweat from people doing exercise at normal room temperature. And what they concluded basically is that sweat is sweat. There is no...so that the claims that you often hear by infrared-sauna advocates that, you

know, sometimes you hear these wild claims like, "Oh, infrared saunas lead to the body producing sweat that's 20 times more concentrated with toxins," and that stuff is absolutely not supported by the existing evidence, which has basically shown that sweat is sweat. And even sweating from exercise, if you do exercise intensely and long enough to sweat a lot, you're probably purging out the same amount of toxins per sort of gram of sweat. I think the big difference is that most people will sweat way, way more inside of a sauna than they will via exercise. But as far as I've seen in the actual science, sweat is sweat.

Katie: That's a great point. And it's an important point, something we should all be doing often, regardless of whether it's in the sauna or exercise or whatever method works best. It's something important to do, it's a very natural process. And I wanna loop back a little bit. You mentioned the Nrf2 pathway and, for people who are not familiar, can you kind of just give us a primer of what that is and what are some other things we can do to kind of activate that?

Ari: Yeah. So I actually don't know if I said the Nrf2 pathway specifically, but you're right that I was referring to it. So basically we have certain signaling pathways at the cellular level. There's a lot of different mechanisms that are thought to be involved. I actually have a textbook, a brand-new textbook that I just got on specifically the topic of hormesis and longevity. And it's an amazing textbook. It better be, for \$200. So there's a whole bunch of different signaling cascades and heat-shock proteins and reactive-oxygen species. And there's many, many other signaling pathways that are involved. But probably the key central mechanism that really most hormesis comes back to is what's called the Nrf2 pathway or also called the Nrf2 pathway. And fundamentally, what that's doing is basically it's a sensor of oxidative stress, it's a sensor of the amount of free radicals or reactive-oxygen species that are present. And it's picking up on those, and then, stimulating a set of adaptations.

So maybe let me step back for a second and frame this in the context of mitochondria. So mitochondria are our cellular energy generators. We often learned in biology classes, in high school and college, that the mitochondria is the powerhouse of the cell. And so, we learned that there are these...most people conceptualize them as these sort of mindless energy generators. Well, it turns out that they're actually much, much more than that. And a lot of recent research, in just the last five years, is really positioning mitochondria as key environmental sensors that are actually regulating how our body is responding to what's going on in the environment. So, for example, if you have chronic stress, psychological stress, or if you have toxin exposure, or if you have leaky gut, or if you have sleep deprivation, all of those things are now being picked up and sensed by your mitochondria.

And, in response to that, your mitochondria now decide whether the body should go more into, you know, sort of energy production mode, which is if the mitochondria are determining, "Hey, this environment's safe. We're not under threat of attack. Let's keep pumping out lots of energy," or to shift more into defense mode where they are deciding, "Hey, there's threats present, there's toxins, there's stress, there's infections, there's..." you know, whatever kind of stressor, "we're picking that up. There's inflammation, there's a poor diet, there's a leaky gut, there's lipopolysaccharide leaking into the blood," mitochondria are actually detecting the presence of those things, and then deciding, "Oh, we're in an unsafe environment. We're under attack. So now let's shift out of the energy-production mode into defense mode." And then, they actually initiate a set of cascades that, for example, effect immune activation and inflammation and many, many other things.

Now, if you can conceptualize this, I wish that I could illustrate this visually for everyone but...basically, whenever there is any type of stress stressor present, whether it's psychological stress or toxins or any of the other things I just mentioned, that ultimately gets translated into, at the mitochondrial level, increased production of reactive-oxygen species. Okay? Even in the case of exercise, part of what you're doing with exercise is you're taxing, you're putting a big load on your mitochondria to produce lots of energy to power this intense physical movement. So, in that process, the mitochondria actually produce lots more free radicals. Now, in response to that, when there's a presence of that kind of thing, of a stressor that's translated into increased production of free radicals or reactive oxygen species at the mitochondrial level, that actually stimulates the Nrf2 pathway. Which then translates into the ARE, the antioxidant response element, and basically acts as a signal for the mitochondria to build up their internal antioxidant-defense system and which ultimately makes them more resistant to any future exposure of reactive oxygen species.

