

The Cell Danger Response and Reversing Chronic Disease in Our Kids

Laura Frontiero, FNP-BC interviewing
Elisa Song, M.D.



Laura Frontiero, FNP-BC

Welcome back to the Restore Your Mitochondria conversation. I'm your host, Laura Frontiero. I'm bringing you experts to help you boost your energy and fix your health so you can build the life you love. Today is a special guest, a friend of mine, Dr. Elisa Song. Hi, Elisa, welcome to the--

Elisa Song, M.D.

Hey, Laura, I'm so glad to be here.

Laura Frontiero, FNP-BC

Me too, this is really, really important to have you here, because in the world of mitochondria, pediatrics is really underrepresented, I would say. And that's why I was so hoping that you would come onto this summit, because I really want you to talk about the cell danger response and reversing chronic disease in our kids. And you know, for viewers on this summit, some of you are parents, some of you are grandparents, some of you are aunts and uncles, there's children in your life, and so this is a relevant conversation probably for you, even if your kids are grown up. Because chances are you're gonna have grandkids. So this is really good that you're coming on, I wanna introduce you to our audience. You're an integrative pediatrician, a pediatric functional medicine expert, and a mom to two amazing thriving kids. And in your integrative pediatric practice, it's called Whole Family Wellness. You've helped thousands of kids get to the root cause of their health concerns, and you've helped their parents understand how to help their children thrive. And that includes body, mind, and spirit. And you do this by integrating conventional pediatrics with functional medicine, homeopathy, acupuncture, herbal medicine, essential oils.

And you've created this amazing resource Healthy Kids, Happy Kids. It's an online holistic pediatric resource to help practitioners and parents bridge the gap between conventional and integrative pediatrics with an evidence-based, pediatrician-backed approach, and I know you were a voice of hope and a voice of reason, and just a sound voice during all the COVID stuff, and you continue to be, so, thank you for being here.

Elisa Song, M.D.

Oh, you're welcome. Like you said, children really get pushed to the wayside in conventional medicine, and functional medicine, so this is super important, and what we're gonna talk about today really applies to anyone who has a chronic health concern, child or adult, so, I'm honored to be here--

Laura Frontiero, FNP-BC

Yeah.

Elisa Song, M.D.

With you.

Laura Frontiero, FNP-BC

Yeah, 'cause guess what? Our mitochondria work the same, whether they're kid mitochondria or an adult mitochondria.

Elisa Song, M.D.

Yep.

Laura Frontiero, FNP-BC

It's all the same. So this is good for everyone. Now, let's jump in and talk about the fact that our kids are getting sicker and sicker, and this is no joke, and we cannot ignore it. We're facing an epidemic of chronic childhood diseases, including mental health disease, which we've seen just exponentially ramp up in the last couple of years, I feel like it's suppressed by the media, but we know that the suicide rate, especially of young girls, has gone up. So what are our current numbers right now, with what it looks like, in our pediatric population?

Elisa Song, M.D.

Yeah. And the numbers don't look good. Right, and here's the thing. The numbers haven't looked good for decades. And it's really time that we, as a society, as a world, that we wake up, because that saying, that the children are our future. It's not gonna be true anymore, if we don't step up, and we really need to step up for our kids. So right now, about a little over one in two, maybe 55% of kids has some sort of a chronic diagnosis. And if you have kids or are around kids, you probably know a kid who has chronic constipation, or asthma, or eczema, or behavioral concerns, autism, ADD, even autoimmunity, right? And as Laura said, this epidemic of mental health illness, of course, during the pandemic, a variety of reasons that suicide and depression and anxiety have gone up in kids, but even before the pandemic, suicide has remained the second leading cause of death for our youth 12 to 17 years of age. So second leading, what's the first? It's accidental injury, which, you know, car accidents, just risk-taking behaviors, which often are associated with anxiety and depression to begin with.

And that, if you took influenza, the rate of suicide, the deaths by suicide in our youth, we're 27 times higher than annual deaths from influenza, so we just really need to figure out, what are our public health priorities? Now, the situation isn't really getting much better. And I'm not here to paint doom and gloom, because we have the knowledge to know how to reverse this, right? But first comes knowledge, knowledge and awareness of what the problem is. And by 2025, which is right around the corner, some of the projections are really estimating that maybe eight in 10, eight in 10 of our children is gonna have some chronic diagnosis. And I'll tell you, in my practice, these kids are coming in at younger and younger ages with chronic diagnoses. I used to think, this was years ago as I was starting my practice, I was just floored when I had an 18 month old girl come in, and she had been diagnosed with ulcerative colitis. Well, fast forward, this is not too long ago, maybe about six years ago. I had a girl come in at six months of age, diagnosed with Crohn's disease. Six months.

