Introduction to Mitochondria and ATP

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What it does is makes ATP. Now think about at the molecular level of ATP. Most of us think, well, it makes ATP. Oh, but let's not short shrift that process.

It's taking two highly negative charged particles and combining them. Think about this, that it does that so prolifically that you make average of 150 to 160 pounds of ATP every day of your life.

Welcome to the To Curious MD podcast. I'm Dr. Ali Ahmed. And I'm Dr. Surya Ravan. With the wisdom from holistic, alternative, and these conventional medicines, we are here to challenge the status quo.

We're curious about the connectivity and complexity between diverse fields of knowledge as a relief to consciousness, chronic illness, mental health, resilience, and beyond.

learning more about the art and science of healing, or listening to stories of extraordinary healing. You're in the right place. Let's dive in. Today we're at Two Curious MDs.

Today we're honored to welcome Dr. Sandeep Dugar. He is a visionary scientist and an entrepreneur whose groundbreaking work has shaped modern drug discovery and continues to redefine how we understand human health and performance.

He has had over 35 years of experience in small molecule drug discovery and development. Sandeep's contributions span oncology, inflammation, central nervous system disorders, cardiovascular, neuromuscular, and now metabolic diseases.

He is best known as the co-inventor of Zetia and Vitorin, two landmark therapies that have improved the lives of millions of patients worldwide. Beyond his distinguished role at several institutes, which includes Bristol Myers Squibb, Johnson & Johnson, and others, Sandeep has been a forefront of pharmacological and pharmaceutical innovation as the founder and co-founder of several research biotech companies, including Cardero Therapeutics, Empyrium and Therapeutics, Pastegenics, and Neurogenics.

His latest venture is where we met. We met at the IMMH conference where Sandeep spoke about Blue Oak NX, which represents the culmination of decades of scientific curiosity and discovery.

And this is a mission-based company that brings to market a novel product inspired by Sandeep's seminal discovery of natural flavonoil that mimics the mechanism of newly discovered endogenous steroid, a molecule produced by our mitochondria.

Podcast Welcome and Guest Introduction

And we will be talking about the mitochondrial health in metabolic health. And this compound promotes mitochondrial biogenesis and protection, offering a powerful evidence, a way to support cellular vitality and metabolic resilience.

Sandeep has accolades numerous and several and over a hundred patents and he's a co-author of several scientific publications and presentations and is also works close to home at UC Davis as on the advisory boards and other departments within UC Davis.

So welcome Sandeep to our podcast where we will be talking about the work that you have been doing with Blue Oak NX and how the mitochondria comes to this discussion about how mitochondrial health and metabolic health is making a deep impact in every aspect of our healthcare.

So thank you for being here. Well, thank you, Aliyah, and appreciate all the introduction. I hope I can live up to all of that, but thank you and really pleasure to join both of you in this conversation.

Thank you. Thank you for being here. You know, I think when we approached at the integrative medicine and mental health conference and we found this booth and we talked to the excitement that you carried, even after all these accomplishments, right?

All these years of striving, one would feel, oh, I'm done. And yet, and yet to find the energy itself, you know, to go down, drill down to the energetic.

I mean, we're talking mitochondria. We're talking about the energetic powerhouse. of every single cell in the eukaryotic system. And so we're really getting down to the nitty-gritty of what is energy?

Shakti. You know, where does this communication with the life force her. So if one can think kind of metaphorically about this, we're right at the portal of life.

And I can feel, as I'm even describing this, that yes, that excitement must keep you going, but I'm sure there are other, you know, places where that resilience comes from.

You're an embedded member of the UC Davis community, you mentor, you know, you have a community that you've grown as a result of this work you've done.

So the inspiration, I think, and I mean it inspire in the way of life is always about inspiration, is always about taking a breath in, inviting life in.

So I just want to hear what inspires you. So one of the things is I'm very inquisitive, right? So it has been one of the fundamentals of, as a scientist first, the idea of asking questions and saying, can you find an answer to things, right?

To tell you frankly, I mean, I got introduced to mitochondria only in 2009, and for some work coming out of clinical studies in San Diego, and I just fell in love with this thing.

And I was surprised how little we know about it. We all know what it does. But to me, the more I researched it, the more I learned, little bitty I learned, and then the experiments we did, was that core of inspiration that, I mean, in physics, they talk about, and I don't mean to be saying about from any religious connotation, but let's look at, we call it God's particle, right?

In physics, that was found. This is the God's particle, and it's in front of us. Yet, we know so little about it, right? What does it do? Saying that it's a powerhouse is a very clear first step, but it's so much more than that.

It is so much more than that. Along the way of our conversations, I'll tell you about some fun facts about the mitochondria, and I'll tell you about what it does.

I think the entire scientific community just should focus on it and we'll be better off. So that's what, I mean, to me, the science inspires me, the applications inspires me, and the fact that really with this understanding, perhaps we can start to address so many issues that faces us as humans that should be our goal.

So that's what part of the story is. Beautiful, beautiful. I know that there's this origin story of mitochondria, right? So maybe even starting there.

So, let me give you a bit of the flavor of what things are. It may not be in chronological order, but it kind of puts the

story in perspective that, of course, the whole story of endosymbiosis is pretty well accepted.

The formation, as you said, the modern eukaryotic cell. But we know that every living species on planet Earth, there's not one that does not have mitochondria.

Okay, so that's one thing we share with every creature on planet Earth, including plants. Name it, fish, name it. They all have the mitochondria. So while our genomes are different, the concept of the mitochondria to drive that life is the same.

And it does a very simple thing, which is simple for the mitochondria, but almost impossible to achieve in a flask. What it does is makes ATP. Now think about at the molecular level of ATP.

Most of us think, well, it makes ATP. Oh, but let's not short shrift that process. It's taking two highly negative charged particles and combining them.

What Inspires Mitochondrial Research

Think about this. that it does that so prolifically that you make average of 150 to 160 pounds of ATP every day of your life. Okay, if I took to take all the ATP out of your body and weigh it, that would be the way.

And this reaction you cannot do in a lab. It's impossible. It's like taking two powerful South Poles and connecting them, right? And yet it does it boom, boom, boom.

I mean, you just shook your head, Surya. You just used few tens of thousands of ATP. Anything. You blink your eyes, you nod your head, you eat your food, you whatever you do.

And that particular tissue is making that ATP on demand at that time instantly because you cannot store ATP. So if that doesn't astound you, Okay, I have more.

Okay, so what? 45% of your cell volume is mitochondria, okay? You have over 100,000 trillion mitochondria in your body. So think about it, it's probably more mitochondria than human cells, okay, in your body.

