Introduction to Menopause and Mitochondria

Hello. Hello. Welcome back to Mastering the Menopause Transition Summit 3.0. I'm still your host, doctor Sharon Stills. It's always an honor and a privilege and a lot of fun to be here with you all, bringing you experts about all the things that are important to me and that are important to you if you want to master your menopause transition.

And so I was just talking to my guest before we came on, saying how I really like to expand the view of what menopause is. I know we all want to have happy, healthy hormones and I gotcha on that.

But honestly, in my practice, balancing your hormones is the easiest part of my job as your physician. It's making sure that the terrain that these hormones are going into is functioning optimally.

And so that is not possible without bringing mitochondria into the conversation. And many of you probably already know Ari Witten. I call him Professor Eric cause he's brilliant and he's the founder of the Energy Blueprint.

He's written bestselling books on red light therapy. So like, if there was anyone, I want to have a conversation with to help you understand why mitochondria are important, it would be this gentleman right here.

So welcome to the summit. Thank you so much for being here. Thank you so much for having me. And thank you for the kind words. You are very welcome. So let's just I mean, how did you get so into.

Because I think mitochondria like your face pops up so how did how did that become the area that became important to you? And why should it be important to everyone who's listening?

Yeah, it's a good question. It's hard for me to answer that succinctly, but I'll give you the, I guess, like, the ultra short, CliffsNotes version of my bio.

I've been studying health science since I was a little kid, and, about 13 years old and largely due to an interest in. I was an athlete and I was an aspiring bodybuilder.

So from a very young age, I became interested in nutrition and physiology and biomechanics and biohacking before biohacking was a word, that the original biohackers were bodybuilders, and, you know, injecting all kinds of illicit chemicals and dangerous chemicals into their bodies to try to create some kind of, effect, often with good effect and often with death as a side effect.

But, you know, that that was sort of my realm, and I wasn't playing with steroids or any injectable stuff, but that was the influence. That was the world that I grew up in.

And, it's very different. It's important to understand that that's a very different kind of world when it comes to human physiology. Then sitting in a classroom learning about concepts of physiology, learning about disease, learning about biochemistry.

Ari Witten's Background and Fatigue Research

I've done all that to and I can tell you by doing by being in both worlds that they are very, very different worlds, the kind of expertise that someone arrives at when they only have the classroom side is very different from the kind of expertise someone arrives at.

If they only have the self-experimentation side, if they're an athlete or a bodybuilder. And I think both can be problematic without the other one, without sort of the more practical side and the experiential side of understanding human physiology.

And with too much of a focus on disease. But maybe we'll leave that aside for now. So that's been my background for a very young age is really all about direct experience with modifying human physiology.

And, and not only with myself. But then I went on to in my 20s, I was after getting a degree in exercise science. I was a personal trainer for many years.

So with thousands of people that I worked with over many, many years, I'm working with, maybe probably a little over a thousand people. I'm modifying the physiology of many, many people.

And so there's a there's a relationship that we that we form when we're experimenting in that realm. In my mid 20s, I got mononucleosis from Epstein-Barr virus.

And for the first time, I'm now, you know, somebody who's been an athlete, super high energy, fit guy. I'm the pinnacle of health, by all accounts. Everybody who knows me all of a sudden now I have severe mononucleosis, and I'm left with chronic fatigue for many, many months.

And that really rocked my world. As somebody who has always taken energy for granted. And the next part of the story is a very short version of what was a several years.

But basically I developed a strong interest in exploring the science of fatigue. In response to that, it became apparent to me that this fatigue thing, which I had no interest prior in prior to this, because I didn't I just didn't understand that I always had abundant energy.

I didn't really get what it's like to have chronic fatigue. All of a sudden I realized, wow, your life really goes down in the gutter in really every domain of your life, from your relationship to your career to, you know, I was in I was in school at the time.

I had a job at the time. Everything suffers. And I had a girlfriend at the time and, you know, that was suffering. Everything was suffer. Everything was falling apart because I just didn't have the energy.