At the same time, it's also sending signals for the mitochondria to actually grow bigger and stronger and even, in some cases, to stimulate, what's called, mitochondrial biogenesis, which is the creation of new mitochondria from scratch. Now, let me...hopefully, you can picture this but basically the bigger and stronger your mitochondria are and the more of them that you have and the more built up your ARE is, that antioxidant response element, and all three of those things really go together, the more robust that whole system is, the more resilient you will be to any kind of exposure to any stress. And what that means is, ultimately, you can handle exposures to exercise, or sauna, or things like toxins, or things like, you know, occasionally eating some bad foods, or, you know, a little bit of sleep deprivation, or a little bit of psychological stress, relationship stress, work stress, anything like that, that you can handle those things and that your mitochondria are able to tolerate that stress load, and then, return to homeostasis, adapt to it successfully, and maintain health.

On the other hand, if you have weak mitochondria, if you don't have many of them, if the ones that are there are dysfunctional and fragile and the ARE is not well built up, is not very robust, now you may have exposures to things like toxins, or stress, or sleep deprivation, or something like that, and now it actually overwhelms the system. The mitochondria can't handle that stress load, and so, they actually basically shut down, they go out of energy mode into defense mode and they switch on. Basically fatigue is what you're going to feel in response to that. And by the way, this whole process that I just outlined is really the center of why people have chronic fatigue. So it switches on that defense mode, and then, the mitochondria are basically just throwing off lots of free radicals and they're not able to maintain energy mode.

So at the core of this whole sequence of events, and basically on the big picture, how energetic you are and how resilient you are and, ultimately, actually this extends into longevity and resistance to disease, more broadly, but, ultimately, that depends on how big, strong, and robust your mitochondria are and how many of them there are and how robust that antioxidant response element is. And a lot of that actually comes down to how well you actually built that system up through regular exposure to hormetic stressors.

Katie: That makes sense. That's one of the best explanations I've heard. And it's a perfect springboard to my next question because I have a feeling there's a link. I hear from a lot of readers and listeners who struggle with anxiety or depression, and I have a lot of personal friends who also struggle with those, and it's not something I've gone through personally so I don't have any first-hand experience to share, but I'm curious if you are seeing anything in the data and the research right now, on a link here to anxiety and depression or if

there are other factors that you're seeing in the research, that could be important for people who are going through that?

Ari: Yeah. Great question. So there's some really amazing research that has just come out really in the last two years. I did a deep dive into this recently, I saw a few studies come out, over the last few years, and then, I just went, pretty recently, just on a deep dive to kinda look and see what's come out on that topic, specifically in relationship to mitochondrial health. And there's been an amazing amount of research, just in the last couple years, showing that mitochondrial dysfunction is really a key player in a lot of brain-related symptoms. And there's a field that's emerged now called mitochondrial psycho-biology, and it's basically indicating that mitochondria are at this interface of sort of mind and body. They're at the interface of stress, and I mentioned a bunch of kinds of stressors a minute ago, but even psychological stress and what the body is doing in response to stress.

According to Doug Wallace, he's been one of the world's top researchers in mitochondria for, I think, decades at this point, he said...this is almost a direct quote, if I can remember it...but he said basically, "Mitochondrial DNA is essentially the most sensitive thing in your body." And here's why that's important. So there was a recent study done by Martin Picard and Douglas Wallace, and a few other people, where they basically asked people to...it was something to the effect of like, "Give a five-minute speech defending yourself because, you know, the scenario is that you've just been personally attacked, and your character has been personally attacked, and you've been accused of doing all these horrible things, and now you have to give a five-minute speech to defend your character and to defend yourself against all of these, you know, false claims that have been made against you."

