Beyond TSH: Root-Cause Labs for Hashimoto’s – The Mitochondria Connection With Dr. Sam Shay Transcript

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Introduction to Hashimoto's Root Causes

Hi and welcome. A lot of times people with thyroid issues and Hashimoto's think that they only need to test their thyroid function, maybe their TSH, may be their t3 and t4, and they don't actually realize that to feel your best with Hashimoto's and hypothyroidism, you need address a lot other types of deficiencies and imbalances in the body.

Today we're going to be focusing on the critical lab test you should probably be doing if you have Hashimoto's and hypothyroidism to really feel your best and to get to the root cause of what's going on with you.

I have a special guest with me. who has helped countless women achieve vibrant health through personalized data-driven strategies. He specializes in energy optimization, brain health, and overcoming fatigue and stress.

I know these are common things that many people with Hashimoto's struggle with as well as myself. And I'm really, really excited to have Dr. Sam here.

He's going to combine his medical expertise with his unique comedic perspective to make health information accessible, engaging, and empowering. So welcome, Dr Sam, to the Thyroid Pharmacist Healing Conversations podcast.

It's so great to you have you here! Thank you, it's good to see you again. I really have a Uh, special place in my heart for auto immunity to thyroid.

Why TSH Alone Misses the Bigger Picture

Um, this was a very, very key moment in. Uh history as a practitioner. I was in New Zealand in, uh, I practiced in new Zealand for eight years and very early on, um, within the first.

You know, within the first couple of years, there was a woman that sat across from me who had a goiter, like a full-on goitter, and there's still goiters in New Zealand, believe it or not.

And she had all the signs of hypothyroidism. I have like questions about a dozen or so and she just ticked, I think all of them or all them minus one.

And she had like the losing the hair, the missing out of the eyebrows, stubborn way, cold hands, like you can just go through and she was sitting right in front of me.

And, she said that, well, my endocrinologist checked my TSH and said it was normal and that I was just depressed and I needed to go on antidepressants.

And she's sitting there clearly suffering, clearly having all these other issues going on. And it's one of those moments in practice where it is very hard not to get deeply upset, not at her, never her but at some air quotes specialist that is just fixated on one number and not actually seeing the person in front of them and willing to look at other numbers.

And so I told her, I said, "I swear to you I will find you a better thyroid test than merely just TSH." And that's what launched me into… I think this was like 2013 or 14. This is what launch me in to really diving deep into functional testing, like really deep.

And I found lab testing that checked for T SH, reverse T3, RT3 RT4, anti-TG, and anti TPO. And actually anti TSH

antibodies, our receptors. Anti-TSH receptor antibodies.

and then was able to help her because she has loaded with antibodies but her TSH was quote, fine. So she clearly had autoimmunity, but because the endocrinologist only looked at TSh, they would just have these blinders on and weren't looking at anything else.

And then later on, I realized that there was more to autoimmunity to thyroid than just even the antibodies and additional thyroid markers.

Key Lab Categories Beyond Thyroid Hormones

And I found that there's about a half dozen or so different types of tests that directly influence thyroid health and are sometimes upstream to thyroid that may be causal as to why the antibody, why there is autoimmune to the thyroid.

I would love to know if you were ever able to help the lady shrink the goiter, right? Because this is a common thing that we, we don't get it as commonly in the United States, but sometimes it does occur.

Her goiter, what happened was that the area, she was swollen all over. So there was the size of the goitter and then there were the sizes of all the swelling of her neck and her body and everything else.

Things definitely got smaller, like body, throat, but it's unclear to me how much of it was goiters that was reducing versus just ambient swelling that just all her body, including her neck, like she was kind of like a brick neck.

so to speak. So there was a lot of variables in there. She definitely got smaller. And the problem also that I ran into with her case specifically was that in New Zealand, it's a very much a socialized medicine system and multiple generations of it.

There's very, very limited resources for Kind of non government based. Medicine and so she unfortunately had to chose to leave. Uh, care earlier because she did not, uh, she, did, not allocate the sufficient funds to, to pay for this type of healthcare that's outside the government.

The government system was like, here's your TSH. Oh, well go take in a depressants. But, um, it's that that, that a very complicated discussion. I don't want to get into because there's a lot of.

That there's a lot of multi generational things to unpack there around 1's relationship to health and and how 1 chooses to invest in it. So, but I can show you another case here.

