Introduction and guest background

Is estrogen in women playing the role of this exercise hormone I found? So when we did this study with some collaborators, that's exactly what we learned.

That estrogen initiates the migration of this estrogen-related complex into the nucleus to initiate mitochondrial biogenesis in the absence of exercise.

Do you feel like your hormones have turned against you? Trust us, you're not alone. We're Dr. Serena and Dr. Heidi, and on Hormone Heroines, we explore all the root causes that are behind hormone imbalances, and we teach you how to thrive through them.

Join us for real talk, expert tips, and even a few laughs. Hello and welcome back to Hormone Heroines. I'm Dr. Heidi Codino and I'm here today with Dr.

Sandeep Dugar, who is the co-inventor of Zetia and Bitorin and has 38 years in the drug discovery with 100 plus patents and major awards, including ACS Inventor of the Year for breakthroughs in disease treatment.

Welcome, Sandeep. How are you doing today? I'm doing very well, Saidi. It's great to join you this morning. Thank you. I'm very excited to have you here.

Dr. Serena sends her apologies, but she actually delivered her baby on Monday. So she has a very good reason not to be here. Do pass our congratulations.

I will definitely. Yep. The cute little baby was born very early in the morning. All right, so we're going to have you here to talk about estrogen, especially, but hormones, perimenopause, menopause, postmenopause, all the things.

So why don't we just dive right in? And because, you know, this is a podcast that's to regular listeners as well as doctors. Can you just explain the fundamental biochemistry behind estrogen for us?

So first of all, I want to make sure your audience understand that I'm not an endocrinologist. And so I'm primarily a researcher and really trying to understand the biochemistry, pharmacology, a variety of things.

So, and in that context, I think it would be great for your audience to really start to make an association of not only the role of estrogen, but how other things it does besides the other additional functions that are not often spoken about.

So perhaps we can get to the idea that yes, it's a hormone that's produced and so it's, you know, a primarily female sex hormone and there are varieties like estradiol, estrone, and estriol.

Um, and it's primarily produced in ovaries, but of course men also have it, right?

Estrogen basics and mitochondrial biochemistry

Because adrenal glands, et cetera, but our focus today obviously is, uh, women's health and it helps really support, uh, you know, cardiovascular, uh, bone and brain health.

Yeah. But one of the things if, you know, as we deal about this, we have to fundamentally ask it, okay, this is great. This is what estrogen does, keeps women healthy.

It has a significant role in women. But why does it do this? Why does it achieve this? Right. And I think that's one of

the big questions that'll help us to treat people better.

Exactly. Right. So, you know, these days there's a lot of debate about HRT. OK, when to do it, how to do it, where to do it. And, you know, for a long time we said, oh, hormone replacement therapy is not so good.

Now we're revisiting that whole question because we accept its pharmacological effect. But often there is not a deeper understanding of how that is happening.

We just accept it. Right. So today maybe we'll say, okay, yeah, it does all these things, but why does it do it and why is it important in women? Okay?

Right. And that takes us down to the fundamental in physiology in women, particularly of childbearing age. Okay. That's critical because that's where estrogen plays a very significant role during those times.

I mean, estrogen levels are high. And so one of the questions that I've been trying to work on for the past 15, 16 years is fundamental cellular bioenergetics.

So if you think about this, our function, whether it's our physical function, biological, biochemical processes, all require a fundamental energy. I can't move my hand or talk to you if I don't have energy, right?

You know, you're talking to me, you're blinking, all that process needs energy. And we just accept that as happening. So thinking about this, estrogen being a steroid hormone, how does it come about?

As I mentioned to you, it's made primarily in the ovaries in women, but the adrenal also makes it. Fat adipose tissue also make it. And men have it. Of course, men don't have ovaries, but there's a role for estrogen in men also.

And mitochondria start all steroid synthesis in human bodies. Okay. So they do the first step of conversion of cholesterol to pregnenolone. Okay. Now, interestingly, it's called pregnenolone because it was first detected in pregnant women.

Oh, I didn't know that. I just knew pregnenolone, but never knew where the name came from. Exactly. So, pregnenolone, preg, pregnant women, that's where, and it skyrockets in pregnant women.

And so people say, great. But then the question is why? Because see, body doesn't do anything unless there's a need for it. It doesn't waste energy. Why would mitochondria all of a sudden upregulate the biosynthesis of pregnenolone in pregnant women?

Right, because they need higher estrogen and progesterone at that point. Right. And why? So I'm like a two year old. I'll say, okay, this has happened.