And so, they did the study I think with like 50 people, and then, they measured mitochondrial DNA in the bloodstream literally within minutes of doing this speech. So the psychological stress of that caused mitochondria to react in such a way that they actually they pumped out the DNA that's contained inside of the mitochondria, the mitochondria got so stressed that it actually released the DNA out of the cell and into the bloodstream. Now, that is one of the key signaling molecules that actually signals to other cells in the body, "Hey, we're unsafe. We need to shift into stress mode." Okay? So, you know, people often think of the adrenals or cortisol as being the stress response system, or the HPA axis. Well, what's upstream of that? Even upstream of that you have things like, for example, the amygdala and the limbic system. But upstream of even that, you have molecules that are being circulated in such a way that that they're triggering the whole system to enter into a sort of defense mode or danger mode or stress mode you can conceptualize it as.

Now, so just in the last couple of years, there was a whole bunch of research now coming out that, first, there's a couple things. So one is that a lot of these brain-related conditions, that we are often used to conceptualizing as separate, are probably not really separate. So, for example, brain fog, depression, anxiety, psychiatric disorders like schizophrenia, bipolar disorder, many, many other conditions, even neurodegenerative diseases, there's links, we're discovering that there's links between all of these things and that they all really come down to the same central mechanisms. And so, what do I mean by there's links? Well, for example, if you have depression during your lifetime, your risk of neurodegenerative disease goes up dramatically. If you have autism, your risk of neurodegenerative disease goes up dramatically. If you have, you know, anxiety, your risk of, you know, other brain-related symptoms goes up dramatically. If you have chronic-fatigue syndrome, your risk of psychiatric disorders or depression goes up dramatically. So there's all these

weird links, right, where having one of these things leads to a much higher probability of having others of these brain-related symptoms.

So, and, you know, in my field, it's often the case that somebody with serious chronic fatigue doesn't just have chronic fatigue, they also have brain fog, they also have brain-related fatigue, which is after doing mentally-demanding tasks they feel exhausted and can't focus or concentrate and just sort of wanna sleep, it's like their brain shuts down, or they have depression and anxiety. So these brain-related symptoms are basically clustering together, they're related. And the reason why is that they all come back to some of the same central mechanisms at the level of the brain. One is mitochondrial dysfunction, I think that's the biggest one. There's also neuroinflammation, and then, there's also a couple of other things, microglial activation that's sort of like the immune system of your brain and, in response to certain toxins, they can switch on, and then...or stressors, they can switch on, and then, start producing lots of inflammatory compound.

So all these things really tie together, mitochondrial dysfunction, neuroinflammation, microglial activation. And if you look this up, you know, for example, look up mitochondrial-dysfunction depression, mitochondrial-dysfunction psychiatric disorders, mitochondrial-dysfunction neurodegenerative diseases, you'll find research now emerging on all of those things because they're all coming back to that. So I believe that, by taking care of your mitochondria, you will have a huge impact on, not just, for example, like your energy levels, but you'll have a huge impact on preventing depression, anxiety, brain fog, brain fatigue, chronic fatigue syndrome, neurodegenerative disease, depression, anxiety, psychiatric disorders. I mean, all of those things are related to the mitochondrial function and levels of inflammation in the brain.

One other thing I'll mention, since I didn't really explain this in depth, as I was talking about that Nrf2 pathway and ARE, part of that antioxidant-response element and part of stimulating that pathway of the Nrf2 pathway via hormesis is not just an antioxidant defense system but it's actually an anti-inflammatory defense system as well. There's another pathway that sort of opposes the Nrf2 pathway and it's called the NF-kappa B pathway, and it's a very strong pro-inflammatory pathway. Well, the more that you can activate Nrf2, the more that you tend to shut down the NF-kappa B, that pro-inflammatory pathway. So, in other words, to sort of tie everything together that I just said, hormesis stimulates this Nrf2 pathway and the ARE, it opposes oxidative stress from free radicals and opposes chronic inflammation and makes your mitochondria bigger, stronger, and more of them and makes that whole system more robust so that it's constantly able to fight against oxidative stress and neuroinflammation and mitochondrial dysfunction, which are the things that are underlying, not only chronic fatigue, but also things like depression and anxiety and even some of the more serious neurodegenerative diseases.