And, and so that gave me a lot of empathy for people with chronic fatigue and I wanted to explore deeply what the science was of human energy levels. And that led me to adrenal fatigue and many of my mentors and people that I admired and looked up to and learned from since I was a teenager.

We're talking about this thing called adrenal fatigue. And then I stumbled across the idea that within conventional medical circles, they really Pooh Pooh the idea of adrenal fatigue.

They brush it off as pseudoscience and quackery. They don't consider it a real medical condition. And at the time, this really irked me and led me to sort of want to stick it to them and, basically write a book proving that adrenal fatigue was a real thing.

And so I spent what turned into about a year of doing nothing like a full year of my life, doing nothing but exploring all the scientific research that has existed, that has been done for decades on the topic of, adrenal function, cortisol levels, HPA axis function and its relationship to chronic stress and, burnout, chronic fatigue symptoms, things like that.

This could this part of the story could, but I have multiple hours of lecture just on that topic alone of that year of my life. So I'm giving you that three sentence summary of this.

But basically at the end of that, I discovered that the conventional medical view of adrenal fatigue was correct, that adrenal fatigue is is not really the first of all, is not really a thing.

There is such a thing as HPA axis dysfunction, but it's there is no such thing as adrenal fatigue per se. And that that certainly is not the cause of the epidemic of chronic fatigue.

And we know that because there's decades of studies, dozens of studies that basically test groups with chronic fatigue syndrome symptoms versus normal, healthy controls without chronic fatigue, and they simply look at their cortisol levels and dysfunction.

And if it's true that adrenal function and cortisol levels are the main mechanism of why those symptoms emerge. Science 101 means this is very easy to prove.

Those studies that are designed that way, as I just described, would clearly show a strong correlation between abnormal cortisol levels and the symptoms of chronic fatigue.

And that body of literature exists, and it does not show virtually any correlation. And to get specific, there are 15 studies out of 59 that have been done over the last three decades that show slightly lower cortisol levels on average, and the people with fatigue compared to normal healthy controls 11 that showed the opposite slightly higher.

And I'm not even talking abnormal. I'm just talking about a statistically significant difference. Slightly higher cortisol levels in the people with fatigue.

And then the vast majority of studies, 33 out of 59 showed no correlation whatsoever, no no detectable difference in cortisol levels or HPA axis function in the people with those fatigue symptoms, including chronic fatigue syndrome.

Compared to normal healthy control. So there just there's no compelling body of evidence to believe that, the adrenals and cortisol are the major player in these symptoms.

So it was a shock for me to do that. That wasn't what I expected to find. It was it was the opposite of my bias going into it. And so that's what made me realize nobody really knows what else causing chronic fatigue.

We know there's this thing that we call chronic fatigue. We know there's differences in energy levels. All the conventional medical people, they don't really have any explanation.

We could talk specifics if you want about that, but they don't have any clear scientific explanation for the causes or effective treatments, and that all the natural health, alternative medicine, functional medicine, people have been talking about adrenal fatigue for decades.

And basically I spent a year of my life to figure out that that's not the cause of chronic fatigue. And. That's so at that point, I basically went, well, what the hell is, you know, going on that explains this.

What is controlling human energy levels? And I spent several years after that basically building out what essentially is like a long list of 150 different, you know, physiological mechanisms of things that in one way or another, influence or, impact on our energy levels.

So, you know, we obviously no sleep, for example, is and circadian rhythm are tied to energy levels. So but what are the mechanisms going on there? And then, you know, nutrition certainly is, is tied to energy levels.

But what are the mechanisms and exercises tied to it. But what are the mechanisms and toxins are tied to it. But what are the mechanisms. So I spent, you know, months and months going into the science on each of these topics to build out sort of, an understanding of what's going on physiologically, how these different factors relate to our energy levels and, and then after that, I basically just had this, this very complicated web of lots of different mechanisms that are in one way or another, influence energy.