Why? Okay. Okay. Yeah. You need estrogen to support your cardiac function. Why and how? What does it do? Yeah. And so, in one of my other research, I've been delving into the mitochondria, okay?

And one asked a question that you can only make more mitochondria when you exercise. Nobody debates that fact. That's the most natural way to make more exercise.

Now here's the quandary. When you're pregnant, you need much more energy Okay? Because… You're making a human being in your body. There you go, right?

But you're not able to exercise as much. So what's happening? Why is it that all of a sudden, in women of childbearing age, you have a need for energy, which means a need for more mitochondria, Right?

To make that energy, yet you're not exercising enough, yet you're doing it fine. We have seven billion people on planet Earth, so we're all right. We're doing well.

Right? So then let me do the question of, pregnenolone is the starting point for the synthesis of estrogen in the ovaries. In the ovaries, not in the adrenal.

All right? So why is it that you need estrogen so much in the ovaries? Yes, it has the cardiac effect and the metabolic effect, but why in the ovaries?

Because that's where the fetus is growing. Right. All right? Alongside on the other side of my equation, we had just discovered a steroid hormone that mitochondria make when you exercise.

Okay. So people say exercise makes more mitochondria. So like a two-year-old, I asked, well, why and how? Right? Right. Yeah, it does. I agree that nobody debates that, but how does it happen?

That quest of years led me to identify a new steroid hormone that the mitochondria make. We're the first ones to detect it and first ones to report it in humans.

And we understood it's pharmacology. When I went to PubMed, mine was the only paper you could find. I'm going to cut this story a little short so that we get to the next part of it, but it lays down the foundation.

Because what happens is this steroid, when made by the mitochondria and the cells have an energy deficit, the cells recognize that. and that make the steroid when you're exercising and this steroid through translocation of the estrogen related receptor initiates biogenesis.

Okay. Okay. So now on this side of the equation, what I'm learning is that this steroid is made by the mitochondria, it goes into the cytosol, it creates the complex of the estrogen-related receptor alpha, beta, gamma, which translocates to the nucleus, and then you make myogenesis.

Exercise hormone discovery and estrogen connection

Okay, estrogen-related receptor. Why is it called an estrogen-related receptor? Because it binds estrogen, but people didn't know what does it do. So in my mind, here's the connection.

Is estrogen in women playing the role of this exercise hormone I found. So when we did this study with some collaborators, that's exactly what we learned.

That estrogen initiates the migration of this estrogen-related complex into the nucleus to initiate mitochondrial biogenesis in the absence of exercise.

Oh man, that's so cool. I love it. Yeah. No, it's not as potent. It's not as potent. And that's why you have floods of it. Women have it. And so now here is potentially an answer.

Why pregnant women don't need to exercise because you have an internal hormone that is producing mitochondrial function and levels automatically. to your hormonal system.

And that's why in childbearing age, you have more estrogen and you are healthier than men. Right? Of course, you don't have the muscle mass, et cetera.

But now, as soon as you eat perimenopause, postmenopause, this estrogen goes away. Yes. And here's the bigger problem. Not only does it go away, so you've lost your internal mitochondrial processes, but because women inherently have less muscle mass, less other components, you see a plummeting of all the metabolic functions.

Yes, you do. So women don't have the exercise capacity that men do. So for them to recover from this double whammy, that means you don't have the exercise capacity and you've lost your internal protection, health plummets.

Now you see the cardiac effect, the metabolic effect. The brain fog, all these things plummet. And here is that connection between a potential, I'm not saying it's the only one, because nothing in the world works just with one thing, but here's a key component of estrogen role in mitochondrial processes that maintain cellular bioenergetics in women.

And when you lose it, you've got a problem. Yeah, that, I mean, that makes so much more sense because I, you know, as a clinician, obviously I know that when I get my, you know, post-menopausal or perimenopausal women on some hormone and they, we bring their numbers up a little bit, they definitely have more energy and they have less fatigue and they have less brain fog and they have all these things.

And it's like, you know, I just know it happens, but I never knew really why. So that's so cool to hear. Yeah. So this is the reason why we got interested so much in women's health.

Okay. Because what you want to do is a very safe intervention. And what it does is that it starts to give back the muscle, it gets back the mitochondrial processes, your metabolism starts to rebalance and you feel better.

Right. Because it's making more mitochondria. It's helping to boost that whole process. That is so cool. I love it. I love geeking out on this stuff. Well, you know, to me as a researcher, as a scientist, these things are good questions to ask.