Katie: I love that that came full circle and tied back into hormesis and sauna use and exercise. And it makes perfect sense in light of your explanation why we do see the studies about exercise reducing depression and anxiety, it makes complete sense.

This episode is brought to you by Alitura Naturals skincare. You guys loved the founder, Andy, when he came on this podcast to talk about his own skin healing journey after a tragic accident that caused massive scarring on his face. From this experience, he developed some of the most potent and effective natural skin care options from serums and masks and everything in between. The results are visible in his perfectly clear skin

that is free of scars! I love the mask and use it a couple times a week, and often use the gold serum at night to nourish my skin while I sleep. All of their products have super clean ingredients and they really work! Andy is absolutely dedicated to creating the highest quality products possible and it shows. Check them out at alituranaturals.com/wellnessmama and use the Discount code "wellness" to get 20% off.

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Katie: For people who are in that right now and trying to work through depression or anxiety, are there other forms of hormesis that they can look at that are also helpful, or even other supplemental things they can do that seem to be backed by the research right now?

Ari: Yeah, great question. So, first of all, I mentioned that there's a study, a fairly recent study, by a researcher named Charles Raison who has been looking into specifically the link between inflammation and depression. And also, he has a unique interest in sauna use as a treatment for depression. They've done a study which has shown that...I forget exactly how many sauna sessions they did, but I think just sauna use for a few weeks had very, very long-lasting antidepressant activity that was actually even more effective than antidepressant pharmaceuticals like Prozac. So a handful of sauna sessions can be an amazing antidepressant. There's some research, it's very limited research, on cold exposure for fighting depression. Exercise certainly is a big one. Fasting, I don't know if there's much research there, fasting is another type before hormesis, I don't know if there's much research on that specifically as it relates to depression and anxiety.

But certainly many, many phytonutrients, which, by the way, I should also mention, are what's categorized as zenhormetic phytochemicals. They're also a type of pro-oxidant, these things are often conceptualized as antioxidants. In most cases, they're not antioxidants, they're actually pro-oxidants that stimulate the Nrf2 pathway and actually turn into, ultimately, an antioxidant effect by building up that internal cellular antioxidant response system. So things like Astaxanthin and lion's mane mushrooms have definitely anti-depressive and anti-anxiety effects. And there are certainly a number of other substances that are potentially very useful for that. Schisandra and coffee-fruit extract boosts brain-derived neurotrophic factor and Bacopa. You know, there's a number of other phytonutrients that may have benefits but certainly, I would say, exercise and sauna use are amazing hormetic antidepressants.

Katie: Got it. I'd also love to hear your take, because I know something that is often recommended for people struggling with anxiety especially is to use CBD. So I'm curious if your take on all the recent research, and mainly articles I'm seeing across all sites on the endocannabinoid system and CBD in all of its various forms, and what you think is the right approach there.

Ari: Yeah. That's a great question. So CBD is sort of a mixed bag of research, as it stands right now. I think that, overall, it is definitely a beneficial compound and there's some research that has shown really profound benefits. And there's other research that hasn't shown amazing benefits, like, for example, anxiety. I've seen some research showing that long-term use of CBD didn't really have much of an effect at all on anxiety but I've also seen an animal study recently that suggested that CBD was a very potent antidepressant. There's definitely some research that the endocannabinoid system is a key, key player in our body's ability to regulate stress and turn on and off stress. And specifically, the key part would be to turn off stress, to like help shut that system down once the body's been in stress mode, to help reregulate it back into a non-stressed state.