But I didn't have any sort of coherent framework, of, of what really regulates human energy levels. So like, as a, as an analogy, you can think of a car.

There are lots of components of a car that are important for it to function. So if I take away the wheels, not going to

function very well. If I take away the tires, not going to function well, I take away the spark plugs or the engine block or the, you know, you name it lots and lots of other parts.

That car won't function.

Why Adrenal Fatigue Falls Short

So there are parts that are necessary that are required for it to function, and that influence the function can cause problems if they are dysfunctional, but they're not the things that are actually regulating whether or not that car is functional, whether it's driving down the road, how fast it's driving down the road, and so on.

And what in this case, in this, in that analogy, what regulates that is the human sitting in the car deciding whether to turn the engine on and whether they're pressing the accelerator pedal or the brake and how hard.

In terms of human physiology, though, what is that thing that's regulating human energy levels? So that's what I was trying to figure out. And nobody within conventional medicine or outside of that had figured that out at that point.

The most compelling explanation that I found, which emerged in my time doing this and this was, I think, back in 2014, was a paper from, Doctor Robert Inovio, who runs a lab for mitochondrial medicine at the University of California, San Diego.

And, brilliant guy. I've had the pleasure to meet with him in person and interview him. And, I think one of the most brilliant medical researchers of our time, and he wrote a paper called The Cell Danger Response.

And basically this was, a synthesis of many decades of research by researchers all over the world on mitochondria and all these, these other roles of mitochondria.

So, we we all had this conception that we learned in biology and physiology courses as mitochondria, as sort of mindless energy generators that just take in carbs and fats and pump out energy.

And, you know, if if it were that simple, we could just dump more fuel into the system, eat more carbs and fats. Boom. You have more energy. Unfortunately, it doesn't work like that.

Mitochondria are a bit more complex. The energy story is a bit more complex than that. But, you know, basically what this paper showed is that mitochondria are way more important than any of us realize.

They aren't just sort of one of many organelles. Like, here's the lysosomes over here, and here's the Golgi apparatus, and here's the endoplasmic reticulum, and here's the nucleus and here's the mitochondria.

And remember, for your multiple choice exam, mitochondria are the powerhouse of the cell. Mitochondria are really, really important in human physiology.

And now the last 1020 years we have a huge amount of data to support the sort of central role or foundational role of mitochondrial health in many different diseases.

And, even the rate of aging itself. And basically what this paper showed is that mitochondria, more than anything else, are the thing that is regulating human energy levels.

And so that position, okay, now we've got mitochondria at the center of all this complicated web of all these different factors that I've been building out for years.

And now I can look at how all these different factors impact what the mitochondria are doing. And now this makes sense and is supported by lots and lots of scientific literature.

So, I'm happy to elaborate more on different aspects of that, but I've been talking for a while, so I'll let you get a question. So here I want to just go back because I'm sure a lot of people's mouths are like still on the floor.

Like, what do you mean it's not adrenal dysfunction? So can you talk about the mitochondria? Is relationship to the adrenal glands. I mean, I'm I'm sure that there is one.

If you could, you could go into, like a biochemistry course and you can examine I know certain people have like Doctor Brian Walsh, for example, who's a friend of mine, has spent a lot of time, look, examining that question of sort of mitochondrial health in relationship to cortisol synthesis.

So, like, you know, the actual process of converting, of, of basically synthesizing cortisol is dependent on mitochondrial health. I haven't spent much time on that because I, I just I don't think it's a central question that we need to answer because we already have the data to show that cortisol problems are not the thing that is even consistently abnormal.

Like most people, the vast majority of people with chronic fatigue do not have cortisol abnormalities. So I think in general, a focus on the adrenal glands is generally misguided.

It's generally not the thing that is causing the problem. There are cases where a person can have HPA axis dysfunction or low morning cortisol levels.

It has almost no relationship to chronic stress or chronic fatigue. I've looked very deeply at the literature on this, and this could be a long answer.