Laura Frontiero, FNP-BC

That's unreal. That's unreal.

Elisa Song, M.D.

Unreal, unreal, right? And fortunately, Mom was aware and savvy and thought, "There's something else that must be going on, "what can we do?" And so she came to our practice and, you know, I'm not gonna say it was an easy road, but now she is a thriving almost seven year old attending school, no diagnosis, no medications, in fact, the gastroenterologists are saying, "Well maybe she didn't have Crohns to begin with." Right? So, she's doing great, and we have the tools. If we are aware, and we have the motivation to do this, and we need to, because in 2005, the new England Journal of Medicine came out with an estimate that our children, with this time in history, is the first time that our children are expected to have a shorter lifespan than us, their parents, right, their adults, first time ever in history, with all of our modern medical advances. And the vast majority are due to these lifestyle-related, non-communicable diseases, which are now really underlying the vast majority of deaths around the world. And as we've seen with COVID, is really the underlying highest risk factor, besides elderly age, for serious morbidity and mortality, for COVID. So for children and for adults, it's time to wake up now, right, so I'm grateful you're doing the summit to spread the message.

Laura Frontiero, FNP-BC

Yeah. So why is this epidemic of chronic childhood disease happening? And I'd venture to say whatever's causing that is hurting adults too.

Elisa Song, M.D.

Yeah, absolutely. Well, I mentioned, it's the lifestyle-related diseases, right, these noncommunicable diseases or NCDs, which are making up, again, as the World Health Organization has acknowledged that NCDs are the leading cause of death around the world. And it's our ultra processed, ultra sugary, ultra fast world. And it becomes cliché. But when we think about it, when we think about the saying, the phrase that most of you guys listening know, that Hippocrates said "All health starts in the gut." Well our modern world has created lifestyle and environmental factors and foods that are directly damaging to our gut microbiome, directly causing leaky gut. And as a result directly disrupting your babies and your child developing gut-brain connection, gut-immune system connection, gut-hormone connection. So very early, from the moment you try to conceive as a mama, if your gut microbiome isn't as healthy as it could be. And during pregnancy, and during labor, and in those early years where we have all of

these, what I've been calling microbiome mischief makers, these things that we don't even think of could be wreaking such havoc on our microbiome, but are laying the pathway to a disrupted gut microbiome, and laying the pathway for a leaky gut, and food sensitivities and immune dysregulation that in those first few years of life, could set the stage for an increased risk for virtually every single chronic disease in our kids. So we need to really think about, you know, how are we living? What food are we creating? You know, what modern conveniences are we striving for, that we can have, but without the expense of our children's health and our health.

Laura Frontiero, FNP-BC

So what can be done to reverse it?

Elisa Song, M.D.

Yeah, so, I mean, you know, it's gonna take a lot more than just us talking to overhaul food policies--

Laura Frontiero, FNP-BC

No.

Elisa Song, M.D.

Agricultural policies, environmental policies, but we start with one kid at a time, right? We start with one adult at a time. And then we do work for broader change, but it's really, we wanna look at what are some of the root causes of this? And I really, as we just said, addressing that gut microbiome in your kids, even if they don't have any gut problems. Right, if your kid comes to me with anxiety or ADHD, or rheumatoid arthritis, and I start looking at your gut, I wanna check out their poop samples, right. And you and your kid, say there's nothing wrong with their gut, I mean, they're pooping every day, it looks like a nice brown banana, I mean, they don't have tummy aches, no reflux, no bloating. Doesn't matter, doesn't matter, you still always start with the gut, because of the imprinting and epigenetic modifications that take place when your gut microbiome is disrupted, and if we can reverse that, and optimize your child's gut microbiome, we can then actually epigenetically change their future health outcomes. So it's really critical to know that's where we start. And then we see where the other imbalance is.

