Introduction to Mitochondria and Energy

Hi, and welcome to another episode of the Healing Lyme Summit. I'm your host, Dr. Myriah Hinchey. And today we're going to be talking about the mitochondria, which is the powerhouse of the cell and how it is involved in a lot of the chronic fatigue that a lot of Lyme patients suffer from.

We're also going to talk about how to optimize the function of the mitochondria and therefore increase energy production. So with me today, I have Ari Whitten, who is a natural health expert and bestselling author, and he's going to talk to us about a few programs and therapies that we can use to increase the health of the mitochondria.

So welcome, Ari. Please tell our audience a little bit more about yourself and how you came to specialize in optimizing energy. Sure. Yeah. Thank you for that.

it's a pleasure to be here, by the way. I think. I could tell a very long story about my personal background.

Ari Whittenu2019s Background in Human Optimization

The very short version is that that health science has been my passion and my obsession from a very young age, from the time I was about 13 years old.

Given that I was kind of I had a background as an athlete. And, when I was a teenager, I was very into bodybuilding. starting as a teenager, I should say. And, That.

Whole world was something that I became very passionate about. How do we. Optimize athletic performance? How do we optimize body composition and fitness and develop bigger, stronger muscles?

Become leaner? So from the time I was 13 or 14, you know, I was already reading college level physiology, textbooks, biomechanics, exercise physiology, nutrition, and doing a lot of self-experimentation.

my older brother was a bodybuilder who was mentored by a professional bodybuilder. So I was kind of in that world from a very young age. And, and those were really bodybuilders are really the original Biohackers.

they. Were the ones injecting themselves with all kinds of crazy chemicals, you know, all the way back in, like the 1970s, decades before Biohacking became a term.

Not. And don't get me wrong, I'm not, advocating for any of that. I've never done any of it myself. But what I am saying is there is a lot to be said, I think, for, self-experimentation and for experiential knowledge of human physiology rather than just classroom knowledge of physiology.

It's one thing to sit in a classroom and memorize facts for passing in anatomy or physiology or biochemistry or immunology test. It's another thing to have decades of experience.

Experience actually changing your own and other people's physiology in real time. so you know that that was my origins, starting from a very young age.

And I went on to do a bachelor's degree in, in exercise science. lots of, certifications in exercise science. I was a personal trainer. I was a nutritionist for many years.

and. I've. I also have a lot of extensive graduate training in clinical psychology, as well as a Master's Degree in Human Nutrition, and functional medicine.

So, yeah, that's a very short version of my background. But basically, at this point, 30 years of really dedicated and obsessive study and implementation and working with thousands of people in the realm. Of, Human Optimization.

That's great.

What Conventional Medicine Misses About Chronic Fatigue

And it's like it's all of the different trainings that I believe you need to kind of like bring it all together and actually be able to change somebody's life, which is the most important part, like being able to just put that into clinical application.

Absolutely. Yeah. I agree. So what do you think conventional medicine is kind of missing when it comes to, you know, whether you want to look at it from a positive side of energy optimization or if you want to look at, I mean, even Lyme and co-infections aside, like this, this epidemic of, you know, of just fatigue and lethargy and poor energy and poor functioning of our bodies.

Yeah, it's. A big question. I would say the meta level answer to that is they're they're missing a lot when it comes to most, most health problems. Over 80% of the chronic disease burden are comprised of.

What are called diseases. Of civilization, which results from a mismatch between the way that human biology and genetics are designed, what kind of environment and lifestyle we. Are.

Biologically designed for, and that we biologically require in order for our body to express optimal health? The gap between that and the world in which we live.

So 80% of the chronic disease burden, things like heart disease, most cancers, obesity, diabetes, most dementia, neurodegenerative diseases, stroke and cerebrovascular diseases, and a long list of other things are the result of this mismatch, between what our biology is designed for in the world and the way.

That we live. The only way that we can properly understand human health when it comes to that 80% of the chronic disease burden is through the lens of evolutionary biology.

So the the meta level answer to your question is they're missing a whole lot because they don't understand human health through the lens of evolutionary biology.

It is not looked at in that way. Instead, it's looked at through a biochemistry and pharmaceutical centric paradigm. Where we. Look and disease centric paradigm where we look to find the specific diseases, and then we zoom in at the micro level and we figure out what specific mechanisms, cellular, molecular, biochemical mechanisms are off in this particular disease state.

And then we say, oh, you know, heart disease, it's the LDL or it's the depression, it's the serotonin. It's this receptor and that receptor. What if we now go into a chemistry lab and.

Develop, A synthetic chemical that can interrupt or modulate or. Block. Whatever that mechanism is, and therefore we can try to undo this disease state.

And, so I think in general, that approach and that style of thinking, that paradigm of human health. is. For most health problems, a highly, highly ineffective way of trying to improve health.

It can work in certain contexts. It works really well when it comes to infections. It more broadly, like a historically, I will say, in the context of like big breakthroughs for treating bacterial infections that used to be commonly deadly became neutralized in large part to the end due to the antibiotic revolution.

And that was a huge breakthrough. That was the biggest breakthrough of modern medicine. It's like. What's. The bad guy in this disease state? How can we develop a chemical that kills the bad guy?