The only cell in your body that does not have mitochondria is the mature red blood cell. That's the only one, okay? Everything else has mitochondria. and its job is not just to make ATP, but to sense the cellular situation and induce responses within the cell to address these situations, whether they're pathological, whether they are promotional, whatever it is, good or bad, it senses it and it does all the process.

Genes cannot make proteins without the mitochondria. The proteins cannot be folded and transported to the right place without the mitochondria. As a matter of fact, your cells cannot die till the mitochondria decides the cell to die.

It is the final frontier of making cell. There you have it. Here is an amazing thing that gives us life, it sustains life, and it addresses the pathologies of life.

Process of aging is depletion of mitochondria. At the age of 21, you have your highest mitochondrial content. After that, it's all downhill, 10% to 15% mitochondrial loss every decade.

What does that lead to? Slowing down of our skeletal muscle function. We can't lift what we were to do. We can't run up the steps as fast as we did. Our metabolism slows down.

No matter what we do, we start gaining weight. Metabolism is the central part of mitochondria. Most everything you eat is for the mitochondria. They process it, they produce the energy, they maintain the body temperature, they maintain everything.

So the entire metabolic process happens with the mitochondria. And just a little bit of a glimpse there that what is important with that metabolic process is the nutrition.

So what is the other thing we don't talk about in our medical situation, nutrition? So I'm going to ask you, of course for our listeners, can you explain to us how does the mitochondrial function decline with age?

And how does your research or the work that you're doing counteract that process? Right, okay. So first of all, mitochondria is produced based on demand, okay?

So when you're growing up, your body's going through internal growth exercise. So the body keeps making more mitochondria, okay? So the only way to keep making more mitochondria that we know of naturally is exercise.

So after 21, since most of us are not so committed to exercise and the body does not grow anymore, it automatically reduces the amount of mitochondria you have.

And that is under hermetic control. So that's your natural loss. Now, then what happens is the environment you live in, the food you eat, can be toxic to the mitochondria.

So that destroys the mitochondria. So, what we do is we keep piling on, right? We eat lots of garbage. We live in polluted air. A lot of medications we take are toxic to the mitochondria.

Stress in our life is toxic to the mitochondria. And all of these things can only be compensated by exercise. And if you don't exercise and this volume keeps increasing, your mitochondrial level goes down.

And so, the response is everybody has their own response to the mitochondrial level depending on all these factors. And we talk about sugars promote reactive oxygen species, et cetera, et cetera, and then they damage the mitochondria and et cetera.

The other part happens is as you get older, your ability to get rid of damaged mitochondria goes down. So that also increases cellular stress. That also affects the mitochondria.

Because every stress, no matter how, focuses on the mitochondria because they have to deal with it. So that continuously goes on. So it's not just the pathologies of lifestyles.

And as I said, exercise is the only way to replenish it. So, if we were to be good, eat well and exercise is the two key, and those are the two things we don't do well in modern society, right?

Now, that became the question for me, that this is such a basic process, why don't we know how it happens? Okay, so Aliyah and Suraya, you go out to the gym and you lift weights and you run and you build muscles.

Well, what happened between the action of exercise and the consequence of exercise? What's that pathway? And nobody knew that. And I went and asked all the people who had been working in this field and they said, well, it happens.

And I said, yeah, but can't just happen in vacuum. So that became my quest. And I said, I needed to do and understand that. Now I can give you the short answer or I can give you a bit more on the details.

Mitochondria, Aging, and Exercise

So let me give you the short answer and then you can ask what details you want. Fair? Okay. So the question comes in that the mitochondria are the ones that start all steroids, okay?

And they end all steroids. So the mitochondria make the mother of all steroids pregnant and alone. It's made by the mitochondria. And it's made by the mitochondria by the activation of this enzyme, which clips the side chain of cholesterol by ROS, reactive oxygen species.

What reactive oxygen species also does is activate a last enzyme, which is also in the mitochondria, which also does a hydroxylation. So if you look at the steroidogenesis pathway, the first step and the last step is controlled by

the mitochondria.

Fascinating. All right? So the question comes in, what happens when you make ROS? So when you exercise, you make ROS. And ROS is the signal for the cell that says we have increased energy demand.

Okay? The mitochondria sense it because the mitochondria don't know how long you're going to run, whether you're going to run for five minutes or you're going to run for a marathon.

They don't know that. Right? So it's anticipating that these two enzymes get activated and the mitochondria makes this steroid. this steroid as I'm a chemist.

So I said, if I did this, this is a new steroid. So I designed that steroid. I said, the product of these two processes in the mitochondria would make this steroid.

I went to PubMed and there was no report of the steroid. Nobody had ever even studied it, looked for it, analyzed it, everything. I said, okay, maybe this is not wrong, but I made it.

And I still remember that day when the data came back and it just blew my mind. This is one of the most potent steroids I had ever seen. And its functional role in all our asses was to induce mitochondrial biogenesis.

And not only do you want biogenesis, but then in life animals, we could see increased transcriptional processes, particularly on the metabolic side and the muscle side and the neuro regenerative side.

So what it is doing is this steroid is doing all these processes you would do that would explain the outcome of exercise, right? So the question comes in is, is this steroid, is the sensor, is the one that's made by the mitochondria when it senses energy deficit because of exercise and that it tells the nucleus to make more mitochondria without cell division?

Yeah. And so, and then when we did this primary studies, we found it was doing this was active at less than 10 to the negative 13 molar. So talking about femtomolar level, very potent.

Which makes sense because even short exercise induces biogenesis and it's very potent. And there's a form of this that circulates in the blood. So the next question was, yes, we have shown this, does it exist in animals?

We went looking for it in sea elegans and in rats and we found it. Okay, so there it was. in actual living creatures, and it's conserved because mitochondria are conserved, so its existence is elegant.

Then we exercise rats and said, does it go up? And sure enough, you exercise rats. Within 30 minutes, the levels of this goes up in your plasma, and within two hours, it's gone.

And the it that you're referring to is the- Is the steroid. Is the natural flavonoil. No, it's the steroid in your body that's making, okay? Okay, so this is my mitochondrial steroid.

Yeah, so this is the first new mitochondrial steroid, actually the first new steroid discovered in the last 50 years, and it is made by the mitochondria.

So we were the first ones, and through a proposition, through a structural part, make it, and then we went looking for it. and we are the first ones to report its existence and its pharmacology of a brand new human steroid.