Laura Frontiero, FNP-BC

Absolutely. This is exactly where I start in my practice. Very first thing you do when you come in is we do gut assessment, and we start foundationally. I was talking to another speaker today, and a good analogy came up. You gotta get your house in order before you fix the other things.

Elisa Song, M.D.

Yes.

Laura Frontiero, FNP-BC

And really, think about your gut microbiome as getting your house in order, it's foundational, you can't build on a shaky foundation, right? You have to have that in place.

Elisa Song, M.D.

100%

Laura Frontiero, FNP-BC

Yeah, yeah, so, this is a great segue into talking about cellular resilience, because gut health and mitochondrial health are deeply linked. You cannot have good mitochondrial health without sound gut health as well. So what is cellular resilience exactly?

Elisa Song, M.D.

Yeah. Now resilience has become sort of a key word through the pandemic, you know, emotional resilience, immune resilience. And then we need to really think about, you know, what is cellular resilience? At that cellular level, how do we make it so that your cells can bounce back quickly and completely, no matter the hit? I mean, that's the definition of resilience. And when we talk about cellular resilience, what I impress upon parents, it's very important to understand that resilience doesn't mean never taking a hit. It doesn't mean never being stressed, never being sick, never having a fever. Living in that kind of a bubble actually reduces your resilience, right? And so, it's just like, if you haven't ridden a bike in forever, the first time outta the gate, you're gonna be creaky and you may fall over. Well, we wanna be practicing, practicing, you know, we wanna have our immune system and our cells really build that muscle memory. So cellular resilience means that whatever the hit is, and I'm talking psychological, physiological, infectious,

environmental, you know, toxic, all of those create a certain cascade of cellular reactions that are identical. Right, that initial hit, doesn't matter what the hit is, your body can't tell the difference between psychological stress or physiologic or infectious or immune stress, at least in the beginning. Right? And so that cascade gets set off, and we need to make sure our cells are fully able to take that hit, recover at a cellular level, and then remember even how to do it for the next time. Right, and that's what we want, what's what we want, we take that hit, we brush ourselves off, we get back up, and then we're more confident and stronger for the next time.

Laura Frontiero, FNP-BC

Absolutely. So, it's so interesting, because people always discount stress. They think, "Well, I just have stress in my life. "Everything else is okay. "I don't have a mold infection, or a parasite infection, "or a lyme infection, or whatever, it's just stress." But like you just mentioned, your body reacts to that initially the same, as if it's any other stressor coming in.

Elisa Song, M.D.

100%, you know, it's fascinating, 'cause when you look at, by now, living through the pandemic, everyone's heard of cytokines, right? So, as we have psychological stress that psychological stress releases the same kinds and amounts, maybe even more, of those inflammatory cytokines, as physiologic stress or infectious stress. And then let's take it the other way, what about being happy? Right, we all want our kids to be happy. Well there's a couple of different kinds of happiness. That's been kind of the philosophical question through the ages, what is happiness? But hedonism, right? The simple pursuit of pleasure. "I just want what makes me feel good." Right, that kind of happiness is actually found to be more inflammatory than another kind of happiness, which is called eudaimonic happiness, where we find happiness in serving others, and having a higher purpose, and in achieving something good in our lives. So it's really, you know, we wanna think about, as parents, so many of us, I mean, all of us, right? We all want our kids to be healthy and happy, but we wanna reframe what that means, right? Being happy and healthy doesn't mean never being stressed, never being worried, never having to overcome a problem. Because guess what, if you never learn how to overcome it, just like your cells, you're never gonna learn how to get stronger and stronger, and have that growth mindset that we want for our kids.

Laura Frontiero, FNP-BC

Oh, so good. So good. Now, building on this cellular resilience, you have to understand cellular resistance, or excuse me, cellular resilience, to understand cell danger response. So can you talk about cell danger response, Explain what that is. And that happens in all of us, and this is kind of new-ish in the last 10 years, I think, in the mitochondria research, we used to think that mitochondria just made energy and that was it. So what is this piece, cell danger response?

Elisa Song, M.D.