So in the interest of maybe avoiding that, the very short summary, I've looked at lots and lots of different, types of chronic stressors, everything you can imagine from psycho social stressors, job stress, relationship stress, generalized, psychological stress to, physical and metabolic stressors like cigaret smoking and alcohol consumption and, unemployment, stress and stress from metabolic conditions.

Like, like you if you some people conceptualize, like, let's say, chronic high blood glucose as a type of metabolic stress. So you can look at type two diabetes that has existed for decades in relationship to cortisol levels.

And any other even physical overtraining from from over exercising. You can look at any type of stressor you want, any type of long term chronic stressor in relationship to cortisol levels.

There is no point with any of them that we see a link show up with abnormally low cortisol, or any sign that any of these types of chronic stressors are translating into what could be termed adrenal fatigue or adrenal exhaustion, where you're seeing a flat lining of cortisol.

In fact, virtually all of these stressors are linked with significantly higher levels of cortisol compared to people who don't have that chronic stressor in their life.

There are some exceptions. For example, you could find certain links with like PTSD, which arguably isn't really a chronic stressor, but is it is a condition.

PTSD is generally linked with lower cortisol levels. Athlete in terms of physical overtraining, with athletes, you know, there's there's like 15 studies maybe that have been done ever on that, like maybe four of them shows a slightly lower cortisol levels.

Several of them show slightly higher cortisol levels. Most of them show no link. So but in general, there is no body of literature that supports the idea that chronic stress really have any type wears out the adrenal glands and causes low cortisol levels.

What what happens is in general, it causes adrenal gland hypertrophy. The gland grows and produces more cortisol chronically in response to chronic stress.

Now, low cortisol levels do exist in certain situations. There are things that can cause it. Antidepressant use is known, for example, to lower cortisol levels.

Certain toxins are known to lower cortisol levels. The biggest cause by far is a night owl chronotype. Simply going to bed late at night will massively lower your morning cortisol levels, and this has been shown in people who don't have fatigue and don't have any other health conditions, but who are simply night owl chronotype.

If they go in and get their their cortisol levels tested, they will have morning cortisol levels that are considered to be abnormally low and would get them diagnosed by a practitioner who believes in adrenal fatigue would get them diagnosed as having adrenal fatigue, and they don't even have any symptoms.

They don't even have any fatigue. They're just night owls. So, that's that's by far the biggest and most robust, factor that we know is linked with low cortisol levels.

But again, I think this question is mostly just focusing on the wrong thing, because we already know that abnormal cortisol levels don't even exist in the vast majority of people with chronic fatigue.

So solving that problem doesn't translate into solving the fatigue problem. So how do we solve the fatigue problem? How do we know if we have healthy mitochondria function or not?

It's a good question, especially because we don't have great tests for it. Right. I I'm, I'm this I'm going to suggest something kind of primitive. Do you have good energy levels or not?

How to Assess Energy and Fatigue

Okay. Do you need a test to show you if you have good energy levels or not? If you don't have good energy levels, something's off with your physiology and I would say I just want to interrupt, like, because I just find in practice it's really important to define things like what would you consider good energy levels, what would that look like in a day?

Because I think we need a baseline of what that really means. Look, it's energy is something that is a proxy. It's it's something like love or happiness.

Right? It's something that we all know is a thing. But it's very difficult to measure and quantify objectively. Okay. And what a lot of people are doing is trying to find some kind of biochemical correlate that has ostensibly has the appearance, the facade, I would say, or the illusion of saying, oh, yes, now we're measuring objectively this, this thing.

But like, if you ask me if I asked you, let's say, what are the biochemical correlates, what tests can you run to show me that you're truly in love with your husband?

Or what tests can you run to to show me? Are you happy or depressed? You can't run any tests to make those determinations. We're talking about, functional outcomes that are a mixture of many, many complex layers of physiology.

And you can't yes, you can run tests. You can run a microbiome test, and you can find an abnormality here or there, even if the test is legitimate, most of them are not.