And it can work in that context of certain infectious diseases? but. When it comes to diseases of lifestyle, that approach really doesn't work well. So that's the big picture context when it comes to chronic fatigue specifically.

I mean, if you look at what conventional medicine offers when it comes to chronic fatigue, they basically don't have any clue. And they I mean. I'll give you.

I'll give you some specifics as I'm not trying to I want to be charitable and I want to be accurate. I'm not trying to be mean when I say they don't have any any clue.

I'm just saying they they literally don't have any proposed conceptual framework, evidence based framework to even understand the physiological causes of chronic fatigue or any real scientific framework for how to treat it and how to resolve it.

there's a paper, maybe it's 5 or 10 years old at this point. It was published in the American Journal of Family Physicians, and it was called Fatigue.

It is called Fatigue and Overview. And it's basically a set of evidence based guidelines. For. Physicians like the. This paper is intended for physicians as a framework, as a, as a set of evidence based guidelines for how they should treat their patients with chronic fatigue and, basically, it says a couple of things that are really interesting.

One is when it talks about testing, it says, you know, there are no specific tests that we recommend doing for patients with chronic fatigue. we recommend doing standard, blood tests.

You know, the standard, the routine blood lab tests that that would be done for most people. And then it goes on to. Say only. In 5% of cases. Are is.

Is anything even identified on those lab tests that can explain a person's fatigue? So in other words, 95 out of 100 people. Who go. To their doctor complaining of fatigue, they get their blood tested and under the impression, oh, wow, this, this, you know, medicine is so advanced, my doctor is going to figure out why I'm fatigued and we're just going to take some a blood sample, and that blood sample is going to show the specific abnormalities that are going wrong that's causing this, this symptom of chronic fatigue.

And then they're going to have the solution to fix it. Well 95 out of 100 people, basically they have their blood test drawn, their blood drawn, and then they get their test back and they get a report that tells them nothing of value.

and in 5% of cases, maybe you're told, oh, there's some anemia present or you have diabetes or hypothyroidism or something that could explain it. But 95% of people don't have anything on the blood test that can that is, has explanatory value for further chronic fatigue.

As far as treatments, they. They, Offer four different treatments that are supposedly evidence based treatments. in in this paper, one is.

Why Adrenal Fatigue Doesnu2019t Hold Up

Cognitive behavioral therapy. One is antidepressant drugs. One is, recommendation to go for 30 minutes of walking per day. And the other one is use of stimulant drugs as needed.

And those are literally the four things that are mentioned in that paper zero mention of nutrition, zero mention of circadian rhythm and sleep, zero mention of every other aspect of lifestyle.

Yeah. It's it's sad. It's it's dismal. Yeah. So all of the things that you said right. Typical. They're going to look for anemia. They're going to look for a thyroid issue.

that's usually about it, you know, now you we get into the functional medicine realm and some doctors will do adrenal evaluation. And I know that you've done quite a bit of work on debunking.

Right. The whole like adrenal fatigue as a, as a cause of chronic fatigue, or low energy. So tell our listeners a little bit more about, your, your thoughts on this, as well as the research that you have found to actually back your position up?

Yeah, this was something I did. many years ago, maybe at least 6 or 7 years ago, probably. No, maybe more than that. and it angered a lot of people in the natural health and alternative health and functional medicine circles, because especially at that time, every, every practitioner was really all about adrenal fatigue.

times have changed. A lot fewer people are talking about it now, and I think I probably have some at least a small part in helping to shift the the narrative and the thinking around chronic fatigue.

but I spent, I didn't I didn't set out with this intention, but I ended up spending about a full year of my life, doing nothing but exploring the scientific literature on this topic.

I read, and I don't think it's an exaggeration to say this. I read, I think. Every scientific paper. That has relevance to this topic that has ever been.

Produced. and so over three decades of study by researchers all over the world. That. Looked at this question of what is the relationship of adrenal function, cortisol levels, HPA axis function more broadly, hypothalamic pituitary adrenal axis function, and chronic fatigue symptoms.

So given that I spent a year of my life on this, I could potentially talk to you for many hours on this topic. And I've published online. over. 100 pages of reviews of the literature with quotes and screenshots of the studies.

over 70 studies. That. Have been done over the on this. But I'm going to try to summarize this year of my life into, a few paragraphs. So, Basically, if I can summarize that body of evidence, I'm trying to remember the exact numbers of studies, but it's something like approximately, 20% of those studies that tested this found a link on, that actually let me step back.

Okay. The majority of what these studies do. Is they take people. Who have chronic fatigue symptoms. Okay. And first of all, in the scientific literature, it's worth noting that there are almost no studies that even exist on the phrase adrenal fatigue.

It's not a recognized medical, syndrome. and within conventional medicine, they I mean, there's papers now on this. There weren't at the time I did this, but, there's papers where conventional medicine and the largest bodies of endocrinologist hormone specializing doctors basically outright say there is no such thing as adrenal fatigue.

Okay. Now that way of thinking or that that position, that claim is within a lot of natural health, alternative health and functional medicine circles.

It's kind of like, oh, you know, those conventional doctors, they don't really understand. They, they they just don't get it. But in reality, those doctors.