And when you suddenly see the correlation and the dots connecting, you're right. It's like these gives you goose pimples, right? You say, oh, whoa. And so anyhow, So that's why I think bioenergetics fundamentally, and it's not surprising, Heidi, that bioenergetics, as I mentioned, makes us function.

And when that depletes, when bioenergetics depletes, lethargy, fatigue, lack of metabolism, all these things kick in. Your mental concentration goes away.

You're not so receptive and perceptive anymore. Because all those things require energy. Yeah. Well, and there's also that kind of malaise too. It's not like regular depression.

It's kind of like a malaise where you're just like, I think I could lay in bed all day and watch the net and not do anything because I just don't care right now.

And so I try to explain that to patients. I'm like, we can get that better because it's really hard to get out of that. It is. It is. And it's not that, it's just that their body is just sapped out.

Yeah. It feels like it. I've been through it. It feels like it. It feels like all of a sudden, out of nowhere, you're just drained. Yeah. Can't claim that I have personal experience, but I can correlate to it.

Yeah. Yeah. But by the way, I have personal experience. Anyhow. Okay. So, Cynthia, we're talking about how brain health and heart health and all that stuff, how is estrogen the key to the bone, heart, and skin health?

So again, so if you look at it, the two highest energy consuming organs in your body are the heart and the brain. So brain is like 0.2% of your body weight, I mean heart.

The brain is like 2% of your body weight. And between them, they'll consume like 50, 60% of your body energy. Right. Well, they're doing the most stuff, so.

Constant. They're constantly running. And also, if you think about it, they are on autonomous control, right? You can't make your heart beat slower or faster.

It does what it does, right? Period. Right. And then you have the other organs. So in the sense when you have less bioenergetics and brain function, you can imagine that your ability to do cognitive things is compromised.

Right, and slowed down, like word finding and everything, and it takes you a lot longer to remember things and why

you walked into a room. So we've touched on the heart and the brain, let's touch on the question you asked about bone.

Now bone maintains its sense based on the need you put on it. So for example, osteocytes, your immature brain bone cells will mature to osteoclasts or osteoblasts.

So you want osteoclasts to make new bone, but that differentiation is promoted based on need. So when you exercise, you make muscle and that muscle Processes induces these differentiations because if you have heavy good muscle, you need good bone to hold on to it Right.

Okay Now if you don't have good muscle the body doesn't need the bone strength So he doesn't want to spend energy because see you're already energy deficit So it's like in your pocket you got 100 bucks, so you can't spend 150. There's no debt bank in your body.

It's you have it or you don't. There's no other thing. And energy is produced on demand because ATP by the mitochondria is only produced when you ask of it.

Menopause, energy loss, and bioenergetics

Now, as you go and you have lower muscle mass, you are not exercising enough, you have lethargy, all kinds of things, you start to lose skeletal muscle, which happens in women.

If muscle mass goes down, the bone doesn't need to be as strong to hold on to the muscle. So your bone regrowth processes are also slowed down because the body does not want to spend the energy to make bone that it doesn't need.

when it already has some energy, right? And it's pretty well known that women who are very athletic and have strong muscle have stronger bones. You know, part of the things you can see in underdeveloped countries, you know, women are working in the field at the age of 60, age of 65, they're lean, they're muscular, and they're cool, they're good.

So these are all correlations. If you think about the entire physiology, the hierarchy is basically determined by your bioenergetics to survival. So your limbs are not so important to survive, but your brain is.

Right. So it will feed the brain and the heart, then the liver and the kidney, because these are essential critical organs, and it lets go of the brain.

So in a way, you also have osteoporosis in men. You know, it's not just simply in women. But since men already start with a heavier muscle, larger muscle body, at the starting point, their bones are denser and stronger.

Right. So when osteoporosis hits men, it's later not as profound as it hits women. And so the argument is that if you exercise and re-establish your skeletal muscle, it should have a downstream domino effect in your bone.

Right. And you would create, yeah. Yeah. Well, and I think it's very important for our listeners especially to remember too, you know, men have andropause, right?

So like their testosterone will go down, but theirs is kind of like this, like just a gentle little kind of thing. And I explain to like everybody, all of my patients, I'm like, Perimenopause is like those, you know, those car lots with those balloon guys that go like this all over and then fall down and then come up and then fall down.

That's what our hormones are doing in perimenopause. And also I like to always remind my patients, you know, testosterone, we make more testosterone than we do.

estrogen. So testosterone is very vital in being able to build the muscles and keep the muscles and all of that too. So our testosterone dips faster than a man's testosterone and we didn't have as much to begin with.