Yeah, so the cell danger response is one of my very favorite topics to talk about, because, once we understand what the cell danger response is, it can change the way we think about chronic disease, and how we're addressing chronic disease. Those people that you and I see, functional medicine practitioners see, who are stuck, right? And you just wanna know, how can I move the needle, and understanding the cell danger response can be the key. So if you are listening, you are one of those patients, we wanna really understand what this is. Now the cell danger response was first described, and really elucidated by Dr. Robert Naviaux at UCSD. And he's one of my heroes. I had a chance to meet him in person, actually live, during a conference, during the pandemic. And I was just so starstruck, and I'm like, "You are my hero!" Right, we all have our own own stars, and he's one of my stars, right, I definitely had stars in my eyes meeting him. But so he described the cell danger response.

But more than that, he described this complex system of how we stay healthy and how we respond to toxic insults, right, quote, toxic insults. And so, when we are in a state of good health, usual health, ideally we remain in what's called the health cycle. The health cycle consists of our wakeful activities, right, our metabolic activities, and healthy movement and restorative sleep, right? We stay in this health cycle, and the foundation is a healthy gut microbiome, right? We get toxic hits all the time, right? Every day, right, we get a little stressor here, "Oh my gosh, I have this deadline," or "Oh my gosh, I'm like 10 minutes late "to my kid's school performance." We get exposed to infections, we get exposed to car pollution. So when those toxic insults exceed the capacity of restorative sleep to heal ourselves, then we ourselves get triggered to enter the cell danger response. Which is part of the healing cycle, right, it tips us over. Now, when we enter this healing cycle in the cell danger response, that is a primitive cellular response, it goes way back to when we were cavemen, right, cave people, cavewomen. And it's the same cellular response that

occurs, just as we mentioned, no matter what kind of hit it is, whether it's emotional, psychological, physiologic, infectious. Why? Because when we were back in evolutionary days, we're still evolving, but as we were really evolving, we couldn't have an immune response for if you touched the hot fire, or if you cut yourself on a blade, or if you got an infection. We needed an efficient way to deal with any of these exposures. So, that's a cell danger response. The cell danger response, when that's tipped off, what it happens, is mitochondria release ATP into the extracellular space. That ATP is a signal for your cells to say, "Oops, I gotta enter the cell danger response." So there's three distinct phases of a cell danger response. And your cells must go through each phase, phase one, then to phase two, then successfully through phase three, once they're successfully through phase three, they can now enter back into the health cycle with wakeful activity and restorative sleep.

Each of these phases is a little bit different. In phase one, the idea is to protect us, right, protect the host. So wherever the injury is, those cells that are injured get walled off. Right, they lose connection with the rest of your body, because the last thing we want is a raging forest fire that knocks you down, right? Your cells try to contain it. And during that stage, the cells are trying to neutralize a threat, whether it's an environmental toxin or infection, whatever it is, inflammatory cytokines. If that threat is neutralized appropriately, then phase two can start. And in phase two, any cells that were injured get repaired, that's where all of our functional medicine core clinical imbalances that have come up in the fighting process, like maybe gut dysbiosis, or methylation dysfunction, or mitochondrial dysfunction, all of those need to be addressed, you know, past that activation. And any cells that are just damaged beyond repair, get replaced.

Stem cells come in and make new cells, okay? Once that appropriately happens, and in phase three, this is one of the most important phases. Phase three, those cells that are new or repaired. Remember, in phase one, they disconnected from the rest of your body and we can't have individual cells working without connection. Those cells need to reconnect to the rest of your body. And that happens via the vagus nerve. Okay, so we have all of these important components that happen in place. And then as soon as your vagus nerve reconnects your cells to your brain, your gut, the rest of your immune system, you're back into the health cycle. So when we talk about reversing chronic disease, it's interesting, Dr. Naviaux had an amazing point. We actually don't reverse chronic disease. We help patients move through the cell danger

response, back to the health cycle, and that's really important to know, because healing is an active process, and we can help facilitate that. But when we think about all of the components, it's amazing to see how what we're doing in functional medicine really can help foster moving successfully through the cell danger response.

Laura Frontiero, FNP-BC

And this is such a good explanation, and when we're in the cell danger response, we actually feel it physically. So can you explain what that's like, as the human going through the cell danger?

Elisa Song, M.D.