This is the same steroid like you would have for estrogen or testosterone or n-prostine-dione or cortisol, right? So here we have now a possible answer that this is what happens when you exercise Your body makes the steroid, the steroid induces more mitochondria biogenesis, it induces all the transcriptional events like if you're lifting weight, making muscle proteins, muscle differentiating proteins, and we have shown all of that.

And then the final question comes in, does it exist in human? Short story, yes. We found it in humans. We found it

in scientists. We have, in scientists, is about 20 to 40 picogram per mil, and in athletes who run soccer, just a little less than nanomolar per mil.

So there's very clear exercise-related presence of it, concentration of it. What the flavonol does, Alia, is that it's a structural mimic of this steroid.

Because the steroid is so potent and it's a steroid, we were able to find this flavonol epicatechin that is a structural mimic. And now when we take this molecule epicatechin and you take it, it induces all the positive effects of exercise without you having to exercise because the body sees this flavonol and the entire machinery gets activated same way as the steroid would activate.

And the reason we went for the flavonoil because it comes from cacao, comes from green tea. It's been in human diet for thousands of years. It's very, very safe.

And that's why we can give it as a supplement to anybody. And the reason we went as a supplement is because we are a public benefit corporation so that we want to keep the costs low.

If I do more and more clinical trials, all the costs have to be passed on to patients. But we're doing clinical studies to continue to prove this thing.

And the other part is, think about this, that it's the mitochondria we're doing is giving people the benefit of exercise without them having to exercise because say they cannot exercise, right?

There are a lot of patients that cannot. So hence the application is open, right? Because it's not just a cardiovascular supplement. It's not just a muscle supplement.

It's a mitochondrial supplement. mitochondria supplement have wide use. So I would be doing trials for the next 20 years. So all of that came together after all these years.

And we said to ourselves, and I was joined by two wonderful, wonderful colleagues, Monica and Sonia, who are just also passionate, mission-driven, but absolutely such a wonderful team that we have come together as.

The whole idea here is to do a public benefit corporation so that our costs will never go up. If that volume goes up, our costs will only go down so that we can make this available to everybody.

One of the part I wanted to mention is that often when you talk about pharmaceuticals, you will see those ads, right? Take this thing if you have depression, oh, by the way, it can induce suicidal thoughts, right?

You see what I'm saying? So one is good for one thing and then 20 things can go wrong. Epicatechin, the worst thing it can do is that if you take too much of it, it stops working.

That's it. Because mitochondrial process is under a hermetic control. Right? No matter what I do, I'll never get Arnold Schwarzenegger muscle. I won't, because my body is genotyped and phenotyped to what it is.

Over the 16 years after so many patients, we have not seen a single adverse effect. And because, I mean, we give less of it than what you would ingest with, say, chocolate.

But this brings us to a very important point. What we learn is that just chocolate is not going to be good because it has other things in it that inhibit the activity of this.

So there's a competitive inhibition. Also, this thing is not as stable. So if you don't manage it right, it will polymerize, it'll oxidize. It's not thermodynamically stable.

So what, over the years, I've been able to do is figure out a way to formulate it so it's stable. When we manufacture to the quality, we want to make sure there's no heavy metals in there, there's no bio-burden in there.

Because if you're giving it to kids who will take it for a long time, or even adults, you have to make it to pharmaceutical grade, even though it's a supplement.

So yes, it's a supplement, but we're looking to give it to people for their health. I have a question. Where does this, for our audience again, where does this affect the mitochondrial health or resilience or the conditions associated?

Which type of conditions does it show up in where we have enough? And we can speak a little bit about mitochondrial conditions, genetically oriented. And then we can talk a little bit about the degeneration of mitochondria.

What kind of conditions that this shows in? Can you speak a little bit to the clinical pathways here? Okay. So remember, as I mentioned, that mitochondria dysfunction or depletion is agnostic to the pathology.

Okay. Every pathology touches the mitochondria, right? So whether you have diabetes or whether you have muscular dystrophy or whatever, it touches the mitochondria.

So we did studies in patients with diabetics with hypertriglyceridemia. We did studies in patients with cardiomyopathy, diabetics with cardiomyopathy.

We did study with Becker's patients. We're doing studies with Lay's syndrome right now. We're doing it in muscle steatosis. We're doing it in kidney. So the idea here is that the application really is that wide because everything affects the thing.

Now, what it is doing is simply giving your body the energy back to address the issue. Let's go back to the original part I said that you're declining the mitochondria as you're aging.

You're healthy. You have no other morbidities. You're healthy, but you're losing that mitochondria. Now, if you have a chronic disease that you're fighting, that mitochondrial disc reach goes higher, okay?

And as it goes higher, and that degree of decline gives you the severity of the phenotype. All we're doing is balancing this back up, giving your body the resource to fight back with what it is doing.

So, what did we see? Within 30 days, in patients with hyperglycerides, we saw a statistical reduction of triglycerides with 30 to 40%. Okay? What did we see in Becker's patients?

In eight weeks only, we saw an improvement of cardiac function that no other thing had. So, these people had heart failure. And then we looked at their cardiac function with graded exercise and VO2 max and lactic acidosis.

And we saw P values to five to six decimal places. in eight weeks. When we treated patients with diabetic cardiomyopathy, this is all published. We looked at their part and we did their biopsies.

Their muscle sarcomere, they were in their 60s, looked like the sarcomeres of people in their 40s. And this is published data. This is independent published data.

And these people who had better chain existence were walking a mile. So we're seeing the clinical response. We're seeing the biochemical marker changes.

And we did extensive studies. And these are all, again, published data. And what we see was not just a clinical response in these metabolic disorders, but we saw a clinical response in neuromuscular disorders.

We've seen the biomarker changes in these patients, and we've seen through electron microscopy changes, you can see the levels of mitochondria go up beautifully organized.

Suddenly, the sarcomeres that looked like hamburger were beautifully organized. So, those are the things we have done over the years, Lea, to show that if you improve…

Now, we are doing many more studies right now, and we've gotten into both primary.

Discovery of the New Mitochondrial Steroid

So, if I could take a moment, so you can differentiate all pathologies into two categories, primary mitochondrial or secondary mitochondrial. Okay? One, when you have a mutation in the mitochondrial gene itself, and the other one is secondary because of other reasons the mitochondria affected.

And one would think that the ideas here is that as long as you supplement the mitochondrial level, the process should be agnostic. And sometimes the data we're seeing and hearing is bearing that fact.

because whether it's through your lifestyle you are hitting your mitochondria or you had an unfortunate issue of a genetic mutation in the mitochondria, we're seeing effects in that.