This is an example. Uh, this is this in in New Zealand. Um, the anti thyroid, globulin antibodies were almost 500. And then 11 months later, when we tested, they just came back down to within much more normal ranges.

and with this person, um, in particular, one of the major, major aggravating factors. that we found that was upsetting the antibody system, the immune system was gluten.

So, and we'll cover the connection of gluten and Hashimoto's in a second. These are all the different types of labs that connect to the thyroid. We have genetics labs, we have the mitochondria, We Have nutrients and metabolism, with the adrenal system.

we Have the gut system and estrogen. One of the reasons I believe that women get more Hashimoto's than men is because obviously there's more estrogen dominance in women than there is in men.

Then we've got the gut issues, and one of primary things around gut is intestinal permeability or what's called colloquially leaky gut. And if you've different things that leak across the undigested foods, specific und digested proteins or specific infections or infection or the kind of excretia of infections, those get into the bloodstream and shouldn't and the body mounts an immune response and they send out shape seeking, not heat seeking missiles called antibodies.

And these shape-seeking missiles attack these infections or food particles that look very similar to the thyroid tissue. It's kind of like you're walking into the middle of a Bloods and Crips turf war and you accidentally wearing a red shirt.

You're just going to get shot because you are in the crossfire. And the thyroid, unfortunately, is wearing a red shirt as it relates to these shape-seeking missiles.

And so the antibodies attack the thyroids, mistaking it for an intruder. Then the immune system tags the Thyroid for destruction. So the way to address that is you heal, seal, and soothe the gut.

You remove the offending infections, the indigested protein sources and then you heal, seal, and soothe the gut so that the leakiness doesn't even happen to begin with.

And then sometimes people can go back to having those foods that were improperly digested in the first place, sometimes. Gluten is particularly damaging because it not only looks similar to thyroid tissue, but it also can damage the guts.

So it's a two for one. It can create the leaky gut and it can leak across the and then attack the thyroid. Adrenals, there's a lot of really interesting research showing that hypothalamic pituitary adrenal axis dysfunction, which is the Scrabble award-winning way of saying adrenal fatigue.

We've kind of updated our jargon.

Gut, Gluten, and Autoimmune Triggers

The HPA axis disfunction will shut down the because adrenals are short-term survival, thyroid is long- term health, longevity, repair, and growth. And so if you're in short term survival whether it's from a real or perceived threat, then the body will hormonally shut down the thyroid to a measurable degree because you are focused on short terms survival from that real tiger chasing your perceived tiger whether its a deadline or traffic or whatever it might be or watching too much news or whatever, whatever your source of stress is, the adrenal system will take over and shut down the thyroid because out of, you know, however many hundreds of thousands, millions years of evolution, we learned the hard way Short-term survival is more important than long- term viability.

So the thyroid will subjugate itself to the adrenals if there is a perceived or real threat. If someone has chronic stress, then their thyroid is going to shut down.

Also, chronic will affect the gut and make it more vulnerable to being leaky. And then you can see how all these systems are starting to interconnect.

Then we've got nutrients and metabolism. Uh, there's lots of nutrients deficiencies associated with thyroid issues, whether it's tyrosine or iron or vitamin D or certain B vitamins or, you know, we can use zinc.

We can, no, can you, You can rattle this list better than anyone. And, um, people can have nutritional deficiency. So if you only test TSH, reverse T3s, free T 3, but you don't test the other nutrients, you can be missing like the building blocks to make the thyroid.

So people may not have a specific thyroid hormone deficiency, they may be Missing the Building Blocks to Make Your Own Thyroid Hormone in the first place.

but it's being interpreted incorrectly as, oh, you just need, we need to add more hormone. Well, how not just add the nutrients to make your own hormone?

Then we've got mitochondria. This one's a bit complex, but the best way to understand it is that mitochondrion is the business end of the thyroid. And when people think about thyroid, and I learned this when I studied with Dr.

Kalish, I stayed with him for four years, he said that Um, people talk about basal metabolic rate and he said, well, what does that mean? And it's like, oh, it how many kilocalories you burn?

Yeah. But what is that actually mean. And w it was a group of us practitioners and none of could really answer the question. You could feel the awkward.

He let the Awkwardness sit in the air for a bit. and He said it, how much your mitochondria are burning. and that the whole, and so the way that I took his teachings and translated them is that T4 is the four-wheel car leaving the thyroid, getting onto the bloodstream superhighway, then it pulls into the parking lot of the mitochondria, the T-4, And then, it makes that transformer's noise.