Do get it. Not all of them, but they they have seen the literature and the literature. They are correct in stating that the literature does not support the existence of adrenal fatigue.

The reason. We know that is because of these decades of studies that basically the gist of what most of these studies do is they take one group of people.

That. Has these symptoms, chronic fatigue symptoms, okay. And this because there's no studies on adrenal fatigue. What they do is they take. People. With other recognized syndromes that are considered legitimate medical syndromes.

And there's a few different syndromes that are that have relevance to this. One is called burnout syndrome. One is called clinical burnout. One is called stress related exhaustion disorder.

One's called vital exhaustion. And then we have studies on, chronic fatigue syndrome as well. And we can sort of lump all of these under the banner of, you know, there's differences in the symptoms between them. But all of them have this general idea that kind of overlaps with the idea of adrenal fatigue, that chronic stress leads to fatigue.

Okay. The difference being that adrenal fatigue specifically says chronic stress leads to fatigue by virtue of exhausting your adrenal glands. Ability. To produce cortisol.

And that, specifically, is the physiological mechanism. By which we get fatigued. Right? We exhaust the HPA axis system or we exhaust the adrenals. Then we have a cortisol abnormality.

And that is sort of the central physiological basis of this set of symptoms, chronic fatigue in particular. Whereas these so that's adrenal fatigue. These other medical syndromes say well yeah of course stress can result in chronic fatigue.

But they don't posit a mechanism. They don't they don't explicitly say it's because of XYZ mechanism in the body. Right. They have nothing to do with cortisol specifically.

So with that said. The basic gist of these studies take a group of people with these symptoms with chronic fatigue, take another group. That is. Age matched and demographic match, same gender, same everything.

Control for variables like smoking and drinking and, you know, obesity and whatever else. And see if the group that has chronic fatigue symptoms actually has an abnormality in cortisol levels or in HPA axis function.

There's different studies test this in different ways, but the majority of them just test cortisol levels. And if the adrenal fatigue hypothesis is correct, it is actually an extraordinarily easy thing to prove.

Right. And and what we would see if it's true that chronic stress leads to fatigue by virtue of exhausting the adrenals and causing cortisol abnormalities or low cortisol.

Is every. Every one of those studies, or at least the vast majority of those studies. This is science 101. Okay. It's very easy to prove this hypothesis.

if this is. True and this is what's mediating these symptoms, then people with those symptoms. Would have. Cortisol abnormalities. Right? So, what that body of.

Literature and again, there's decades of studies on this. What it shows is that the vast majority of people with these symptoms, with these, whether it's chronic fatigue syndrome or burnout syndrome or clinical burnout or whatever else, whatever other syndrome, the vast, vast majority of these studies find no discernible abnormality in cortisol levels or HPA axis function in.

The people with With the fatigue or with the burnout, or with the chronic fatigue syndrome. Okay. And to put some specific numbers on it. there were 50.

Seven individual studies. That. Had been done. on. Lumping all these conditions together, 15 of them showed. And on average, the people. With, with. The chronic. Fatigue had slightly lower.

Cortisol levels, not even a cortisol abnormality, but a significant difference from the control group where it was on average, a bit lower. 11 of the studies showed the exact opposite, finding that on average it was a bit higher in the people.

With. Chronic fatigue. Or burnout. And 33 the vast majority of the studies showed no discernible difference whatsoever. So you could not detect who had fatigue and who didn't based on looking at their cortisol tests. So, In any other area of science, this would be considered a totally invalid biomarker for fatigue.

It is it is very obvious from that body of evidence that this. But this cannot be a biomarker for fatigue, that like you

cannot use this as an indicator of a person's fatigue.

And certainly what that evidence indicates is that there is no reasonable, evidence base to make the claim that the physiological reason people get fatigued is due to adrenal or cortisol abnormalities.

In fact, that evidence base disproves the hypothesis. It shows that the people can have fatigue without any abnormality in adrenal function or HPA axis function or cortisol.

And indeed, not only can they, but the vast majority of people with. Fatigue do have fatigue. Without any abnormality in adrenal or cortisol. Function. Right.

And so I know, or at least I sense, I assume we're going to get to kind of like the point that it is mitochondrial dysfunction. But for people who are listening because it's not I can just imagine how someone would be thinking, okay, but okay, if it's not the adrenals though necessarily causing the fatigue, could it be the adrenals negatively impacting the thyroid?

And then this, you know, clinical hypothyroidism, it's causing the fatigue like was that piece. And I don't want to go off on a whole tangent about it.

But like was that piece evaluated to or like do you have just for the people who are listening and wondering this, do you have sort of like a response to that piece of it?

I mean, it's it's basically just a claim that doesn't really have. Any. Evidence base for it. Okay. It's a it's. A claim that. Is. Seen in certain functional medicine circles.

just. As adrenal like some many functional medicine practitioners for the last 20 or 25 years swore up and down that they were certain. That fatigue. Is caused by adrenal and HPA axis abnormalities.

But the research shows us that's not true. it's like. Basically there are certain things that that become trendy over time. And adrenal fatigue was something that trended for a long time.

Then it's kind of fallen out of fashion. Thyroid stuff was trendy for a while and everybody was like, oh, it's, you know, if you've got this problem, it's your thyroid.