So that's another thing that we need to make sure that we're doing and that way we can build the muscle to help with the osteoporosis and the osteopenia.

And you also need the energy to go work out because like I said before, like when that malaise hits or the fatigue from not having enough estrogen or mitochondria, you're just, it's so hard to get yourself to work out because you're so tired and you can't even do it good.

100%. So this is this interconnectivity, right? And it goes to the point of understanding that Physiologically, your body is making choices, right? It's choices to how to deploy the resources it has, okay?

Because there's an intrinsic phenomena of saligenesis. Saligenesis is a concept that a good colleague of mine, Bob Navio, has introduced. That means you are hardwired to heal yourself.

That's survival. You're hardwired to do it, right? It's just the point is that you're losing the currency to heal yourself. And if you give yourself the currency back, your body has an amazing capacity to give back the health you want.

Right. It's just getting over that hump to be able to do it. Correct. Yeah. And that's the work that we've been doing in terms of studying mitocatalyst E about how, because it is the surrogate of this exercise hormone I speak about.

It is structurally related. It's structurally related. It's functionally related. And we've done 16 years of research, preclinical, clinical, to say, All this is good to understand, but how do you help people, including women, who are unable to exercise?

Because you put a quandary in front of them, well, this is your path forward, but oh, too bad, you can't go down that path because you're not able to.

Right? Right. So the idea has been to see what is the surrogate. So this is something we pulled out of cacao and green tea. Oh, OK. and it's a single molecule, it is the only one that we know of that mimics this hormone I spoke about and induces the mitochondrial processes in your body to say, okay, I've just exercised.

And we see the pleiotropic downstream transcriptional processes kicking, muscle rebuilding, metabolic upregulation, and mental anxiety, cognition start to shift.

And we've seen that both pre-clinically and clinically. And because the whole idea in my mind was that if you give the mitochondria boost of function and level, back to younger age phenotype, does the body have the capacity to recover?

And the answer we are finding in multiple clinical trials is yes. Now, we don't have long longitudinal data yet. Right? But we have data that is long enough to convince us that is the case.

And since this is fished out of, you know, cacao and green tea, it is incredibly safe. It's been inhumanized for thousands of years. We just start treating it like another natural product, but with pharmaceutical understanding, with science and basis.

So, you know, one of the things I felt that, you know, it can't be just You can't just put out a supplement without scientific validation. So we find ourselves one of the unique places where we are taking a supplement but fully doing validation studies both in the clinic and in the pre-clinic for a variety of indications.

And since it's mitochondrial, it is agnostic to the pathology. Because every pathology, you know, when you break a bone, cut your skin, or have diabetes, it all hits the mitochondria that is your sentinel and response element for healing.

Right. So you're saying that this molecule in the trials that you're doing, this molecule is basically, to put it in layman's terms, is like basically tricking your body into thinking you exercised so it continued to make more mitochondria.

Exactly. You got it. Oh, that is so cool. I mean, we're not saying don't exercise. Absolutely not. But yes. No, no. And you're 100%. But also we are saying, please eat healthy.

Remember, there's never a single solution to everything. What we are saying is that this could be part of the puzzle of resolution of the pathophysiologies in perimenopause or premenopause or postmenopause.

Bone, muscle, and hormone decline

in women that says okay perhaps with this added help but that doesn't mean that like even after you exercise please don't go and eat a dozen donuts please don't do that okay yeah that does not help your case no no okay so please make sure that you are changing a lifestyle and this is another something that would help you get things better Right.

To get over that hump so you can actually do all of these things. Exactly. That's amazing. How far are your 16 years in? Yep. Right. Okay. So how far away are you from having even longer term?

Like, are you doing certain studies in certain populations? Yes. Okay. So we are right now doing studies in say frontal lobe dementia, We're doing study in elderly with metabolic and inflammation and cognition disorder.

We're doing muscle steatosis. We forget that as we age we start to put fat in our muscle and that leads to fibrosis and that leads to inflammation. We're doing that study.

We're doing study in primary mitochondrial myopathy. We're doing study in neuromuscular diseases. So we're doing variety of aid clinical studies right now in centers like Karolinska, University of Glasgow, Children's Hospital Philadelphia, Stanford, UC Davis, Wash U, things like that.

Because my intent is always to make sure you collect evidence, okay? It's not simply take these supplements and it'll help you. No, the idea is take this because we have determined the mechanism of action of this.