And, like, one door opens and now becomes an arm, so now it's T3, one armed engineer that's now button mashing on the controls of the mitochondria to dial it up, to burn more protein, fats and carbs to generate energy.

And that your basal metabolic rate. So people can have, and I've seen this multiple times, people have the sign, if you have weak functioning mitochondrion, it can appear as if they're having hypothyroid symptoms.

But you test their thyroid, their thyroids are normal. but they have all the signs of hypothyroidism. It's not their thyroid, it's their mitochondria.

Because that T3 engine can button mash all it wants on the mitochondrial control panels, but the factory of the mitocondria is broken. You can bottom mash it all you want, its not gonna change.

you gotta fix the factor, you got to fix them mitochondrion, not blame the thyroid. And then the last piece is genetics, which is kind of underlying It's the underlying filter through which all lifestyle, nutrition, all the epigenetic influences on your entire health and wellbeing get filtered through.

And in particular, you want to look at genetics as it relates to inflammation.

Adrenal Stress and Nutrient Deficiencies

Some people are hyperinflammers. Look at genetic as a relates vitamin D utilization through the VDR receptors. You want look a genetics, as relates optimal diet, like are you genetically keto, paleo, Mediterranean, or high carb.

And that test now exists. Genetically, you want to look at your relationship to food triggers like histamine, alcohol, caffeine. There are people who are genetically vulnerable to caffeine-induced anxiety and depression.

And when I lecture on that to a group of entrepreneurs, the tension in the room utterly thickened. Because suddenly, everyone in room is paranoid that now the one thing fueling their business is now causing them anxiety and depression.

And it's kind of a hilarious moment when you can feel everyone clench, all these high-powered entrepreneurs just clenched, like, oh my god, coffee, my business ruined.

Good news is alternatives to coffee that can support you to put despite your genetics. So those are the main categories and I'll pause. I will just pause there because I know that was a lot of kind of big picture overview and just like love to hear your experience of hearing all those different categories.

I think these are just such important categories. I know a lot of times I'll work with people who say they've tried everything for their thyroid, but it oftentimes they haven't really gone down these different pathways of trying to figure things out.

For some people, it might be a ferritin deficiency that prevents them from properly utilizing their thyroid hormone. And so they're going to be on thyroid meds, and they are still going be tired.

For some people, it's going gonna be adrenal dysfunction. They're gonna have low cortisol. Some people got infections or hormonal imbalances might be driving those thyroid antibodies and a lot of different symptoms.

We, for our time today, I would love to dive in a little bit deeper on the mitochondria because I feel like they are poorly understood, not really appreciated.

And there are things that individuals can do in their own day to day life to support the health of their mitochondrion. But can you tell us a little bit like what what are the So everyone's heard of the mitochondria as the electricity factory or the powerhouse of a cell.

And we've heard this just the same way we heard the term basal metabolic rate. Like we hear it and it's an abstraction. Uh-huh, no, that goes right over.

So let's break that. That analogy actually works really well, but I'm not sure anyone's really, really broken it down. Let me give you some numbers here on the mitochondria.

Mitochondria are not actually mammalian cells. They're actually… A separate like I think called bacteria or something that made this evolutionary deal with you carry out or mammalian so like we're going to let this other organism live inside ourselves.

We're gonna feed it acts mitochondria its own DNA like it's actually a separate thing. It is inside of ourselves and the deal is we feed and protect this mitochondria, proteins, fats and carbs, and protected with our immune system in exchange for it gives us ATP, it give us electricity.

That's the evolutionary handshake that was made long, long time ago. So what what the mitochondria depends on what literature you read, but it can be estimated and argued that it's anywhere from like, three, five, even up to 10% of our body weight is mitochondrial, like and there's big arguments over how much but It's a lot.

Like even if it was 3% Of our Bodyweight, that's A lot And so just imagine any big city, let's just take New York, Dallas, LA, San Francisco, any large city.

And now imagine that three to 10% of the footprint of that city is the electrical grid. So every cell is a micro city and now if you've got three 10%, of entire surface area, the foot print is electrical grade.

And how much electricity needs to run the city? Now, how important is that? Well, if New York lost electricity for more than three days, it would turn into Mad Max.

Like a city or a house without electricity not only becomes inconvenient, becomes dangerous. Dangerous if you don't have electricity. So you need to have your electricity running.

And the analogy for the mitochondria's electricity factory is the following.

Mitochondria as the Body's Energy Factory

You have the factory itself and the factor has specialized walls. Those are specialized fatty acids called sphingolipids. So the fact has to have walls, then it has have security guards.