But you can run a food intolerance panel or you could run lots of different tests and you could find abnormalities. Just because you find something doesn't mean it's the explanatory factor in your fatigue, because whatever you're looking at when you test that biochemistry is a small picture of what's overall going on in your biochemistry.

So let me give you a, some more concrete data. There was a paper published in the American Journal of Family Physician, and this was a paper, maybe about ten years ago is a paper that is was published with physicians in mind.

And it was it got a set of guidelines for physicians on how to treat their patients with chronic fatigue. Okay. And, this paper is very insightful in a lot of ways.

Not not because it has useful content, but just to illustrate how little they understand about this topic. But one of the things they say in this paper, amazingly, is as far as testing how patient how doctors should test their patients with chronic fatigue.

They said, you know, basically run a standard lab test, only do other tests if there is a strong indication, like if you suspect tuberculosis, run a tuberculosis test or something like that.

But in general, standard lab testing. And then they literally say in this paper, if you want to look it up, it's called fatigue. And overview, published in the American Journal of Family Physician.

They literally say in this paper, only in 5% of cases is anything found on lab testing that can explain the chronic fatigue symptoms. That means, I just want people to understand this.

People have fatigue. They're suffering from fatigue for maybe months or years. They go to the doctor. They think all this sophisticated, cutting edge science and technology exists.

The doctor's just going to take a blood sample, and they're going to run it through this technology. They're going to give me a report and that reports can identify all the, you know, the specific things that are causing this fatigue.

Well, 95 out of 100 people who go to their doctor with chronic fatigue get lab tests that essentially say, you know, this looks mostly normal. I can't find anything here that explains your chronic fatigue.

95 out of 100, okay. And you measure they're measuring lots of things, but they're not detecting, you know, in 5% of cases maybe they detect anemia or hypothyroidism or something like that, that that can explain it.

But 95 out of 100 people don't have anything show up on those tests that can explain it. So yes, more comprehensive testing can bring that fraction up, but more comprehensive tests.

This gets into another discussion, but there are lots of tests in the functional medicine realm that aren't valid or accurate or repeatable tests like I've done split testing on microbiome tests, for example, with the same stool sample, where different tests using different technology give me radically different and contradictory results.

That's not good data that I can take action on. I don't even know which of those tests provided accurate information that I could potentially do an intervention on.

It's junk data that's non usable unless I know the test is giving real information, I can't use it there. Similarly, you know, I have a friend doctor Alan Christianson, who's published different tests on the same individual hormone tests, blood versus urine versus saliva.

And they give totally contradictory data, you know, so, like how what tests you use and, you know, the accuracy of those tests plays a huge role in this, too.

And there's there's a problem here because people think, just because I have a report that shows information on some sample that was taken from my body, I assume this is very scientific, but people don't realize how much of that is not good science.

So going back to this question, I would argue, do you have youthful energy levels or not? Do you have energy levels like you had when you were young, or do you desire more, more energy?

Do you feel like you crash in the afternoons? Do you struggle to find energy to do things like, we don't need to overcomplicate this because we don't even have good enough science to to say where I can.

I wish we did, but it would be great if I could say yes. Just run this test, and this test will objectively energy, identify how much energy you're producing at the cellular level.

We don't have that. So I think, we've greatly overvalued tests with questionable legitimacy and accuracy, and we've greatly undervalued simple self observation and, like, just recognition of our signs and symptoms.

And, you know, what's going on with our body like that. That is very useful. And I think you'll agree that a skilled physician uses that information. And it's a big part of of the work they do.

Absolutely. Yeah. I think that, if we're getting the proper amount of sleep and we can wake up with a spring in our step, and I think what I noticed a lot with women and men is that often we're pushing and we say we have good energy, but we're just pushing through or we're crushing on caffeine.

And when given the opportunity to lie down, we just crash because we're just running on this false energy. And so wouldn't it be great if if you could solve the the fatigue epidemic by just telling people to consume more caffeine and stimulants that make my job easier?