And we want to make sure that we can demonstrate in either structure function studies or patient reported outcomes and say, okay, are we seeing what we, and these are all being done by independent PIs.

Okay. That's awesome. Cause I know, you know, there's lots of studies going on right now, especially we just did a podcast last week or the week before where we were talking to some neurologist about how HRT with estrogen, especially, I mean, obviously progesterone too, cause you don't want to do one without the other, but with estrogen really helps.

to prevent and stave off the dementia and possibly Alzheimer's in the future. Because there's so many, especially in the frontal lobe, there are so many estrogen receptors.

So if you're finding a way to use this molecule to actually make more mitochondria, I can totally see how it goes. Because that's probably what the estrogen is doing.

It's just going in, getting that receptor and then making more mitochondria. Oh my gosh, you're just putting everything together for me right now. Yeah.

And Heidi, one of the things also is that we forget that whoever takes this has to take for life. So safety has to be quintessential. And one of the challenges about hormone is that it is so circadian in its response, correct?

That it's hard to mimic it. Because it's not just the mitochondria, it has a lot of other activities. So don't let me suggest that this is the only thing it does, but it has a lot of other activities, which I think should still be done.

But the question is that can we reintroduce estrogen levels by elevating mitochondrial function? Because remember I told you that mitochondria initiate all steroidogenesis.

That has implications even in childbearing women in terms of pregnancy, in terms of ovarian uterine function. We're doing a study at UC San Francisco on oocytes and the idea of filtering mitochondria.

The system has a process of filtering the healthiest mitochondria into the oocytes. But the point is if your basal level is less or you don't have good mitochondrial health, are you putting the less one?

Good ones or bad ones? Yeah. We're just finishing a study in Germany also on in males and we see a very significant improvement in sperm morphology and motility.

with our intervention. And as a matter of fact, I think they're studying four and two men are already going to be fathers and they had fertility issues and they're going to be fathers now.

So it's probably the same concept though, right? Because their testings are basically like our ovaries, you know, like our ovaries are the same thing.

You know, so that's probably the same thing is they're putting in better mitochondrial health. And I feel like, you know, it may not have been such an issue back in the day because back in the day we didn't have so many microplastics or so many environmental factors or so much, as much of the environmental stressors that we have now.

100%, yeah. We'll see younger women in their early 20s that are having fertility issues and we check their hormones and everything and even their estrogen and their progesterone are just tanked.

Exactly. Can you? Yeah. And you asked so correct that the environment, but also it's like in men also, you know, clothing. Remember, the idea here is tight clothing is not good for men.

I mean, there is a very clear structure. The testicular structure is done so that it can maintain the internal temperatures, the right. Right, yeah, so they come down when it's hot and they go up when it's cold.

Exactly, exactly. But you see, there's a reason nature did all of that, right? And we're going against all of that. And so no wonder that the sperm has poor morphology, the sperm counts are down, they have poor motility, and then you'll die because it's under stress, it's under stress.

And this is what we've been studying in so many different indications that if you can provide the system, to address the stress and have residual bioenergetics to improve your functions and performances, will you see?

And we've done muscle biopsies in patients. So we've done muscle biopsies after three months, quad muscles in patients with diabetic cardiomyopathy, and their sarcomeres after three months looks like they're 20 years younger.

What? Just amazing. Because the body's healing itself because you're giving it more energy to do with it. And this was done at UC San Diego at the vet school and we did electron microscopy studies.

We did another one with Becker study at UC Davis and looked at the same biopsies and you can very clearly see. What was amazing is that these sarcomeres were not only reorganizing but they were thicker.

And you could tell that these patients had much better performance on graded exercise. So it's not just that you could see the sarcomeres better, that these patients were actually physically doing better.

So there was a clinical response. So these are the things we're studying constantly to understand. And this is why I think that if you give the body the energy.

So if you think about this, the two most validated, the most validated health inputs you can do is exercise and nutrition. Right. Okay. Those are the base foundations.

You got to work on those. And this is where I'll tell you, it's like a quirky mind of mine. So exercise directly plays the

role of mitochondria. And mitochondria, as you know, is a bacteria in your body.

Okay, so it's a bacteria body, it has its own circular DNA, it was through endosymbiosis.

Mitochondrial supplement research and clinical trials

Now let's talk about nutrition. Remember, I still mentioned don't eat a dozen donuts, right? What is the nutrition? Why is that fundamental? Because it hits your microbiome.