That's the problem. It's really not how the body works. Things think like individual glands and hormones don't function in isolation. And they're not the most upstream things that control our physiology.

so and. To answer your question specifically, no, none of the studies that have looked at adrenal and cortisol and HPA axis function also consider the thyroid.

That's that's not a limitation of my knowledge. That's a limitation of the actual evidence. And all the research that's been been done on the subject, those studies do not assess thyroid function because nobody thought it was worth assessing.

Nobody thought it was. That was an important variable. Now you can dig up a few studies here and there on thyroid function in relationship to chronic fatigue.

And what you can find is that. People with. Hypothyroidism certainly can have fatigue as a symptom. Of. Hypothyroid or hypothyroid Spiritism, or lots of other medical conditions.

but. The vast majority of people with chronic fatigue do not have thyroid, thyroid abnormalities. So this is another thing that's again, it's kind of like it became trendy for a long time for people in natural health and functional medicine to say it's all about the adrenals, it's all about the thyroid.

But the the basis of evidence backing up those claims is really lacking. I see this much more as just like a trend

more than anything is like this Xyzzy practitioner says it's all about the thyroid or the adrenals.

So and they do a lecture on stage at a conference and then all these other practitioners start implementing it, and then it spreads to more and more practitioners.

And soon everybody's talking about the thyroid and the adrenals, and nobody. After a decade of this, nobody bothers to actually go look in the primary literature if any of it actually has a sound evidence based.

Mitochondria as the Driver of Energy and Stress Response

Right. So so let's get to the mitochondria then, because I know that you want to talk about that. And in the realm of Lyme disease, it's super important because mitochondria is in every single cell in the body.

And I think that it's one of the key links as to why Lyme affects every single cell of the body and every single organ and organ system, and therefore system in the body.

Right? So we know that there are various toxins that Lyme releases and various cytokines and cell damage and all of this. And, you know, it's all very, very toxic to the mitochondria and inhibits its ability to function normally.

So I would love for you to talk a little bit more about the mitochondria and how you think that relates to fatigue, but also then from a positive side, you know, optimizing energy production.

And then, let's talk about some therapies and things that we can do to really enhance mitochondrial function. Sure. So. First of all, it's it's interesting just to like I think some some bigger picture comments.

So the human body is composed of a lot of different parts. And all of those parts are essential in one way or another. And you will have problems. If you.

Start to remove some of those parts, or if a particular part is dysfunctional. So if you think of a car as an example, If I like if I. Remove. The wheels of the car.

The car is going to have a hard time driving down the road. If I remove the tires, it's going to have a hard time driving. If I remove the spark plugs, it's going to have a hard time driving.

If I remove the frame of the car somehow, or the engine block, or the pistons or any number of other parts that cars or the fuel, the car is going to have a hard time driving, but there's lots of parts that are necessary for it to function.

But there's a difference between something being necessary, such that if there's dysfunction in that part, it causes a problem versus what is actually the most upstream thing that is regulating the function, that is making decisions about how that car should function.

and you can think of that as the driver in the driver's seat that is deciding to turn the key to start the engine and to either press the accelerator pedal or the brake and how hard to press it.

So the question is, in human physiology, what is what is doing that what is the most upstream thing that is regulating other things? Right. Because if you.

Remove a person's thyroid gland, you're going to have a lot of problems. If you remove their adrenal glands, you have a lot of problems. If you remove their colon, you've got a lot of problems, right?

There's lots of parts that are necessary. What's the most upstream thing that's regulating function of the body. And there's different aspects to that story that the brain is involved.

The nervous system is certainly involved in that. but. The one of the, the key upstream things that regulates how our metabolism works, it turns out as a result of a lot of research, really in the last decade or 15 years or so, it turns

out to be the mitochondria.

And we originally had this kind of conception that you and I learned about in, in high school and college and graduate. School. Physiology and biology courses, that was sort of mitochondria as the powerhouse of the cell.

And we learn about them like they're. Sort of. These mindless energy generators that just take in carbs and fats and pump out energy in the form of ATP. And.

You know, based on that kind of understanding of mitochondria and what they do, it would seem that the solution to solving the problem of fatigue might be as simple as just providing more fuel to them.

If what mitochondria do. This if. 90 plus percent, almost all the energy that is produced by almost every cell of the trillions of cells in our body is coming from mitochondria in those cells.

And what mitochondria are are mindless energy generators that take in carbs and fats and pump out energy that powers those cells. Maybe the. Solution is just to provide more fuel to eat more carbs and.

Fats. Except that. Doesn't work. I was going to say there wouldn't be a problem in this country exactly where the case exactly. And actually the opposite is true.

most most people have an excess, consumption of those fuel sources, which actually turns out to be toxic to mitochondria to have an excess of those fuel cells, those those fuel sources.

But the, the bigger. Picture, and this was largely the work of a researcher at the University of California, San Diego, who runs a lab for mitochondrial medicine there named Doctor Robert Navajo.

Who wrote a. Seminal paper called the Cell Danger Response. I think back in 2014. Now it's decade old. And this was a synthesis of like decades of research into mitochondrial functions, the different aspects of what mitochondria do by done by researchers all over the world.

And he put this together into a paper and kind of synthesized it into a conceptual framework to to really create a new vision of what mitochondria are and what they do.