So right now we have studies going on at the Karolinska Institute, at Children's Hospital Philadelphia, at UC San Diego, We're starting a study at UC Davis, at Stanford, at Wash U, St.

Louis, because one of the things we also want to make sure that as confident or as comfortable we are, we want to keep doing these studies to keep moving.

or at least get the assessment of validated or at least real life data. One of the things I've turned into is real world data, real world evidence. And this is where our interest also has come about in mental health, because 2% of your body uses 20% of its energy.

And the question is, and there is books written about, Chris Palmer has written about it, other people have shown it, that bioenergetics plays a significant role in mental health.

plays in many layers of mental health, right? The mitochondria is where it all exists. But one of my questions, which is you kind of alluded to, and I just want to clarify, are you saying that if there's something, say, genetically wrong with the mitochondria, such as what you would see in mitochondrial conditions versus an aging-related mitochondrial loss, would there be a different effect of this steroid that enhances biogenesis for those two different type of So most of these in the clinical setting, we've been looking at the flavono.

So one of the things is that when you have mitochondrial mutation, you have a heteroplasmic issue. So to our hypothesis, that if it's not embryonically lethal, the child is born, but they do not present the full phenotype six months, 12 months down the road.

Correct. And the question is that because of the mitochondrial mutation, they are challenged further and they're losing it. So in their heteroplasmy, so in their cells, they have good mitochondria and bad.

One of the things also comes to that your mitochondria are replicating so fast, right? Yet it's a small genome. It only codes for 13 proteins. So it has the potential of creating mutations every time just by simple Mendelian concepts, right?

But your body gets rid of it. So, you and I make mutated mitochondria all the time, but we get rid of it because we have good healthy ones and they get rid of it.

In these patients, the level of the mutated mitochondria is always higher, so they're starting to lose that battle. So, as the cells divide… Correct?

The two daughter cells that are created, they may have disproportionate heteroplasmy. And suddenly the mutated mitochondria on one side may increase. And that population becomes the dysfunctional cellular population that starts to accumulate, et cetera.

Right? So the argument is that if you can keep the heteroplasmy towards a ratio where you have good bit of

healthy mitochondria, the phenotype presentation can be delayed.

So this is based on the hypothesis of what happens to patients when they're born and slowly show the phenotype. They're losing their battle. What we are trying to do is prevent them from losing the battle.

And in some of the studies, we are seeing exactly that. Now come to the secondary side, as you mentioned, when the insult is from the outside, you create that mutated mitochondria.

that dysfunctional and the battle is the same, right? So the battle is the same. So if you think about it, mechanistically they function the idea and our role is to keep promoting and maintaining that heteroplasmy in the right sense.

You mentioned something about neuromuscular and, you know, kind of the dystrophies that we talked about and in pediatrics and really the population we're talking about are, you know, these conditions where, yeah, they may have been lethal within the newborn period or just a little later.

And it just helps to really think. And I want to just take that in, that losing battle metaphor that you said. There's an accumulation. We know that there are conditions in which we see a slow deterioration over time and it's kind of an inevitable deterioration.

And so some of these use cases that you're talking about, giving them that extra juice, that extra mitochondrial genesis so they can start to win the battle and it becomes a battle of kind of increments.

And in doing that, what you're doing is you're giving the body, this developing child's body, an opportunity to take energy towards development. Right?

Because that's what we worry about is like if the body doesn't have enough energy, it doesn't have enough energy for walking, for speaking, for living.

And it's not critical at that time, right? It has to survive. It has to survive. So growth, even cognition growth, language. You see a lot of issues when children, they don't have language development.

They don't have other things because the body is saying, I only have this thing. I got to make this thing live. Forget about learning. I got to make this thing, the body live.

And you're absolutely correct. And the good part is these are the decisions that your body is capable of making. All we are doing it is giving it the resource to make those decisions.

That's it. And what I have learned, so this paper we have published when is this kind of hit me. So the Becker muscular dystrophy patients we treated with this supplement for eight weeks, they had both neuromuscular issue and they had heart issue.

But remember as the disease progressed, it was the neuromuscular first followed by the heart. Okay? But when we gave them the supplement, the response was the other way.

The heart responded first, then the muscle, because the body knows that the heart is more critical. You can live with not being able to walk, but you cannot live if your heart fails.

That is the day it came to me and I said, look at this beautiful body of ours. It knows what it needs to do. Yeah, it is, it openly does. I'm just thinking numbers, right?

Where do we have the most mitochondria in our body? Which organs? Mostly the organs. The heart, brain is the one, I mean, the concentration is just tremendous, right?

That's why it uses 20% of your energy, right? And then the organs come next, like the heart, the kidney, the liver,

because these are the places that are critical for your health and life.

Now, of course, skeletal muscle is a huge organ. So cumulatively, it's great because people have estimated that in a single neuron with the full dendrite company, in one, you could have a million mitochondria.

So, you're right. Organs are the key and the body knows. And that's when I saw that effect, I'm going, whoa, I mean, this is your body. So, earlier, to hark back the thing, it's the same when you exercise, right?

Your body overall starts to say how it is that you feel, how do you… So, after only a while, you get to this place where you have the exercise thing where if you don't exercise, you suddenly feel like something is missing today.

I haven't done something today. and your brain is just going, wait a minute, you know? Yeah, because it's used to a certain level of mitochondrial genesis.

And you feel that depletion of energy because of what's missing. It's such a behavioral thing you're talking about. And you're right, our modern world is kind of set up in a way to devalue it.

And we can talk about all the different reasons why, you know? But I think it really gets to this idea that we don't really know how this body works at this level.

Or we don't think about it every day. We don't sit there and kind of go, wow, let me visualize the powerhouse of every single one of my cells and really just know that I have the tools.

in my hand to increase my longevity in the next minute if I choose to. Even just sitting and doing some breath work, that's exercising the diaphragm. You know, like exercises many, many different things, right?

So just even a little bit. No, but sorry, you'll appreciate it. So I've had a new appreciation on the whole idea of meditation. I've somehow got philosophical about it because it's called centering, chi, centering.

So you call it Shakti, chi, whatever it is. But think about this, and I'll take you to a tangent, which is crazy philosophical way of thinking about it, centering the Kundali.

Centering our physical being through meditation and all also helps your bioenergetics. Now, the center of your body is your navel. Okay? That's the center.

And it's funny, as you're growing, that's where you got all your bioenergetics from because your entire mitochondria comes from the mother, not the father.