Structure, Aging, and Mitochondrial Health

I mean, we all we all think, oh, it gives us energy. But actually people don't realize that it actually lowers your baseline energy levels. And then you need more and more and more.

So for the women listening, what? I mean, as we age, we're losing hormones, we're losing mitochondrial function. How do we prevent this? How do we how do we grow bigger, stronger, happier, healthier?

My dear mitochondria, what are what are the things that the women listening can implement and start doing? Yeah. Well there's a there's a subtlety to how you phrased your question that I think is excellent and that, that, feeds into the answer that I want to give.

I think that for many decades now, we've all both within conventional and alternative and natural health circles, we've been locked into a kind of paradigm of health that sees everything through the lens of biochemistry.

That is about the micro level mechanisms of what's going on with this receptor and what's going on with this molecule and that molecule and this, this cascade of, of, biochemical reactions.

And, you know, looking at things at that level, I think that we've forgotten something that's really important, which is how much of our health and the function, including the biochemistry of our body, is actually dictated by structure, by dictated by the actual physical structure of our body.

Structure dictates function. So, for example, if on a bicycle I use, hexagon or triangle shaped wheel, that bicycle won't work very well. Structure dictates function.

If I want the bike to work, it's got to be a circle. And our our physiology is very much like this. When we have structural problems, it controls function.

So I'll give you a few ways of thinking about this for reference. Let's say I go to the gym frequently. My background's exercise science. So this is sort of my preferred analogy.

If I go to the gym frequently and I lift heavy objects, my body will engage in adaptation to that stress where it builds bigger, stronger muscles that are capable of lifting heavier objects.

Structure allows for higher function. If I break my arm and immobilize those muscles in a cast for a couple of months, the muscles will do the opposite.

They will atrophy. Two months later, when I get the the cast sawed off at the doctor, I will have very small muscles

that are very weak because the structure doesn't allow for them to be strong.

Similarly, another thing that's dictated very much by the sort of mechanical stress on the system is our bones. So if somebody, you know, we know, for example, that if somebody has bedrest, like in a hospital for just seven days, we can measure just in one week, we can measure and noticeable decline in their bone density.

And on the opposite side, if you subject your body to weight bearing and, you know, going to a gym and things like that, doing other weight bearing activity in sports, the bones become denser, right?

If that weak bone that's fragile is subjected to stress, it might break, right? If you fall, if you're a 65 or 70 year old person and you have a fall up now, you've got a broken bone in your hip or your leg or something like that.

Whereas if you have dense bones, it holds up. It doesn't break. Right. Structure is important for function. This principle extends to every level of our physiology.

Our brain engages similar adaptations in response to, for example, cognitive stress, where it increases how robust the neural networks are. And this is something in the literature called cognitive reserve capacity, which we know is strongly, preventive of dementia and Alzheimer's.

By having more robust physical structure in the neural networks of your brain, your brain becomes resistant to dementia in the same way that stronger muscles, bigger, stronger muscles are resistant to sarcopenia and physical frailty.

That same principle. I could give you many more examples, but it extends all the way down to the mitochondria. And the mitochondria, like our muscles, become physically larger and more robust when they are stimulated, when they are challenged and physically they shrink, they atrophy, and they even die off.

You lose mitochondria if you don't stimulate them. This is a physical, structural issue. In the same way that the examples of muscles I gave a minute ago, the only problem is it's less easy for us to see because it's happening on a much smaller scale.

But I want to emphasize it's not purely a biochemistry issue. It's not just you can't fix it by taking a drug that alters your biochemistry. And in a certain way, it's not just the mitochondria that are quote unquote dysfunctional.

Mitochondria dysfunction is sort of a hot, a trendy phrase these days. But it's it's not purely like we think of mitochondria, sort of the static entities that are there that are either damaged and dysfunctional or functioning well.

But that's not really the whole story. The whole story is are they big, strong mitochondria? And do you have lots of them or are they small, weak, fragile mitochondria.