And the big shift in this paper was. To to reframe. Our understanding of mitochondria away from mindless energy generators that just sort of take in carbs and fats and pump out energy to.

Actually, to, to environmental sensors. They basically have a dual role. One is in energy generation, and the other one is as sensors that are designed to pick up on signals of what is happening in the environment of the body, in the environment of the cell, and based on those signals.

Specifically. Danger or safety signals, we can call them. They. Determine, they regulate. Going back to what I was describing with the car, they. Regulate what the.

Cells do in response. They regulate all these downstream. This cascade of different effects of what what's happening in the body. Based. On that. Okay. And they're deciding.

So they're in other words, they're not just the thing that produces the energy, they are the thing that is deciding whether or not to produce energy and how much.

Should be. Produced, how much should we push the accelerator pedal or how much should we push the brake? That is in. Large part. Dictated. By the mitochondria sensing signals of what's happening in the environment.

So a few minutes ago, you gave this description of what's happening in Lyme disease with all these toxins that are being dumped into the body. So, What's happening when you get that dump and when you get this chronic, it doesn't even need to be chronic.

But if you get a chronic, elevation in inflammatory cytokines, which we also see in Lyme. That. It turns out the cytokines themselves are actually sensed by mitochondria as a danger signal.

This is sort of a universal danger signal. That. Signifies to the mitochondria. The. Body is under attack in some way. And the mitochondria use those signals to say, oh, we're under attack.

We need to shift out of energy mode into defense mode. And if I can give it like a brief analogy for people to understand why this happens, because sometimes people think, well, if you're under attack, shouldn't they be producing more energy?

Well, think of it this way. If you. Are in the kitchen prepping dinner and you're chopping vegetables and you're making a nice soup and you're, you know. You've got.

That dinner prep going and a burglar walks in and puts a gun to your head and says, you know, give me all your money. You don't just carry on prepping dinner as normal.

You have to deal with that threat. So the body has basically two, two modes peacetime metabolism and wartime metabolism. And you can think of this as energy mode or defense mode.

And these two functions of the mitochondria producing abundant energy or defending against threats are mutually exclusive roles. So to the extent that they are are sensing the need to defend against threats, they turn down the dial on energy production.

And that is the fundamental reason for of of what regulates human energy levels, what explains whether we're chronically fatigued or highly energetic.

So it's kind of like the autonomic nervous system, right? You're either in fight or flight or you're in rest and digest, and you can't be in. Both that you.

Could you could say that as and there's a lot of overlap there as well, because, there's a whole field of what's called mitochondrial psychobiology. there's a wonderful researcher named Martin Picard who's kind of led this whole field of research.

But basically what this is about is the mind mitochondria link. So if you ask me. What are the stressors that can signal to the mitochondria that the body's under attack?

Well, there's a long list of things. And it can be everything from toxins. To physical. Trauma to the body to pathogens to sleep deprivation. To, poor diet, to, leaky gut.

Which causes leakage of things like LPs into the bloodstream, which is also toxic to the mitochondria and causes elevation of cytokines and also, psychological stress.

What happens in the mind via our subjective perception of events? Also, it turns out, directly influences mitochondrial function actually within a matter of seconds.

so when we are and there's been studies in this field that have shown, dramatic changes in mitochondrial function in response to psychological stress, very, very rapidly, literally within minutes of exposure to psychological stress.

So that psychological element, this mind mitochondrial link. Is hugely. Overlapping with the autonomic nervous system. Right. Are we stressed or are we relaxed.

And that also ties in to how our mitochondria function. Okay. So and this is definitely feeding into like it in many ways like that soul dangerous about that.

So that's fundamentally what it is. So all of these stressors, to the extent that you have a level of stress and

demand on those mitochondria that exceeds their capacity, that exceeds their ability to meet those demands.

The body says up. We're under attack. We're it's not just that we're under attack at some low level, okay? It's that we're under attack to a level that exceeds our capacity to handle it.

And when that happens, they shift from energy mode into defense mode into the cell danger response. Okay.

How Stressors Push Cells Into Danger Mode

So I don't want to run out of time. And I want to be respectful of your time. and I want you to be able to to tie in how near infrared light helps with this, how your energy blueprint method, you have this breathing technique, like I want you to be able to talk about all of those things.

So in as much time as you have left, try to kind of guide us through, okay, how do we deal with this? I mean, obviously we need to kill infections if they're underlying issues.

We need to detox. We need to do all of those, you know, basic fundamental things. but beyond like the basics, what are other therapies and things that, patients can do to help to not only get their mitochondria functioning normally, but to optimize their function.

So that this is, potentially huge, discussion that we could have in response to that. let me, let me deliver. I'm going to be very selective and kind of where I guide us from here.

So we. Could talk about red light, but. It's a it's a. Without some further explanation. It's a bit of a non-sequitur, you know, kind of, going off the previous explanation.

But let me let me provide the context that will sort. Of create. The links. This piece. That I was just explaining about. The. The demands on the system, demands on the mitochondria relative to the system's capacity is a really important thing to understand.

And this. Relates to GS I'll. Maybe won't go too deep in this, but, there's a common sort of way of thinking about, human health and, in natural health and functional medicine circles, and it's called the allostatic load paradigm.