Now what is the role of the microbiome is to take the food you eat and turn it into morsels that the mitochondria can use. All your nutrition, all your food is for the mitochondria.

It is the one that will process it to create ATP and other nutrients like, you know, short chain fatty acids and some signaling systems and in the brain it'll make neurotransmitters and stuff like that, right?

But it's taking the food. Right, which help with anxiety and depression and all that stuff. All kinds of stuff. And now think about this, what is the microbiome?

It's a bacteria. Right. So if you keep your two bacteria bodies happy, you will be happy. Yeah. And one requires exercise, the other requires nutrition.

Right. And that connectivity, if you maintain healthy, that's going to be good. Right. Well, and I think that's why a lot of times with estrogen, especially people forget that part of our microbiome is the estrobolome and that estrobolome feeds off of estrogen and it, you know, detoxes and it tells things where to go and what to do.

So when we lose like in perimenopause, when we start losing all of our estrogen, then it's not getting fed and it dies off. So that's a lot of that lactobacillus and that's a lot of the…

There you go. and all of that. So then that's when a lot of those perimenopause, menopause, postmenopause women have all these gut issues and they don't know why.

But it's really because your gut, your gut microbe is not happy. Exactly. And it's not producing the right nutrients for your mitochondria. So your mitochondria are not happy.

Right. Well, and I tell people all the time, you have to eat healthy in order to have energy because you have to feed your microbiome. If you feed it crap and it doesn't like it and it doesn't use it, you're going to be fatigued.

So much fatigued will come from your gut. Like you cut out your food intolerances, you cut out the inflammation and you'll have more energy too because it's able to work and send it to the mitochondria.

Simple things like, you know, we all drink apple juice. orange juice, okay? I think it should be banned. Yeah. Because… I don't think I've drank that in years, but yeah.

I know, but we give it to our kids, right? Oh, it's healthy. It's not healthy because what happened is once you take the fiber and all out, fructose, we cannot metabolize.

Humans take fructose and turn it into fat, okay? And that is for when we have Starvation because our body is evolutionary still 10,000 years old It doesn't know that we have enough in our refrigerator to eat 10 times a day so it takes fruit but when you have fructose as a fruit like an apple and Orange or any other fruits you eat it you slow the absorption of fructose Okay, you absorb only a little bit of it But the most of the rest of the fructose goes to the microbiome and it's good for the microbiome Right.

And it's got the fiber to help that that keeps that microbiome happy. Happy. So now the microbiome gets its nutrient, which is fructose. But if you drink apple juice, you absorb all of it and you're starving the microbiome if one of its essential nutrients, which is fructose.

So these are simple things. So, you know, when it's not just what you eat, it's how you eat it. Right. Exactly. I constantly am telling my patients, I'm like, I want you to have at least 40 grams of fiber a day.

Yes. But I don't want you to have Metamucil or, you know, all those other brands. I want you to eat it, because also as humans, we do not chew our food 100 percent.

But that's actually a good thing in these kind of instances, right? So if you chew fruit and you chew some veggies, you don't chew it all the way, you swallow it, it kind of has those fibers.

And so it also helps to sweep out all of the stuff you don't want. And it helps the mitochondria in that way, too, by just getting out all of the toxins, too.

Yeah. So this is where it comes down to ideas that it's a systems thinking, not only about the food you eat, how you eat it, when you eat it, about exercise and bioenergetics because, to quote one of my icons, Einstein said, it's energy and that's all there is to it.

It's not physics, it's not philosophy, it's fact. If you think about it, the sun only gives us two energies, light and heat. Without it, life would be a thing.

And if you think about it, the mitochondria is the one thing we share with every living thing on planet Earth. That includes plants. That includes fish and insects and everything, right?

So if you think about that this is the one thing we share that is to every species and its sole purpose is to make energy. to keep us going. It has to be about the most important thing in your body.

Because if I take mitochondria out of a cell, cells cannot make mitochondria. Right. Okay. Without the mitochondria, your genes cannot make the proteins.

You know, this is again my two-year-old. Why? How do and how and why do genes make protein? And who tells them to start and stop? Why does it suddenly, you exercise, what told your leg muscles to make fallastatin?

It's the mitochondria. Right. So they're not just making the energy, they are sensing the cellular status and as the cellular status moves away from standard hormesis, it tries to rebalance the cell.

Right, but sending signals. It sends signals everywhere across your whole entire body. It's our alarm system. Yeah. What we're learning now is that there's not one kind of mitochondria.