All right? So as you're growing in utero, your entire biogenesis of your existence, the mitochondria, has come through your name, which is the center of your body.

And sometimes you think about it as we talk about meditation and we talk about things, it's centering ourselves, right? So yeah, as a scientist, I've gone a little bit somewhere on the deep end there, but you think about it, that nature is beautiful that way, how it does things, right?

Oh, absolutely. I truly believe that we're at that place of where science and philosophy and quantum physics are meeting and we're making a very, you know, just like the telescope and the microscope helped us to, you know, look in, you know, we're kind of looking and also able to not just observe but interact with.

And what you just beautifully described was how you track through just logic, you know, and in this logical, what's next? The inquisitiveness, the curiosity.

How does this work? Does this exist in nature by itself? Oh, look at this. And then, oh, can it be stable? I mean, just this process that you described to us leads us back to the body, leads us back to the philosophy of, well, it's already working in this way.

You just figured it out. With the day, energy is what makes the universe run. Energy is at the core of it. Remember, no sun, no life. What does it do?

It gives us energy, right? Light and heat. It's energy. Einstein famously said it, and it's all about energy, and that's it. Nothing more. So if we think about our health and our thing, we have to pay attention to energy.

And unfortunately, in our reductionist system, it gets left out. But we are not a reductionist body. We are a system. And the one component that completely…

And this is kind of a crazy statement, but I'll make it. But if you really want to be reductionist on health, then say, all my reductionist theory on health takes me to the mitochondria.

That's it. I see that happening. I see that happening in just the fact that you came from pharma, right? Like you're coming from the scientific reductionist place.

Yeah, 100%. Right? Yeah. We felt that one protein inhibition will cure cancer. Well, it hasn't done that for decades, right? But I finally think about is that, but this reductionism is based on evolutionary process.

This is based on existential confirmation. It's based on the world we see around us. Okay? We may not share the genome with the plants, but we say share the mitochondria.

Yeah. We shared the fundamental thermodynamic concept. You touched beautifully on the idea of quantum physics and all, because these are the laws of thermodynamics.

They're not rules. These are the laws, inviolate laws of thermodynamics. That's what allows the mitochondria to put two negative particles together like there's no tomorrow.

Epicatechin and Exercise-Like Benefits

And in the annals of science, just ask people, as a chemist I can tell you, ask people if they have one other example that this happens so proficiently, that your little bitty mitochondria does so well.

Absolutely. So I, you know, it's so beautifully put together here and I want to hear from you, like what are, you know, maybe even, you know, we've touched on the philosophical, we're even getting to the place of like, you know, reductionism and kind of like holism.

We're thinking of the system as a whole, right? And we're talking now of ourselves as these bodies, this 8 billion of us that are on this planet. And if we think of this planet as a whole, You know, we've had this real challenge right now of humans feeling like we're part of the planet, that we remember, that we've forgotten, right?

And I love how this story brings us to, we're all one on this mitochondrial level. We're all one. If there's species extinction happening, that's our body.

We are part of this one body where all the mitochondria are popping in and out of existence. I think of that as particles and waves, right? Popping in and out of existence, constantly bringing us energy.

And where we direct it, and I love how you brought the spiritual too, is when we are in alignment. Right? Even in the yogic principles of where we sit with our spine straight, you know, we've noted that your CSF flows more efficiently.

If your CSF flow is flowing more efficiently, you are getting rid of all the stuff that you don't need in your brain and that flow, that movement and that mitochondria are kind of like the gears.

You're talking about now, okay, you might be going at second gear, third gear, you know, by the time you're 50. But here you go, you have an ability to get into fourth gear if you choose to.

Your own system. And if we can just think about it that way. And I agree with you that the idea of connectivity to the whole system around us, because what affects the mitochondria in the plant will affect us also.

Let's not ignore that, guys. I mean, this is important because I mentioned environment. Plants also feel the stress. Okay. There's a beautiful seminar.

We conducted that seminar at UCSF just last week. You guys know about that, right? So Andrew Dillon presented an amazing fact about how a plant that got hit by an insect and immediately you see the permeation of that signal through the mitochondrial process.

So plants see that too. They are sensing it too. And this is where, as I said, you know what keeps me going? Aliyah, you had a question? Inspiration. I mean, this is it, isn't it?

It's such a fundamental part of our entire existence. And here's the part that think about this. On planet Earth, we had a redosed atmosphere. Oxygen came on at the advent of photosynthesis.

Oxygen levels came up. Now, was it an accident that made life possible? Think about it. Photosynthesis uncontrolled, oxygen levels will keep going up and up and up.

And maybe in a lot of the exoplanets, the accident of endosymbiosis did not happen. And in those cases, oxygens went on and on and everything died because of oxygen toxicity.

But you still had the remains of life particles like carbon, nitrogen, et cetera. You still had that. But in this case, this endosymbiosis, What it did, it started using oxygen in the oxfas.

So suddenly, the bacteria that became mitochondria started consuming the oxygen. Hence, oxygen on planet Earth leveled off at 21%. So what was happening was a balance between oxygen of photosynthesis and consumption of oxygen through this accidental endosymbiosis process.

that was done by the mitochondria that protected us from oxygen toxicity and created life. Well, then brings the argument about cellular health, cellular respiration, right?

Yeah. What happens at the mitochondria? There's a respiratory process. Exactly. Oxygen consumption rate. Yeah. And how that can improve, like, just air quality in general or the oxygen, but does this have a place, does this also, looking at mitochondrial health on a planetary level, is there also a case to be made for mitochondrial health for our planet?

Aliyah, this is conserved. So remember, this flavonol I speak of, I give it to zebrafish, it works. I give it to C. elegans, it works. I give it to rats, it works.

I give it to mice, it works. I give it to humans, it works. Right? So it's conserved. The process is conserved. Right? Except that since plant can't exercise, they have other means of doing it.

So they also have their mitochondria is called chloroplast, but they have the process of photosynthesis and other ways to replenish that. But that does not protect them from environmental pollution.

That does not infect them from things. So if you think about it, environmental death of plants is mitochondrial toxicity in those plants. Extinction, you know, when we talk about animal kingdom, you know, think about this, that here is a one organelle that is the genesis of life, and if we keep it healthy, it will sustain life.

We ignore it, we shall be gone. I mean, there's nothing more to it, right? Because nothing in your body will function if you do not have the mitochondria giving you the resources to do it.

So I'm going to now segue a deep dive into how do you see this? So we know now what damages mitochondria. We know that there's this process of balancing it out.