It's generally a pretty good paradigm, and it basically is a model of health that says, you know, sort of health and homeostasis is our natural state.

And when we have too much stress on the system, it disrupts our ability to maintain homeostasis. And those stressors can be toxins or psychological stress or relationship stress or poor diet or sleep problems, or any number of other stressors.

And to the extent that we have too much total body stress load or what's called allostatic. Load, it will pull. Us out of health and homeostasis, and we will have symptoms.

It's a pretty good model. The one thing that it generally leaves out of the discussion is. the body's. Capacity and differences in the body's capacity to handle differing stress loads.

And there's a better model that explains that accounts for that. It's called the Homo dynamic space model. and the distinction being that that model also encompasses.

Our. Body's. Capacity to. Handle stress as a key factor in determining whether a given stress load will cause problems or not. So, in other words, it's not just the stressors that are the problem.

It's also something internal to us that can potentially be the problem. Now, let me get very specific and tie this back into mitochondria. We have this conception of mitochondria as sort of static entities in our cells.

We like we have thousands of mitochondria. Purcell. and those mitochondria just sort of stay there for life. And they can either be sort of switched on or switched off or functioning well or not functioning well.

But this description of mitochondria is largely inaccurate. And the reason why is that mitochondria are not static entities. They are highly, highly dynamic and responsive to what's going on in the environment.

And you can have, A lot of them. That are big and strong, or you can have very few of them, and the few that you have are very small and weak and fragile and low capacity.

Think of it like this. What I'm getting at is there's a structural there's a. Physical. Structural component to this, not purely a biochemical component to this. So, as an analogy that people have an easier time conceptualizing because we can we can see it at the macro level.

Easier is muscles, right? If I go to a gym and I lift heavy objects frequently for a long period of time, I will grow my muscles bigger and stronger. Conversely.

If I break. My leg or my arm and I put. That. Those muscles in a. Cast eight. Weeks later when I go to the doctor and they saw it off, those muscles will have atrophied tremendously.

There is this is not just a biochemical phenomenon. This is a physical structural problem. Okay, of of actual. Atrophy of those physical tissues due to disuse and due to lack of challenge and stimulation.

The mitochondria. Most people are unaware of this, but the mitochondria work exactly the same way when they're not stimulated and challenged regularly, energetically challenged to meet energetic demands on that system.

They atrophy. And they shrivel and they shrink and they they shrivel up and they literally die off. In response to lack of challenge on those systems.

Now. This is not a trivial thing, and we have a lot of lines of research showing that the average seven. Year old has. Lost 75% of their mitochondrial capacity.

Okay, again, it's not that's not just a biochemical phenomenon. It is a result of the physical loss of actual mitochondria. The number of mitochondria gets cut in half.

And the mitochondria that are present shrink to about half the size. And if you do the math on that, basically it's 75% loss. Of the. Energy production capacity.

Think of it like this. This is like going from when you're 20 years old with a Ferrari V8 engine in your cells to being 70 with a moped engine in your cells.

Okay. You cannot solve this issue. It's a structural issue. You cannot solve it with drugs or with supplements. You can't just it's not just a function of turning them back on.

It's not even just a function of removing the stressors on that system, because there's still a problem of having a moped engine in the cells, as opposed to a Ferrari V8.

Engine that. Ties in this. All this concept that I'm explaining ties in with the cell danger response. In. The sense that, what I'm referring to is the body's capacity to handle stress.

So I said before, it's the relationship of the total stress load on the system relative to the body's capacity that will determine whether you're in energy mode with abundant energy or you're in the cell danger response.

Right. So, this component of. Your you're. Building, your body's capacity, I find, is one of the most important and powerful and yet overlooked and unknown, aspects of human health.

right now. So this is a big focus of my work. This is what I'm writing my my current book on. but the. To make this practical. What what I'm saying is that one needs to in addition to trying to remove the stressors on the system and to do things like that are generally healthy, like try to sleep well and try to not have too much stress, and to not put toxins into your body and to drink pure water and things like that.

There is also a need to start rebuilding your cellular engine, not just take mitochondrial supplements and take B vitamins and take magnesium and take CoQ10 and things like that.

But to actually start to physically rebuild the structure of your mitochondria, of your cellular engine, and the way we do that is through challenging that system and what is often termed hermetic stress.

I. Have some issues with that, but will. Will. Generally speaking, hermetic stress is what will will challenge those mitochondria.

Rebuilding Mitochondrial Capacity With Hormetic Stress

And hermetic stressors encompass different things, different types of exercise and different types of exercise. Challenge the mitochondria in different ways.

heat. Exposure, cold exposure, things like fasting, things like breath holding practices and things like read and near-infrared light. Therapy as well.

also provide a hermetic challenge to the mitochondria. And it. Is those layers of stimulation. Which, by the way. Used to be present in the ancestral human lifestyle as a sort of as a given.

They were they are part of. The the, the. Hunter gatherer lifestyle of humans. those things have been removed from the lifestyle of modern humans. And as a result of this anti or medic or non-traumatic lifestyle that modern humans live.

the. Absence of those challenges on the system creates atrophy of the mitochondria in the same way that I describe muscular atrophy from lack of. Challenge.