And you have very few of them. So we know the average 70 year old has lost 75% of their mitochondrial capacity. And this is like going from a Ferrari V8 engine in your cells to a moped engine in your cells.

From the time you're 20 to the time you're 70. We also know that 70 year olds who are lifelong athletes and exercisers do not lose 75% of their mitochondrial capacity.

They have the same mitochondrial capacity as a young adult, which means that loss of mitochondrial capacity is not a natural normal product of aging. It is a product of our lifestyles that are devoid of challenge to the mitochondria.

So what I what I want to, suggest to people is to get out of the mindset that functioning better, having more energy, for example, is purely a matter of altering your chemistry.

In in the sense of like taking a drug, let's say, or taking something that has an anti-inflammatory effect. You want to think about altering the physical structure of your body, right?

It's it's very difficult to find somebody with really good body composition, who is lean, who is muscular, who has robust heart and respiratory health.

And as a result of fitness, as a result of a high VO2 max, as a result of building those capacities, who is really unhealthy, right? Right. It's very easy to find people who do not meet those criteria who are very unhealthy.

And it's extremely rare to find somebody who has who doesn't meet those criteria, who's who's healthy. So, the, the mitochondria, there's a structural issue here that's very important.

And what I want to encourage people to think about is how do I start to engage in the things that stimulate my physical structure of my mitochondria to grow bigger and stronger, to sort of move back towards my youthful Ferrari V8 engine in my cells, and seeing that the size of the engine in my cells as the critical determinant of, my energy levels.

Perfect perfect, perfect. So just in conclusion, to wrap it all in a nice little ball, if you had, you know, move your body what would you, what would you want the women listening to start doing.

Hormetic Stress and Rebuilding Cellular Resilience

Okay. So the key question is, how do we do that? How do we build up those, those mitochondria? And, the the answer is you have to provide a bio energetic challenge to the system.

So like, muscles grow bigger and stronger when they are challenged to move heavy stuff. Mitochondria grow bigger and stronger in response to being energetically challenged.

What happens when you provide an energetic challenge to the system? When you do something that requires a lot of energy, is those mitochondria throw off a lot of free radicals, a lot of reactive oxygen species, which we're all taught to think of as bad.

We used to think of as bad. But now the science has evolved to the point where we know that those free radicals are actually vital signaling molecules that tell the mitochondria to grow bigger and stronger.

So we need that. And actually that effect is, for example, blunted by taking antioxidants in tandem with, let's say, exercise. So what we need is what's called hermetic stress back into our lives.

We live a modern in a modern lifestyle that is devoid of the ancestral stressors that we had, where we were exposed to the elements, to heat and to cold, where we had to move our bodies to acquire food.

And travel long distances by walking or running or some combination of the two, occasionally sprinting or engaging in intense bursts of effort, and intent and sometimes in combination with heat or cold, where we had to deal with periods of hypoxia, low oxygen levels in our body, where we had to encounter phytochemicals that provided what's called a xeno or medic stimulus to the body or an exercise mimetic effect.

These things were ones built into our lifestyle, sun exposure and read in near infrared. Light therapy is another example of this. These things were built into our lifestyle ancestrally and now modern humans have what are called in evolutionary biology, mismatch diseases, which and these represent the vast majority of diseases that are killing us.

And chronic fatigue is part of this killing and disabling and mismatch diseases are a mismatch between how our biology, how our genetics, what our, our genetics have evolved for and how our biology is designed as a result of thousands of generations of, human procreation and the modern environment.

So when you get a mismatch between what your genes are evolved for and what they require to express health and the environment you're living in, you get dysfunctional biology.

And that's what the vast majority of our current disease burden, including chronic fatigue, is so a big, big part of that is the loss. Living in antiwar medics lifestyle lived the loss of these different challenges, these different hermetic stressors that were once embedded into human life.

Now we live a lifestyle where we don't have to move anywhere to acquire food. We can sit on our butts and move five feet, or to a refrigerator and all our food and a huge abundance of very calorie dense food is waiting for us.