We know that it is planetary. It's on this level of this is why we're kind of here because the mitochondria do all this work. We know it's maternal and we know it's conserved, meaning that it is present so widely that you can't just destroyed anymore.

If it gets destroyed, that's that last layer of life. So I feel like almost like we're, you know how a brake pad gets kind of worn away and you're at that right like edge of where we are right now.

So we're talking about building that resilience. in that layer, in plants, in soil, in bacteria, in all the life, in fungi, they have mitochondria, right?

Like, yeah, you know, and the things that we're putting into our environment and into our bodies and into our minds and the ways that we are experiencing the death of our own mitochondria.

and able to express it, now giving it a story. You've just given the story of, think of yourself on this level of an energy transmuter on this planet.

And if you think of it that way and you think of health in that way, what does the future of health and wellbeing and flourishing look like on this planet?

And you could play a part in it. You could play a role in it. Because the idea here is that we have to really sense the idea of what have we become in our societies and go back to some of the fundamentals that says, look, the whole exuberance of the industrial age, we need to step back a little bit before we'd go off the cliff.

And we could simply start by addressing the energetics of the planet, ourselves, people around us. Think about Israel. One person has two kids or three kids.

They all have separate genomes, but they share the same mitochondria because it's all coming from the mother. So there's no dilution, none whatsoever, because if you have the genome that's a nuclear genome within two, three generations is diluted multiple times, not the mitochondria.

And so exactly you're right. Life source is energy. Mitochondria is at the center of it all. Take care of it. It will take care of you. It's nothing more complicated, no other systemic holistic reductionist arguments.

Take care of it. Figure out your way. And taking care of it is not just supplementing it, but take care of the food you eat. Take care of the lifestyle you live in.

We eat simple whole foods. So all these people who want longevity and just want to have their cake, that's not how it works.

Clinical Applications Across Disease States

You can't simply go and say, okay, here's an mTOR inhibitor and it's selective, it'll give you life. If the life depended on just one protein, Yeah. And thank you for bringing in the kind of the industrial age, right?

Because you're right, like the industrial age has only been here for a couple of hundred years. And what it has brought about is this idea of consumption.

you know, money or capital or whatever you want to call it and storing it away. And it's focused towards humanity. We have to understand that we live in an environment.

If the environment around us dies around, we ain't going to survive. Technology is not going to rescue us. We have to know that. And so you're absolutely correct.

But at the same time, I'm not saying put the technology genie in the bag. It can't do that. Technology has its role, has its purposes. Absolutely. But to take care of your health is your job.

I think you're getting to the philosophical part here. A real difference in even what we are discovering in healthcare is that we've all been raised in this model of here's the sage on the stage, the person who has all the information, and there will be a transmission to the person who needs the information.

and that that knowledge transfer or technology transfer will make this flourish. And what we're now talking about is almost kind of like a real lining of that relationship to really say the person themselves holds the autonomy, the power, even in the way they talk about themselves, even in the positivity of their words, their thinking, you are talking to your body, even things like, I love my body.

I appreciate what it does for me every single day. That can start the process of inviting energy in. And I just love how we're connecting all the pieces of behavior and intention and spirituality and cellular level.

Yeah, because see, we have a conscious, deductive, anticipating mind frame. Humans can do that. Hence, the burden on our brain is higher than simply survival and living for tomorrow.

So you're absolutely right. Managing that, conditioning that, because if you don't, that puts significant stress on your mitochondria. And if it becomes continuous, it will manifest itself in some form or the other.

Now you read about the sages of the past, you know, who did not perhaps know about these specifics, but appreciated the consequences of those things. And I think what industrial knowledge or modern knowledge can do is contextualize that even better.

I say, here's the reason why you should meditate, right? Here's the reason, because believe it or not, when you sleep, your brain actually uses more energy because that's the time your mitochondria and the brain are working to lay down your short-term memory, your long-term memory.

you know, it's putting you into dream states, it's putting you into all kinds of things. So your brain is not asleep. It is firing away like crazy, right?

I want to just go back to how this, how we started this podcast. This is what you have talked about, which is your question, your curious question to the gap that you notice between cell Longevity, why?

What is the missing component and how is exercise induces that biogenesis? You asked that question. As you started this podcast, I was like, why hasn't nobody asked that question before?

You are absolutely right. Why have we not asked that question? What is the gap? with that link that you went and searched for. So you were curious, curious, and you fueled this discovery, right, that then fueled this creative way of being and recognizing how this is all connected to every living thing on this planet, which is the purpose of our podcast.

We want to be able to do these things, ask these questions, and really sit there because we have the answers. And this is somebody also said this about AI, that AI has the answers.

Eventually, we'll even have better answers for us. But what is the question? Let me rephrase that for you. I think AI will help us better understand the answers we're getting.

Because as we go systemic, the complexity of that answer, we would need to understand that from multi-dimensional processes. Because see, if we don't put in good data, AI will mislead you.

So one of the things that my aspiration is that as we do these studies, these are studies that are now vetted and qualified, we keep putting this into this database.

and take the real-world data of individuals, real-world evidence of individuals, and use machine learning and AI to really understand with how are things happening in these patients.

Because, Elia, your body is very dynamic. What it will be tomorrow, it is not today and will never be the same the day after. Remember, your body is not a static being.

What we have to understand is how to play analysis in this multi-dimensional modality. And this system multi-dimensional is, if you put the right data in, machine learning will give us the understanding that would be amazing.

Yes. Work will be able to ask the right question to AI. And I think that's the highlight of what you're kind of bringing this to, I think, is that we have to be able to continue to ask those questions, be discerning in how we understand as a human being, taking it leveling up, leveling up each time, because we will have to keep up with that.

So my next question to you is, What is the next curious question you have in the work you're doing with Blue Oak? And like, how is this going to impact?

And I know there's going to be doubters and skeptics listening. You know, I don't know. It sounds like, you know, too good to be true. Yeah. So, and then we have that right to kind of, we do have to examine this, but what is that next level of application that you see this and how is it different than say other ways of addressing health?

I think there's still a lot to be learned, trust me. No matter what I say, our knowledge in this field is still new because we're learning there's not just one type of mitochondria.

We are learning how mitochondria communicate with each other. We're learning how they facilitate communication between cells. Right? So where my idea here is number one, to be very phenotypic.

That means it cannot be contrived experiments. We have a tool that is so safe that we can pulse the human system or other animals or whatever it is to start to understand through real world data and real world evidence.

Right? I want to understand what happens if you go into area where there's diagnosed issues of mental health, when you go into areas of diagnosed issues of metabolic issues.