And that is the fundamental driver of why we lose so much of that cellular engine and that cellular engine, for lots of reasons that I, we could go into, but we don't have time, is the basis of physiological resilience.

It's the basis of. It's it's it's. Central to. Health, And our ability to withstand stress and maintain health and homeostasis and high energy levels.

So again this is this is a really big key that many people overlook in the process of trying to recover from chronic illness. And, and one thing, just to go a little further, I will also say that Lyme and chronic.

Fatigue presents. a unique problem in the sense that it can lead to to downward spirals. In. In the sense that chronic. Fatigue itself. Drives inactivity and drives lack of ability to withstand.

And these types of beneficial stressors that I'm, speaking about. And, and because of that, people become less and less inclined to do those things because they are much more likely to have negative responses to them.

And then by virtue of months or years of not engaging in those things, not engaging in physical activity or other types of automatic stress. You get a.

big acceleration of the atrophy of the mitochondria. And so that downward spiral takes place in an accelerated way, where now you have an even weaker cellular engine, and you get yourself kind of in this trap.

Where you. Have less and less physiological resilience, less and less inclination or ability to tolerate or medic stress. So you have more and more, sort of reason to avoid it and not do it.

And then you get this, this downward spiral effect that kind of keeps you entrenched in that. Right? So, I mean, I definitely understand like some of the different exercise techniques maybe not being, feasible because of pain or not having enough energy, etc..

But when we start talking about doing like cryotherapy or cold plunges or, you know, doing various, saunas or doing red light therapy, these are all things that are pretty passive, you know, that most Lyme patients can tolerate.

Right. And I just to reiterate, for everyone listening, please correct me if I'm wrong. These things through hermit hermetic stress will help to increase the strength of the mitochondria.

So going from the moped engine, probably not back to the Ferrari, but at least you know, getting in. In that direction. Right? Yeah, yeah. That's exactly correct.

So, the good news. Is the sister, I'll add a couple layers here. Just so there's no confusion, the fact that most 70 year olds lose 75% of their mitochondria capacity is not a natural, normal product of the aging process itself.

And we know that. Because lifelong. Athletes, exercisers who are 70 year olds have the same mitochondrial capacity as young adults, they do not lose 75% of their mitochondrial capacity.

That tells us that this is not actually a natural, normal product of aging per se. This is a product of modern lifestyles, right? And the good. News also is that just as this system is malleable in the direction of downward spirals, where the mitochondria can shrink and atrophy and die off, it's also malleable in the other direction when we stimulate it, just like with a muscle, if you stimulate it, you are stimulating a signaling cascade.

That your body. Basically says. Whoa. Your body, by. The way, only cares about its survival. It doesn't care about really anything else. So if you provide the signals that tell your body.

Think. Of it like this I want to provide the signals to my. Body that tell it. In order to survive this environment that we are in, I need you to do x, y, z.

Okay, so lifting weights tells my body in order to survive this environment. I live in an environment that requires me to move heavy objects frequently.

And in order to better survive this environment, you need to grow bigger, stronger muscles. So that it becomes. Easier. To accomplish the tasks that are required in this environment.

And not only can you do it easier and more efficiently, but you will be less damaged by them. The tissues will be protected by. Us creating these bigger, stronger muscles.

They won't be damaged from that stress. The same thing happens at the mitochondrial level. So you're build, you're saying in order for you to survive this environment, I want you to grow bigger, stronger.

My okay. Andrea. Right. And that's exactly. What the body will. Do if you provide that bioenergetics challenge to the system, which, as you said, can be done in a variety of different hermetic stressors, some that burn more energy like exercise and some that are more passive or low energy demand.

but the that. The system is malleable in that way. And we have a, system up, process called mitochondrial biogenesis, where the mitochondria can actually not only grow bigger and stronger.

But actually we can create. New mitochondria from scratch. And so we can go from a thousand mitochondria in our cells to 1500 or to 2000. We can start to rebuild in the direction of that Ferrari V8 engine.

Hey, so tell our listeners, because we only have a couple minutes left, where can they go? So how can they find you? Where can they go to to to read some of the information that you've shared?

Or I think more importantly, to really understand, like how do I put a treatment plan together that I can tolerate? And remember, our listeners are a majority people that have complex chronic illness.

So yeah. Maybe some more passive therapies than, you know, than the intense exercising and things. Yeah. So, to answer your question, first of all, so my website is the Energy blueprint.com.

I have a new project called Human optimization.com as well. On the energy blueprint.com, I have sort of my flagship Energy Blueprint program. And then I also have the breathing for energy program.

Breathing for energy is a systematic training in what's called intermittent hypoxia training. Hypoxia is low oxygen state. So this involves breath hold practices but done in a very specific way.

And then in a systematic and progressive way, systematic and progressive. Is a critical. Component. For actually. Invoking those adaptations that I'm talking about.

For re for building bigger and stronger anything but especially bigger and stronger mitochondria. If and this is something that, I would say 90 plus percent of people just get wrong, they just don't understand this well enough.

you it has to. Be progressive and it has to be systematically progressive. If you're. Doing something but you're doing it sporadic and you're doing it without tracking the whether it's progressive or not, if it's like, you know, most people who exercise, it's like, yeah, I go to the gym when I have time, maybe a few times a week, I do.