So I do think that the health of your endocannabinoid system is extremely important. I think it's a mistake, overall, to...you know, that's kind of going on right now where people are, I would say, almost conceptualizing the endocannabinoid system as synonymous with CBD and sort of like, "Hey, your endocannabinoid system is really important so take CBD." And I think it's a lot more complex than that, I think CBD is one potentially useful compound but there are other compounds that also have a really unique benefit on balancing and building our endocannabinoid system. And I'll mention a few things here. So one is that chronic stress of really any kind will absolutely wipe out your endocannabinoid system. So having the lifestyle habits of, what I call, recharge rituals, which are basically just rituals that are built into your day that are powerful ways of de-stressing your system. One example of that would be something like meditation, another example of that would be foam rolling or massage or self-myofascial release. And those things can be layered, in certain ways, to make the benefits even more profound. Also things of stimulating the vagus nerve, so humming or singing or gargling, things like that, just switch on your vagus nerve, I think that is extremely important to get your body out of chronic stress. And that's critical to preserving the health of your end of your endocannabinoid system.

There's also some other things that I'll mention. So greens, this is not a commonly talked about thing, but just green leafy substances are rich in a compound called beta-caryophyllene. And beta-caryophyllene is a phytocannabinoid that has powerful balancing effects on the endocannabinoid system of our bodies. Pterostilbene is another compound that's found in things like blueberries and mulberries and, to a smaller extent, in things like almonds and grapes. Also, another food substance that has a powerful effect on balancing our endocannabinoid system, avoiding alcohol is extremely important. Exercise is another great way to build the endocannabinoid system. And then, there's a number of other compounds that can also stimulate the endocannabinoid system. So saffron is one, nutmeg, clove, magnolia extracts, cacao is another great one that inhibits the enzymes that break down some of the endocannabinoids, and a compound called PEA, or palmitoylethanolamide, also is another great substance. And then, turmeric, you know, common old turmeric and curcumin, which, I'm sure, everybody has heard about before, actually helps balance the endocannabinoids system.

Oh, and one more that I'll mention is sunbathing. There's some research indicating that sunbathing is probably a really good thing for the endocannabinoids system as well. So anyway, I just gave you a whole list of stuff, but I think CBD is one useful component of helping to rebuild and balance the endocannabinoid system but I think all the other things I just mentioned are also really important.

Katie: I agree and I love that. And I hope we have time for one more question because you mentioned sun exposure. And when this airs, we'll be getting close to sunnier days and more potential for sun exposure, and I

know this is another area that you have done a lot of research and you take a very evidence-based approach. So if you could, just give us a brief overview about sun exposure. Because I know sun gets so vilified right now, people are so afraid of the sun. And I personally am not, and I know that you're not either, but I would love to hear you explain why.

Ari: Yeah. Well, it's a big topic, this is something that we could talk about for hours. And it's also a controversial one because, you know, you can go see a dermatologist and they'll still say, you know, "Hey, stay out of the sun. The sun is bad because, you know, if you get sunburned, it can increase your risk of skin cancer." That part is true. If you get sunburned regularly, it's definitely a big risk factor for skin cancer. So I highly recommend not getting sunburned frequently. However, the part that they're leaving out is that there are massive links between regular sun exposure and a huge array of other health benefits, including protective effects on many, many, many other types of cancers, much more serious types of cancers.

So the net effect here...let me actually tell you about one study recently where they followed a group, this was a huge study where they followed something like, I think it was like 15,000 or 20,000 women, over the course of 15 years, and I think it was in Sweden and I think this came out in 2016. And basically what they showed is that, over the long run, avoiding sun exposure is as big of a risk factor to your health as smoking a pack of cigarettes a day. So that's a way to conceptualize how important sun exposure really is and whether or not sun exposure a good or bad thing. So yes, getting sunburned regularly, sunburned, not sun exposure, will increase your risk of skin cancer. That's something to avoid for sure. But avoiding sun exposure will dramatically increase your risk for many, many other types of cancer, neurodegenerative diseases, autoimmune diseases, many other types of diseases and basically lead to your system functioning in a way that is not healthy.