Because see, we forget that if you have a chronic disease, we can teach, treat patients cancer, but we have to understand that there has to be a mental consequence to them having cancer, but we don't even talk about it.

We don't know how that part can relate to the response of therapy. If you give two women with breast cancer the same drug, the response are different.

Can you imagine the connectivities of different parts of bioenergetics that can play? Because Alia, you know that your mental state plays a significant role on your response to therapy.

But we don't even touch it, because the best thing we have is an SSRI. You're depressed. OK, take an SSRI. Well, SSRIs are toxic to mitochondria. Well, how is that helping?

So to me, the idea here is that you may have a disease that a certain particular disease diagnosed, but it sits in a systemic body. And the whole process has to respond, correct?

But we don't even talk about that. We talk about it with ketamine-assisted therapy because ketamine also works at the mitochondrial level, right? It activates mTOR and mTOR then activates again that cellular production.

And then you see this in clinical, you see this, you see patients' mental health get better and suddenly they have more energy. And it's not like they've worked out.

They just feel more energetic. Their skin looks better. There's more volume of blood flowing. There's just more available for more thoughts. Because the energy is not being siphoned away by that insult that was there.

Or trying to make enough mitochondria to survive. Like I feel like depression, you know, like I always bring this up, but this is such a critical piece.

When we study depression in rats in the laboratory, how do we induce depression in them? we actually make them drown. There's like a use up of energy.

We're draining the energy and the life force away. And what is the phenotypic effect? It's quote unquote depression, a loss of interest, a loss of connectivity, a loss of energy.

So there's all of those, you know, aspects of depression. And then when we like Alia, you just brought up this beautiful piece. Yeah, with ketamine assisted psychotherapy, And psychedelics, why are we seeing this transformation?

Because there are substances that go all the way down to that level. You can juice with more mitochondria and then you see the relief of depression. So I feel like, you know, as we talk about diseases, diseases are the little tip of the iceberg up the top, but the process underneath the water is what we're trying to understand.

Exactly.

Mental Health, Inflammation, and Real-World Data

And so earlier to your question, Even today, I'm not smart enough to figure out what the tomorrow's question would be, because I am still learning so much about what I have.

At the same time, I know that there will be questions, and that's why I'm also surrounding myself with a lot of very smart people, okay? Because it's not a personal, it's a quest for health.

So we are doing a study at University of Glasgow that's led by Emily Combet and Paul Shields. Paul Shields is a geriatric gerontologist. He's this guy with the part of the team that cloned Dolly the sheep.

He's the guy who did the telomere work. And what we're trying to understand in that specific study in humans is elderly patients with metabolic disorders associated with inflammation and cognition issues.

Right? So now we are doing not one thing, we're trying to understand three things happening simultaneously. I'm sure there's more happening to their body, but we're starting to understand.

And what we have seen in some of the studies is the effect on inflammation. So think about it, all diabetics have chronic inflammation, right? Do we treat it?

No. What controls inflammation? NF-kB. What controls NF-kB? Mitochondria. Mitochondria are the ones that induce the processes of inflammation because they sense an insult.

So we're trying to understand how these three things are correlated, right? Inflammation, metabolic, and cognition. I mean, what are the things? We're doing a study at frontal lobe dementia.

I mean, these X-leg things that affects us. Trying to understand. I'm going to Dallas to understand. There are beautiful scientists coming up with ways of imaging blood flows.

So this work being done by a professor at University of Dallas where they put a dye on your skull and then their laser can go right through it and they can see the changes in blood flow.

So we can monitor in real time, mitochondrial effects of exercise or of our supplement and see what is going on. So Aliyah, the question, I mean, I can give you like two days of questions, but I don't know.

But Sam, we learned, and part of our process is to work with folks like yourselves to keep getting data back, to keep getting data back and keep adding to our understanding so we can work together to say, how can we continuously help patients, help people with our supplements or any other approach?

Yeah, I mean, as a person, you know, as people at the intersection of pediatrics, mental health, integrative medicine, integrative medicine in the way of, and functional medicine, right?

And personalized medicine, we're kind of seeing that there's a sea change here and we have a lot more that we can offer. This is the part that keeps me up that we just have scratched the surface.

There's so much to learn. I don't think I have the lifetime available to learn it. I wish I did, but I mean, can you imagine as the world learns about the mitochondria, maybe we will step, start a process that the understanding of mitochondrial physiology and its role and within us, we get better and better at freely appreciating it.

That would be the amazing story. The clinical end of this, the clinical application of this is to be determined correct. So I imagine that you at Blue Oak NX have supplements or recommendations or that you're looking into researching and developing.

How would this be applicable to our patients today? And yes, we have data, we have patients in need of something that would get that energetic fire going for them.

What would you suggest here? Earlier, I think that mitochondrial deficit is in everybody who's over 21. That's a comfortable universal statement to make.

We all have that. If you have additional pathology, that deficit is higher. Okay, now you can see in their therapeutic or interventional concepts that replenishing the mitochondria is not part of one of the solutions because we don't have the tools to do it.

It's behavioral right now because all we know is exercise, right? Because if exercise is the only natural way to do it and we're not doing it, so the deficit is there.

preponderance of evidence we have suggests that supplementing the mitochondria will have a clear phenotypic advantage. It may not cure the underlying disease, but it would definitely should have beneficial aspects of phenome.

What that will be is going to be patient dependent. As I said to you, it's the patient's body. We may want to give diabetics approach is to reduce their blood sugar.

But in some diabetics, something else may be more critical than reducing blood sugar, right? So our metrics has to be one patient at a time. That's why we really want to work functional doctors, integrated medicine, because it's the patient-centricity that matters.

Because when you practice medicine, it's all enough one. You don't put average, okay? There is no average. I mean, eight billion people, I'm the only one.

There's no replicate of me on eight billion people, right? So how I respond to what is happening to my body cannot be replicated as an average. We have to go there.

We have no choice. And I think we can do that. And I can say this in a way that one would think that this supplement becomes so inexpensive that everybody takes it because all of us are deficit in mitochondria.

And I'm feeling like we can even bring in this idea that right now, as we're thinking on the population level, you're saying that, you know, this supplement increases your quality of life, right?

Just there, right? If you're over 21, and then you think of this as a score, right? Okay, you've got a genetic condition, you've got an inflammatory condition, you've got a toxic stress, environmental stress, something like that.

And what we are living in, this world we're living in, and you know, as pediatricians, we see this, The toxic stress on the younger population right now is across the board.

It's across the board. Our food supply, you talk about air, you talk about asthma rates around highways, you talk about all the different accumulated stresses.