A yoga class. Or go on the treadmill and run a few miles, whatever I feel like that day. Or maybe I lift some heavy. Weights, but if you track. Most people's, you know, let's say.

Weightlifting habits, you know. If you look back on what they were lifting a year ago for bicep curls or for bench press, and you look at what they're doing now, it's the same thing, three sets of ten with 140 pounds or whatever it is, or three sets of ten with the 15 pound dumbbells.

Nothing has changed if you haven't progressed in any way, if you haven't provided progressive demand on the system, your body has no reason to adapt to anything, no reason to create new adaptations.

At best, you can maintain so that's a critical component that people need to understand. I have a book on red light therapy and near-infrared light therapy, which is a wonderful way to start to create some some bioenergetics beneficial stress on mitochondria also has lots of other benefits for healing and recovery, stimulates decreases inflammation, stimulates healing of tissues.

hypoxia training with breath hold training is probably for people who are chronically fatigued. The much better place to start compared to exercise training.

Most people with complex chronic illness, and especially chronic fatigue syndrome, generally have what's called exercise intolerance or post exertional malaise, where they are very, very prone to bad reactions to exercise.

so it's important to do two things for people in that context. One is to choose. Types of hermetic stress that are much easier for the body to tolerate, which you've, you and I have both already alluded to.

And the other thing is you have to get the dose right. So, Many, many people try to, you know, let's say I want to start an exercise program. So I go look, look up so-and-so's exercise routine.

And then after five years of not doing any exercise, I just go to the gym and I do this hard 45 minute workout. That's that's not the right way to do it.

You need to start with wherever you're at. So if you haven't done hard exercise in a few years, start with a 15 second, you know, interval on the bike, you know, like one interval of a burst of high intensity activity and leave it at that.

For day one, you did 15 seconds of of hard work. Okay. Let's see how your body responds. Or you start with gentle lower intensity stuff and you build up in the lower intensity, and then you slowly build into more moderate intensity stuff.

Programs, Red Light, Breathing, and Practical Next Steps

And then you go into higher intensity stuff from there. But it needs to be, again, systematic and progressive. You start with a low dose. If you're in this context of chronic complex illness, you have to start.

With with. Extremely low doses, very cautiously, and move in baby steps. The biggest. Mistake that people make in this context is they. Don't do that.

They go try something like exercise or like sauna or like breath hold practices or any number of other things. They overdo. It, they have a bad reaction, and then they tell themselves, oh, that stuff is bad for me.

I shouldn't do it because it causes a bad reaction, which causes the problem that I described earlier, which causes the avoidance of the very things. That will are.

Critical for them to actually get better. You have to rebuild the cellular engine in order to get better. But it's tricky. Because you have to do it slowly and progressively.

Make sense? So I'm imagining that you have all of these, you know, programs, protocols available for the listeners to, to go to and, and whether you have to sign up or that's all there.

on website. It is indeed. Yes. And so we'll, we'll link to a webinar. on. The Breathing for Energy Program. I've also got, a four video masterclass available that takes people through a lot of the science.

But, yeah, it has to be, you know, there's sort of two prongs to this system. One is you got to remove a lot of the total body stress load. You got to do all that stuff like improve your diet and decrease your stress load and improve your circadian rhythm and, and sleep and get the toxins out of your life and drink pure water and all these, these these things are are foundational to removing that stress load.

It's about going from this imbalance of total body stress load that is overwhelming your body's capacity to lowering the stress load and building up the body's capacity, both of those things at the same time.

And that's that's the key to getting better, right? So it's a two pronged approach. You can't just do one over the other. Of course. Yeah. I mean if you if you're eating a McDonald's every day and working night shifts.

Yeah, you're not going to. Exercise your way out of that problem. You have to get the foundation in place of, you know, basic life, healthy lifestyle habits for sure. Right.

Thank you so much for being here with us. I learned a lot and I'm sure that our listeners did too. Any last words that you'd like to say before we conclude our interview today?

I would say. One of the keys. To healing is. Creating a new identity. So especially for people in this situation of complex chronic illness, and chronic fatigue, creating a new identity for yourself as somebody who is not fragile.

You have to slowly build your. Your your identity, your self-identity up as a strong and resilient person. As long as you think of yourself as fragile and somebody who is going to be damaged and and harmed by any exposure to a stress of any kind, you are creating a mind body dynamic that sort of entrenches you in that that position.

And so part of what I've seen needs to happen to help people. Heal is to.

Mindset, Resilience, and Closing Thoughts

Start to do things that allow you to start to see yourself and change your identity into a stronger, more resilient person, and to see yourself not as fragile, but as resilient.

And as you do that and you start to actually do things that create stress on the body, beneficial stress, and you build your physiological resilience while you create that new identity for yourself.

That's something that I, I find is a very important key to to healing. Yeah, I think that's super important. I think that our thoughts really do create our reality literally.

And so this is just this interview has been a really powerful, illustration of that. So thank you. Yeah. My pleasure. Thanks so much for having me. Absolutely.

Thank you everyone at home for listening. And I hope that this information helps you on your journey to Healing Lyme. And we will see you next time. Take care. Bye bye.