Yeah. Well, so, when we're going through the cell danger response, there's a metabolic slowing. There's a quote sick behavior that occurs, because your body's not supposed to be going 100% when you're sick, right? You're supposed to be a couch potato and sleep all day, right, you're not supposed to eat so much and gorge, you're supposed to slow that down, right? You know, there are all these healing processes that if we listen to our body, right, just if you have a kid, you know, what do they wanna do, they wanna sleep on the couch all day? Right, and their parents are worried, "Well they're not acting themselves. "I want them to be happy and running around." Well, you don't want that, right? So there's that behavior that occurs that is actually helping us to heal. In our modern world, what happens? "I have to get to work. "I can't miss this deadline. "I can't let my kids down." Right? And so you go, go, go, you ignore those sick behaviors that your brain is trying to tell you to take. And then we perpetuate that inflammation. Now, when we're in that state, and we cannot successfully move through phase one or phase two or phase three of the cell danger response, we get stuck, right?

Laura Frontiero, FNP-BC

Yeah.

Elisa Song, M.D.

You might get stuck in any of those phases. But what's amazing is that Dr. Naviaux has, it's not an exact science, but he's mapped out where in the cell danger response many different chronic conditions are stuck. And the vast majority of the chronic conditions that we see in functional medicine are phase three, right? Whether it's an autoimmune illness, multiple sclerosis, chronic

lyme disease, chronic fatigue syndrome. Whether it's a neuropsychiatric illness like schizophrenia or PTSD, right? We're stuck there. And what is there, what do we need to do, then, to move through? This is where, when you have a patient in front of you if you're a practitioner, and you're doing all the functional medicine work that you know should be helping. And they feel better temporarily, but they slide right back. Well now, remember what happens in phase three. Phase three is where the vagus nerve really comes and is the champion of healing.

Laura Frontiero, FNP-BC

So good. So, I think some vagus nerve support is really important during this time, so when you know you're sick, and you know your body's going through this healing process, how do you support vagus nerve?

Elisa Song, M.D.

Okay, so this is also, you know, one of the things that I talk to kids about, and adults about. Not in a scary, oh, the cell danger response way. But, your brain. When we think of vagus or when we think of the exercises and the tools that support vagus nerve function, most of them are tools that you actually have to use and do on your own, that support something called heart rate variability. Right? Now, when you look at Dr. Naviaux's papers, and you see, in the healthy state, you have optimal heart rate variability, or something called respiratory sinus arrhythmia. And what I'll have parents and kids do, and you can even do this right now, you can find your pulse on your neck. Or you can find it on your wrist, wherever you'd like. Once you find that, take a deep breath in. And then exhale slowly. Right, as you inhale, your heart rate goes up.

As you exhale, your heart rate slows down. That's a normal arrhythmia, right? Arrhythmia, that's associated with breathing, respiratory sinus arrhythmia. And we have that as a proxy, when you have your aura ring, it measures heart rate variability. Now, in cell danger response phase one and phase two, you don't necessarily want your vagus nerve engaged too much, right? Because there is a time for that fight or flight response, we want your body to be kind of ready to go, right? So respiratory sinus arrhythmia, heart rate variability goes down in those first two phases. Right, just like if you're facing a deadline, there's a normal, healthy, cortisol response, right? You gotta get your work done. If you're just Zen and you're not really in that state of optimal brain function for performance, you're not gonna get anything done, right, there is a certain amount

of healthy stress that we need. So during the time when our body is under stress, we need to just, that heart rate variability goes down. And then at phase three, it must go up, in order to reconnect those disconnected cells and get back into the health cycle. And so, yes, it's especially important during that stage when we're stuck in chronic disease to engage our vagus nerve. But here's the thing: it is so much easier to reengage your vagus nerve if you knew how to engage it in the first place before you were sick. Right? Your brain is a muscle. You need to give it muscle memory, so that if it needs to kick in and you need to get that heart rate variability going and optimized. You're not starting from scratch. Right, think about, if you've never, ever meditated. And someone says, when you're panicking over a test as a teenager, "Okay, just go meditate." It's not gonna work! Right? But if you've learned how to meditate, or do breathing exercises, or do tapping, right? You can automatically whip out those tools, and use them when you're stressed and when you need them.

So what are some of the tools that can help optimize vagus nerve function? One of the easiest things to teach parents and kids. Well, you know, easy is relative, right? One of the simplest things is diaphragmatic breathing, that belly breathing, right, where, as you're in, your diaphragm is under your ribcage. And as your lungs expand, that diaphragm moves down, and your belly should be expanding, right? In our modern world we've kind of learned to suck it in, and we keep our belly in, and we breathe up here, right, just through the upper half our lungs. So, we wanna fully expand our lungs as we're breathing in, keeping our shoulders down, making that balloon in your belly fill. And then as you're exhaling, the balloon deflates, and you're fully exhaling. You're keeping your shoulders nice and relaxed.