One of the things is that, so here look at it in urban living, right? Particles less than two and a half microns approaching nanoparticles get embedded in your system and people have shown a direct consequence to the mitochondria.

Now think about it. You have all these cars driving on the roads and their tires lose their tread. Where's that rubber going? all the toxic, you know, we know this, right?

Like all the, if you test the soil around highways and you test the air. And so I feel like what we're even talking about here is this notion of it's going to become almost obvious to those people coming up, this next generation of scientists and the ones that are kind of going into the lab right now and are going to be at the forefront of this mitochondrial science.

that this may become one of the major tools of how to actually withstand, help the human collective genome withstand this toxic stress of climate change that's coming up, of all the oxidative stresses that we're building in our bodies.

And so I'm feeling like what we're talking about is very futuristic. in a way. So it's futuristic and current, but the point is that I always say, it's a process that'll take time, but the journey of a mile starts with the first step.

The idea here is we got to start to do, just not talking about commercial part of it, but suddenly we have a tool in our hands that we can pulse the system safely and almost without concern.

Because very, very few things come into your life that have the safety profile of this flavor. I mean, going back to where the flavonol comes from, from green tea, you said, right?

And chocolate. So our ancestry of those two things are very long in two very separate cultures, right? The Mayans gave us this thing and they called it the food of gods, right?

So P. O. Broma, the food of gods. But in the Mayan culture, the extract of Kapkau was used by only two groups. One were the royal families and the others were messengers.

And I said to myself, why? Why would they give it to messengers? And the only part was endurance, that messengers could run from village to village with messages without getting tired.

So we did a study with mice on treadmill, and I have the video to the Mewkwok Chariots of Fire. And when we made these mice run on the treadmill with a severe incline, the ones that had the flavonol did not tire out, the others collapsed.

Well, when you take their muscles and you study, and some of this work is published by independent people, they don't have stronger muscles, but their relaxation and exhaustion increases significantly.

Why? Because your mitochondria are very active to give you the metabolic energy you need to run. So there's a lot of these crazy things and questions you ask.

Future Research, Safety, and Access

A lot of the early history tells you that people have used it and we see it. There's so much to be learned. Yeah. The ancient and the modern all together.

Yeah. That was beautifully put. Thank you. What a conversation and what a delight to get to know you and to just imbibe some of this inspiration because it's only through being curious, it's only through being inquisitive that we discover these things.

Yeah. And then to me, I think having lots of colleagues along the way, so please understand, I can't do anything all by myself. So I have to be thankful to a lot of colleagues out there.

I mean, there's so many, I can't name them, different labs that have supported this, validated things that we have looked at, and we have also relied on the things they have looked at.

So it's not just that we only relied on our information, other people's information definitely had a seminal impact on our research. And I think that, as you said, if the diaspora continues to expand, we can continue to do more and more research, understand more about this thing, and see where we end up.

Beautifully put. Science is a contact sport, and it's an ecosystem. It's a village. And now we are very focused on- I think it's safe to export. It's safe to export.

But I don't know what focus has become to really get real-world data, real-world experience, because to me, that's where the crux of it is. And after 16 years, I felt that this cannot be left on the vine.

This had to come out, and hence I found Monica and Sonia, my wonderful partners, and we formed a public benefit corporation to make sure it comes out.

So that's a great segue. If people who are listening to this podcast would like to contact you or have patients or have questions, how do they find you?

Our website is great. They can go there, www.blueoaknx.com. There's an info section. I tell you, we love to get questions. We love to talk because it's not about take one and feel good in the morning.

It's about let's have a conversation. What can we learn from each other? What can we tell you? So that's the best place to go, ask your questions, come talk with us.

And if you want to be part of the journey, come join us. You know, I mean, because a lot needs to be done as we move forward. And do you have any advice for parents or patients who might be looking for this kind of medicine?

Yeah. So I'm not this is not a medicine. I'm not a clinician. The supplement. I'm not a clinician. My whole idea here is that my work has been at this translation of science and human application.

To me, the basic fact is mitochondrial deficit is a part of your story. Whatever you have, mitochondrial deficit is part of the story. and addressing that can only help, right?

How, to what degree will be dependent on each person, to each phenotype, but this being so safe, that is the one thing. And perhaps one of the things I could tell, this has been the ilk of my work, Zetia, that I'm a co-inventor of, along with some other beautiful inventors with me, is still the one of its first kind drug.

It has never been replicated, even though we have less patent. Not because people could not find other drugs that work better. They could not find other drugs that were safer.

Zedia has an exquisite safety profile, hence no competition has replaced it. We were the first ones to discover how cholesterol is absorbed by the human body and found a drug that inhibits it.

So we did not win that based on efficacy. We won it based on safety. Our flavonol is the same. It is safe, as safe can be. At the end of the day, water can be toxic.

if you drink too much of it. Oxygen can be toxic, but it is safe as it can be. So we want people to join us. Let's have conversations. Let's build a community of interplay so that we learn and we help.

Thank you. And I love how that you honor the work of all the people that have you've worked with that have contributed to this process as it sounds like it's been a lifelong process for you to get to this beautiful now expanded

expansion.

We will also post in our show notes for the audience, the listing of your publications and work and the website. So I want the audience to know that there's another source of that information because that's information that's so extensive and so beautiful and enriching, especially for people who want to take a deeper dive into the work, particularly for the different case studies that you're…

Absolutely. Yeah. Yeah. So, yeah. So we thank you for making time for us today. This is really why we do this podcast is to continue to build on what we can do better and really ask those questions that help us guide us into the story, into where we can really discover and then activate.

And then we go, yes, there is a way. It isn't about pathology always, you know, in medicine, we're always taught about the pathology, get rid of things.

It's like, no, build the beautiful, build what's good already and continue to maintain that because of course it will grow best in that way, that loving, supportive, holistic way.

Yeah, absolutely. I mean, I think I agree. And this is probably the new concept on how we look at people and their health. and say, look, you are not just the tumor you have.

There's a whole system that is being challenged. And we need to think about that. Thank you. Thank you so, so much. Thank you so much. Appreciate you guys.

I really love the conversation. And thank you for taking your time on a Sunday afternoon. Thank you. Thanks for joining us on the Two Curious MD podcast.

We hope today's episode inspired you to ask new questions and explore fresh perspectives. We challenge you to ask us those unasked questions that you're curious about in your medical practice, condition, health, and wellness.

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post or comment with a question or curious inquiry that you have and seek to explore or learn with us. Stay curious and we'll see you next time.