We don't have to engage in effort. We sit in climate controlled rooms, all these, these layers of access stresses that are the key things that stimulate our mitochondria and keep them robust have been removed from the modern lifestyle.

So if you think back to what I was saying before, two months of muscles in a cast atrophying to half the size imagining, imagine what not just two months, but years or decades of lack of stimulation of your mitochondria does to your mitochondria massive massive atrophy of that system.

So a big part of the recovery here is about reintroduction of these hermetic stressors into your life slowly and in baby steps, and then cautiously without overdoing it and building up systematically and progressively so that you can rebuild a youthful cellular engine.

Perfect. Yeah I'm sitting here chuckling because I'm in the middle of we have a 7000 square foot clinic opening here in Scottsdale. And I'm like we have this whole hermetic I didn't think of it that way until you just start saying it.

But it's like we have this whole hermetic stress where you can come and jump in the cold, you can sweat in a sauna, you can get laser and red light. We have hypoxia training that we're bringing over from Germany.

And so like it's like now we have to go somewhere to do it because we live these past lives. And so but the important thing is that, you know, I mean, there are some benefits to the to the lives we live now and that we're not out stocking saber tooth tigers, but that we have to really realize we have to bring that in.

We have to make an effort to bring it in, because if we just stay in our homes and we don't go out and see the sun and we don't move our body and we don't challenge ourselves, then everything that you've just talked about is going to happen.

And so it's it's up to us. We have to. Exactly. Yeah. And if I can add one layer to what you said there, there's, there's a you could call it a hypothesis, but there's a lot of research that supports this.

There's a lot of researchers who argue that it's sort of in the evolutionary biology frame that the evolution of intelligence itself, like human intelligence, is largely the result of hermetic stressors, is largely the result of our species trying to solve our own discomforts, our own issues of food shortage.

Okay, what do we do when we have to deal with occasional famines and droughts and periods without food? Let's invent farming and let's invent refrigerators and food preservation, right?

Using our brains to solve these kinds of problems. But now we've eliminated food shortage and food scarcity from our life, which turns out is really important to metabolic health.

How do we eliminate having to exert so much effort to acquire food and hunting and gathering so much? Okay, let's bring the food closer to us. Right. We invent all these solutions.

How do we avoid the discomforts of cold and heat? Okay, let's invent clothing. Then. Let's invent climate controlled environments and homes. Right? We've solved all of these problems using our brains.

And this has been the driving factor for the evolution of intelligence itself. What? Right now, we are, ironically, in a position where we have to use our intelligence that has evolved over these millennia to understand that solving all of those problems, the removal of all these hermetic stressors from our life, which drove intelligence development

in the first place, is now causing massive health problems.

So we have to use that evolved intelligence to now consciously and intentionally reintroduce all of those ancestral discomforts and stresses that we once had embedded into our lives that were such a great annoyance to us that we went to such great lengths to solve and the human condition always so fascinating.

Yes, I think that's a great place to stop and let you all kind of ponder that, because there's a lot to ponder there. Well, where can I mean, we've got a lot going on here.

Where can the ladies learn more? Because I'm sure they want to. Yeah, they can go to my website, the energy blueprint.com and, and my new brand that I just launched is called Human Optimization Icon.

Of course it's called that perfect. Perfect title for you. Well thank you. It's always a pleasure. I always get my brain stimulated and learn a lot and evolve my own intelligence when I get to hang out and listen to you.

It's always such a pleasure. Doctor stills, thank you so much for having me. Thank you for being here. And thank you, everyone. So, you know, a little a little self, self control.

Now we have to kind of, you know, say what are we going to do. What are you going to turn off this? Because there hasn't been a lot of hermetic stress sitting in front of the computer, unless you're listening while you're out hiking or something.

But what can you do to bring a little more hermetic stress into your life? Sounds like the opposite of what we'd be telling you, but stress can be good in the right, in the right amounts, and in the right way. So.

All right, so go get go get stressed and we will see you soon.