What's fascinating is when I go through this with parents and kids, a lot of times they're like, "Am I doing it?" "I don't know, right?" And as they're breathing in, their chest, their stomach is going in. And as they're exhaling, their stomach is going out, because that's how we've kind of learned, eventually, to breathe. So, learn how to do diaphragmatic breathing, it's one of the quickest ways to get into that state of optimal heart rate variability. There are other exercises like laughter yoga, right? Just laughing can engage your vagus nerve. Gratitude really does engage your vagus nerve, and there's a loving kindness meditation that I love. It was really helpful for my family and for a lotta families that I taught through the pandemic. Just to try to stay, feel connected with our world. 'Cause connectedness is so important for health, right? And during the pandemic, we

lost so many connections, at least early on. So, there's a loving kindness meditation, four simple sentences, that if you say every day, right, and practice this, they found college students who do this over a six-week period, entered a greater state of physiologic calm, improved heart rate variability, improved feelings of joy and connectedness. And those four simple sentences, so the first thing that that you wanna do is as you're thinking about loving kindness and gratitude, we first extend that to ourselves, right. because for all of you guys listening, you know, as grownups, some of the harshest words you've ever heard towards yourself are the words you've told yourself. Right, so the first thing we do is think about ourselves, give ourselves loving kindness, let ourselves know. May I feel safe, may I feel happy, may I feel healthy, may I live with ease. And then you stop and you think about whoever else you wanna extend that loving kindness to, maybe it's your children, or your partner, or your friends, coworkers, in the early stages of the pandemic, and even now, we're sending out to all those frontline workers, and the community, and everyone in the world who could come together, and just extend loving kindness to them, may you feel safe, may you feel happy, may you feel healthy, may you live with ease.

Laura Frontiero, FNP-BC

That's beautiful.

Elisa Song, M.D.

Right, and even just me doing that, I'm like, and I was going through it quickly, when you really sit down and do it, you cannot do that without feeling a little more calm, a little more joy, a little happier. And it does increase your heart rate variability.

Laura Frontiero, FNP-BC

Nice.

Elisa Song, M.D.

Now, for some people, when they're in that state of illness, it's really hard to do this, right? I get it, when you're feeling like crap, and you're like, "I don't wanna breathe, I don't wanna meditate." Right? Or then you have your kids, who are like, you can't make them do all this. There are some other tools like heart math, it's an app, you can download the inner balance app, and you buy an ear clip. That then plugs into your phone. And you're just looking at this rainbow flower. And you

just focus on your breath. And as the flower expands, you, slow breath in, and as it contracts, exhale slowly, and you can then see, are you in the green, blue, or red zone? You know, green, it's gonna be your optimal state of heart rate variability, and so, that's a more objective way, right, if you just can't think of any good thoughts to have while you're meditating, right, you could do that. Acupuncture could be really, really helpful as well, there's some ear acupuncture points that have been found to directly stimulate the parasympathetic nerve, which is the vagus nerve, we're talking about the parasympathetic nervous system. And so, lots of ways, but I encourage you, no matter what state of health you're in or your kids are in, learn some of these tools now, download the Oak app or Insight timer, or Headspace, all these apps that also have some kids sections, that can help you learn different meditations, even at an early age.

Laura Frontiero, FNP-BC

This is such good advice. Now in the few minutes we have left on this interview together, can you help share with our parents, how to support optimal mitochondria function in their kids?

Elisa Song, M.D.

Yeah. 100%, and I'm gonna tell you why that relates to the cell danger response. Okay, I mentioned in what triggers a cell danger response, is that the injured cells, their mitochondria release ATP into the extracellular space. But during the cell danger response, what is fascinating. Right, we have our really healthy, well-differentiated mitochondria, these are called M2 mitochondria. They're making energy, they're sustaining, you know, all of the metabolic processes that we need to do. And then as an insult happens, and we enter the healing cycle in the cell danger response, our mitochondria, first, in phase one, where we're trying to contain the threat infection, whatever it is, become M1 mitochondria, these proinflammatory mitochondria.