They have their own polymorphs, or heterogeneity. Now we're learning that they create tunnels from cell to cell. So if an adjacent cell is stressed, one cell will migrate its mitochondria to that.

Now we're learning how cancer cells are hijacking mitochondrial function. We know they play a role. So these things are amazing. I mean, think about it.

You have over 100,000 trillion of these in your body. And between the microbiome and the mitochondria, you have more bacteria in your body than human cells.

We're just basically one bit of bacteria. It's fine. We are the structure that supports bacteria. You're right. Yes, exactly. Anyhow, but it's a fascinating, fascinating learning.

And every time I think I know a little bit, you feel like you're just scratching the surface of how amazing. And here's the part, and your audience will appreciate this, that each cell will make about a billion ATP a day, each cell.

Okay? And it has to make it when you need it. It cannot store it. Okay? So just when I move my head, my neck muscle made that ATP at that instant, that rapidly.

And if you were to try to make ATP the way the mitochondria, you can't do it in a lab. No, it's physically impossible. Because it's taking two highly negatively charged molecules and putting them together.

It's amazing. They're just ridiculously amazing and they're so tiny we can't even see them. And I think one of my things is to highlight the relevance of mitochondria and highlight the relevance of exercise and nutrition.

And this gives you the explanation why exercise and nutrition is good. See, oftentimes we say exercise and eat well and you'll feel this and you'll feel this.

This tells people why. Okay. Because you are providing the resources to your cell to have higher, better level of mitochondria and fuel to burn in that mitochondria that provides the energy you need.

Right. That's amazing. So speaking of that, this molecule that you're talking about, is it available to anybody yet?

Nutrition, microbiome, and energy production

Yeah. Okay. No, no. We launched it commercially in August of 24. Okay. It's through our website, but we always recommend, please speak with your clinician.

Because see, Heidi, the idea here is it's not just to sell it, but as we move into new spaces, we want to learn. We want to learn. It's a, and I call this the essential triumvirate, right?

The clinician, the patient, and the intervention. Okay? Work hand in hand to understand that you are getting objective, independent reports about how the patient, because this is how you guys practice, right?

You look at a patient today, and then 30 days later, you say, OK, this is how you were systematically today. This is how you are in 30 days. OK, these parameters are doing well.

OK, what do we understand? And we keep going, right? That's what you do. Right. So to me, this is a systems analysis, because you may think that I'm trying to improve X, or I want to improve X, but the body may have a different plan, and it'll improve Y.

Right. I actually do that all the time, because I'll have somebody come in for, you know, something, maybe, I don't know, gas and bloating or something, and we fix something else, and they're like, oh, but I can actually think now.

But I guess my gas and bloating is a little bit better, but now I'm not, you know, my ADHD isn't as bad. And that's your body. So we did this study in Becker's.

So in Becker's patients, the muscular dystrophy starts first, and the cardiac effect happens next. But when we studied them, the neuromuscular guys were looking for the muscle effect, but what they actually saw was the heart effect.

Yeah. I mean, the heart is a very good muscle. Yeah. No, but again, that body said, I'm going to fix the heart first, and then I'll worry about the skeletal muscle.

Exactly. Exactly. Yeah. It's going to try to fix that part first. Yeah. Because it's more critical. I say you can live without your limbs, but you can't live without your heart.

Right, exactly. That's so amazing. So what is your supplement called? Mitocatalyst E. Okay. And you can go to our website at Blue Oak NX, like the oak tree, but Blue Oak, which is a rare California oak tree, very sturdy, very good.

So BlueOakNX.com. And if you have any questions, please talk with us. I have two very, I mean, not just, I have a wonderful team. Right? So you may know Carrie and Monica and Nikki and Sonia and Paige and all.

And we can have conversations because we are also a public benefit corporation. So our design is to make sure

we keep it affordable, accessible to patients, but work with clinicians to see what's going on.

So safety is not an issue. And what we say that you don't have to change anything because this has no interaction with anything else you got. And see, my life has been in the pharma world for 40 years.

Yeah. So we, I don't know any other way, but to ask the question that are, you know, more defined specifics, we also manufacture it through pharmaceutical grade, like it's a pharmaceutical product, but it's not.

Which is what I like because I like medical grade. Exactly. So this is, this is, so that's all I need is, no, it's GFP manufacturing. So including stability and bio-burden and heavy metals and all kinds of stuff done and precision and stability done so that Because at the end of the day, you've got to do those things to make sure that the intervention you're providing in of itself does not create complications, right?