So one of the other big sort of myths around sun exposure is that people think the sun and vitamin D pills are equivalent. Vitamin D pills are not equivalent to sun exposure. We get many more benefits from the sun than just vitamin D. And the type of vitamin D that we can make in our body isn't even the same as what we can get from oral vitamin D. So beyond just vitamin D exposure, there's many other compounds, for example, we're stimulating what's called the melanocortin system, and that plays a role in regulating our metabolism and appetite. We are stimulating the production of something called cholesterol sulfate, which gets into our bloodstream and helps our blood deliver oxygen to our tissues more effectively. We also have far infrared energy, which we already talked about, which helps stimulate sweating and detoxification, that has its own benefits. It also stimulates the dilation of blood vessels and helps deliver oxygen to your periphery.

So, you know, oftentimes people will talk about having cold hands and feet chronically, well, if you just shifted from working indoors to working outdoors and you had some sun shining on your skin, you would find that your blood circulation to your periphery changes dramatically within about 15 or 20 minutes and you probably won't feel that you have poor circulation to your hands and feet anymore. The interesting thing about that is that humans are meant to be...you know, we've spent pretty much 99.999% of our evolution living mostly outdoor lives where we were getting plenty of movement and sun exposure on our bodies. And that affects how well our body is able to circulate and deliver blood to the periphery.

In addition, we are also affecting the circadian rhythm. So we have light entering through our eyes and impacting on the suprachiasmatic nucleus of our brain, which is the basically our body's 24-hour biological

clock that regulates all kinds of different neurotransmitters and hormones. And that affect our energy levels, our sleep cycle, our mood, and so on. There's research showing that sunlight has a huge effect on many neurotransmitters. But just look at serotonin and dopamine which play a big role in things like motivation, things like depression and anxiety. Yeah, sunlight has an enormous effect on your mood by modulating your neurotransmitters.

And then, the subject which I wrote a book on, last year, called "The Ultimate Guide to Red Light Therapy," sunlight also contains red and near-infrared light which actually penetrate into our bodies and stimulate our mitochondria to produce more energy. And they stimulate all kinds of other signaling cascades that help the healing of tissues, that help alter fat metabolism, that...basically it just stimulates sort of energy production and healing processes, it depends on the specific tissue that we're talking about. But there's research on red and near-infrared light therapy in the context of treating depression, anxiety, neurodegenerative diseases, speeding up fat loss, increasing muscle recovery, improving strength, stimulating the healing of scratches and tendinitis and certain skin wounds, and bone healing. All kinds of different benefits there because it's stimulating the mitochondria to produce more energy effectively and it's stimulating various signaling cascades that basically help in the healing of those tissues.

And I should also mention, tying this back into what we talked about earlier, red and near-infrared light actually also work as a type of hormetic stressor. They act on your mitochondria and create a transient burst of reactive oxygen species, which also does a lot of those same things that we talked about earlier. It helps build your mitochondria bigger and stronger and makes that antioxidant-response element more robust. So anyway, that's the quick five-minute summary. But sunlight is not something that you can replace with a vitamin D pill. Sunlight has an enormous array of benefits to hormones and neurotransmitters and mitochondria that you can't really replicate by just a vitamin D supplement.

Katie: Great explanation. And like always, I could go on for a couple more hours going deep on these topics with you. And I've said before, you're one of the people I truly respect the most in our industry and your research is always extremely thorough. And I always really appreciate your input and opinion, and I cannot overstate how grateful I am for your time today. We're gonna have to, hopefully, do another round eventually because I have so many more questions I would love to ask you.

Ari: I would love that. And thank you so much for the kind words, the feeling is absolutely mutual. I love hanging out with you and I love the work you are doing.

Katie: Thank you so much. And thanks, of course, to all of you for listening and sharing your most valuable asset, your time, with us today. We're so grateful for you and I hope that you will join me again on the next episode of "The Wellness Mama Podcast."

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