Then, in phase two, they become undifferentiated, right? All of a sudden, okay, inflammation is gone, the threat is contained. Now we're gonna do mop up and repair, so then they become this sort of multi-potential mitochondria. And then they have to re-differentiate, become these M2 anti-inflammatory restorative mitochondria. So, supporting healthy mitochondrial function is important for everyone, right? But for kids there can be certain signs that they may already have some mitochondrial dysfunction happening. And those signs are gonna be weakness, you know, poor endurance. A lotta parents say, "Oh, they have so much energy." I'm not talking about run,

run, run energy, I'm talking about cellular energy. So if your kids play a soccer game and they are wiped out, they can't have a play date, they need to stay on the couch, you know that you can't plan anything else. That's not typical for a kid. Right, most kids can play a soccer game and they go on a play date and they come home and jump on the trampoline no problem. If they have low muscle tone, they sit with their shoulders hunched. Not related to screen time, they just always sit hunched. They have a hard time pedaling a bicycle, they can't hold a pencil well. If they're clumsy, right. Or if they've had multiple regressions, right? If they have poor reactions to infections and medications, then that's a sign that maybe there's some mitochondrial dysfunction going on.

Now, we wanna make sure we're supporting our kids, and our mitochondria, to the fullest extent possible. Because every day we take these hits, so, how do we do that? We always first go to food as medicine. Right? Those antioxidants. What happens when mitochondria get stressed? They create oxidative stress, right, free radicals are produced. What do we need to reduce and mop up that oxidative stress, we need antioxidants, right? Antioxidants are all those different colors of the rainbow. So that really, really matters. Sleep, right? If you don't get enough sleep, that's gonna really stress your mitochondria, and remember, to stay in the health cycle, we need restorative sleep.

We also wanna reduce excessive mitochondrial stressors, so don't get too hot, don't get dehydrated, altitude can be a problem. Exercise, but in moderation, 'cause too much exercise will hurt your mitochondria. Even at a younger age, focusing on strength resistance training, because building more muscle creates more mitochondria. And then there's supplements, right, I often do do supplements, and the first supplement I often use is CoQ10, right, Coenzyme Q10, as ubiquinol. But I'll also use carnitine, ribose, phosphatidylcholine, all of your B vitamins, your methylated Bs, all of those will support mitochondrial recovery. Especially if you're trying to help your kids or yourselves move through the cell danger response.

Laura Frontiero, FNP-BC

This is so supportive. Any other final tips for our parents as they navigate this crazy world and do the best they can for their kids, and what can you share?



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BOOST YOUR energy. FIX YOUR health

Elisa Song, M.D.

You know, I would say, as a parent myself, there's so many things in life, everything in life, that can make you feel guilty. Right, that can make you feel like, "Oh my gosh, I messed up, what did I do?" "Was it the tuna fish sandwich I ate "when I was six months pregnant?" I still think about the tuna fish sandwich I ate when I was six months pregnant with Kenzie, right? And she's healthy and thriving, when you just think about these things. I would say, we don't ever look back. Okay, the only reason to look back. 'Cause I know some of you guys might be listening as a parent and thinking, "Oh my gosh, I didn't do X, Y, and Z." Right. We don't wanna look back, there are two reasons to look back, right, in time. One reason is to really define and tell your child's story. How did they get to where they are now, so we know how to intervene? Right, we know how to move forward. And the second reason, another only reason to look back is to see how far you've come.

Right, because you listening now, you know a lot more than you did an hour ago, right? An hour ago, you knew a lot more than you knew five years ago, right? So we always wanna know, where are we moving towards, but then, you know, look back and say, "Wow, I've actually come pretty far." Right? Because we always wanna move forward with hope, and that's where summits like this, or the work you're doing, and really spreading the message, making sure that we really use knowledge as power. I mean, that's what's gonna change the world, we can create a movement of positive change, kid by kid, grown up by grown up. And then as we make that change, stop buying the ultra-processed food and swap out the artificial red dye Takis to the Trader Joe's rolled up tortillas without the artificial color. I mean, we can vote, right, we vote with our dollars, and one step at a time, we can change the world.

Laura Frontiero, FNP-BC

Oh, that's such good advice. Thank you for ending on that note, you're always so uplifting and positive. Appreciate you. You take good care, Elisa, thank you.

Elisa Song, M.D.

Alright, thanks Laura.