And it's like, if you have a headache, you're going to take a nice, refined aspirin tablet and not go chew the bark of a willow tree, right? Yeah. I mean, I'm doing this willow bark in a tincture form.

And also the effect is specific to this molecule. A lot of the other molecules can interfere with this specific activity. It is a part of its hormesis.

If you think about this, you know, you can't exercise eight hours a day or four hours a day, you need pulsatile exercise. That's why the dosing and the pathology of our supplement we have studied.

We've done phase one AB clinical studies at UC San Francisco. So unlike most of the other supplements, we've done all the clinical, pre-clinical variety of things to make sure that what we are presenting with is well understood from its pharmacological properties, but its manufacturing and other components are pretty well established.

And then that's the only thing. We have a whole team focused on making sure that we understand women's health and particularly hormonal issues leading to the pathophysiology, as you guys see.

We see a pretty good connection between estrogen and bioenergetics and how one can start to delve into it. And perhaps, perhaps, try to rebalance some of the estrogen through the natural cycles.

We don't know. Yeah. So are you doing any studies on like postmenopausal women where basically their ovaries are kind of already given out? Yeah, we're trying to.

We're looking forward to doing it to associate. If that's of interest to you, happy to have a conversation. Absolutely, yes. Because I would be curious to see if this molecule could even allow for postmenopausal women to keep making hemestrogen on their own, which would be amazing.

Correct. Yeah. So questions to be answered, but what I always say is before you do, the intervention has to have exquisite well-known safety. You know, I used to work at J&J and now I see commercials from J&J for an antidepressant with the caution that it may initiate suicidal thoughts and I'm going, okay.

Yeah. Okay, I'm trying to get that one. Yeah. Anytime we use anything like that, we have to make sure we have a good park queue with the patient of like, Hey, just so you know, I know this is for depression, but it could absolutely make you want to commit suicide.

Yeah. Yeah. But also, you know, a lot of things like SSRIs have, and believe it or not, it was shocking to me that 76% of the approved pharmaceuticals are toxic to the mitochondria.

Yeah. And if you're tired, you don't feel like doing anything and you're more depressed. So that's our story.

Closing remarks and program promotion

I mean, we've got fundamentally down to the idea that mitochondria with good nutrition and absolutely a surrogate

to exercise because often exercise is not easy to do on a regular basis for a lot of patients.

And I mean, aging is fundamentally causality of mitochondrial loss? Decline. Yep. Yeah. Well, let's see if we can just keep boosting it then. So that's the idea.

Well, Sandeep, it was great having you here today. I'm so excited. And for our listeners, we will be putting a link into that website. So it'll be in the show notes so that that way you guys can click on it and look into it and maybe go through some of the research and everything, too, and make informed decisions with your doctors.

Please do. As well. Yes. Always. Because it's not that it's something we want because we want to learn. We want to get feedback. Okay. Right. And so please reach out to us.

If you send a note to info, I'm sure one of us, Carrie, who is our head of education, will be very much happy to have a conversation with you. I'm talking to your audiences and anybody at Monica, Sonia, Paige, Nikki.

This is our goal is to be interactive, communicative. and be part of the process so that we also understand what the new information is and how we're learning from it.

Perfect. That's amazing. I am so excited and I would love to have you back eventually too so we can even talk more about more research that's coming in.

Absolutely. It's been a great pleasure having you here today and I will see you later. Absolutely, Heidi. Thank you so much and loved the conversation.

And as I say, yeah, to be continued. To be continued. Yes, absolutely. Cause I can't wait to hear about more research. Take care. Bye bye. You know how us women are always just pushing through it and then when we go to find help, we're often not taken seriously or told, oh, that's just part of being a woman.

Yeah, we've lived through it, prioritizing everybody else and then our own health falls to the wayside. That's why we started blossoming longevity by women or women.

We created programs that meet women where they are, addressing the root causes and all of the struggles that come with every stage of life. Like our vitality program.

It reconnects you with your youth and your life so that you can thrive through the years. And with Clarity, we go beyond the skin to restore your health, clear your complexion so you can feel radiant from the inside out.

With our Silhouette program, we help you reclaim your strength, optimize your metabolism and your body composition so that you can feel great in your body again.

And with Harmony, we help you rebalance your hormones to heal from within so you can feel vibrant and ready to take on the world. That is why it's time to stop saddling and start flourishing.

Visit blossominglongevity.com today. Thanks for watching Hormone Heroines. If this episode spoke to you, follow the show and share it with someone who also needs to hear it.

And write a review. That helps more people find their way back to balance.