We call this the immune system. we have to a machinery inside the to run the we call those vitamins. have computer chips that run These are the minerals in the center of the vitamins that act as the computer chips.

This is why heavy metals are so dangerous is because a heavy metal can go in and swap out a new fancy chip for really, it's really really bad computer chip.

Now imagine trying to run a 2025 computer laptop with a 1995 chip, that's what we're talking about, That's why Heavy Metals are So Dangerous. You need a conveyor belt to circulate around everything on the factory.

That's CoQ10. Coq10 is an enormous molecule. It's enormous. it is quite literally the conveyer belt in which all this stuff is happening. You then need the fuel to burn in the In the presence of oxygen to make energy.

So the fuels are fatty acids, carbohydrates and proteins, and you need oxygen, which is one reason why you. You know, you read blood cells and good breathing, This is where breathing and posture also affect thyroid mitochondria because if you're not breathing properly and you have poor quality blood flow or you poor-quality red blood cells, then you are not going to deliver as much oxygen as you need.

So you can see this multifaceted, everything's converging on this electricity factory. And now the thing about the fuel that has to burn in the presence of oxygen, fatty acids, carbs, and amino acids is there's three different truckers unions to deliver the field.

So you've got the fatty acid trucker's union. They're paid in very specific currencies, carnitine, magnesium, B2, the long hauls, they're paying glycine.

If you don't have the currencies, then the fuel sits on the docks. The carb truckers unions, they're paid in like B vitamins, like POEC acids, certain minerals, the protein amino acids.

They're mostly paid mostly in B6. So this is where you see nutritional deficiencies come in. And affecting your ability to burn fuel in the mitochondria.

Now, this is where you see terms like carnitine shuttle issues. This is basically you can't deliver fat to the Mitochondria to be burned because you're not paying the truckers union.

And as a result, and I've had about a half dozen cases like this, I have had people with really strange blood sugar spikes up and down and like they don't do well when they eat fats, but they're constantly craving sugars.

And when you analyze their mitochondria, you see that they are one of two things. When you analyze their mitochondria, you see one of two things or a combo.

One is the carnitine shuttle is broken and they can't actually deliver the fats and or to the mitochondrial itself is not the the factory itself. It's not running properly because the machinery or the conveyor belt or something else.

They're not able to burn the fat. You can deliver it. Or also on their gut testing, they have problems with their gallbladder or their pancreas being able to break down and absorb the fats to even get into the bloodstream to be delivered to the cells, to through the trucker's union to to mitochondria.

So this is where you would want to run multiple labs at the same time. Like this where a gut and mitochondrial converge, like on how well do you break-down fats in order to make it to a mitochondrion.

Then, once you're even burning these fuels, when you burn fuels just like if you were on a campfire, you make sparks. Sparks are dangerous. They can cause fires.

Those sparks are called free radicals. So when you burn protein, fat, and carbs, you make a lot of sparks. In fact, 95% of all free radicals in the body are generated inside the mitochondria.

This is where the vast, vast majority of your free-radicals are all generated. And this is why you need specialized janitors called MN-SOD, GPX-1, SOD.

These are enzymes to go put out all the sparks before the factory catches on fire. And this is where genetics can come in because genetically people can make very slow versions of these janitors where you go to GPX one or cat or the most important, the head janitor, MN sod, who I call Mr.

Sod. The head Janitor Mr Sod is slower than what he could be. And so he can't catch all the sparks in time and that creates all sorts of problems because the factory is at risk of catching on fire.

Then you've got Uh, signals to the factory of what the needs are for the, from the rest of the city or the state, and these are neurotransmitters. Inflammatory markers, like how much is your city on fire and you've got to re divert resources.

You've. A sludge that can build up in the factor. Those are form of toxins. And you need a method to detox them. you got thieves and vandals called viruses that want to come in and.

you know, vandalize or steal from the factory. So that's the Factory analogy. The Factory Analogy is really good, except I'm not sure anyone's really, no one's ever really like fully explained it.

And so connecting it back to thyroid, the thyroid is the main messenger of the body from a hormone standpoint, we need more or less energy So we're going to send a volume of T4 and then it's converted, you know, those various factors influence on while it is converted in that parking lot into the T3 engineer to dial the controls, which is the mitochondria.

But then you've got this entire system of the Mitochondria that requiring tons of nutrition and all sorts of variables to make sure the factory is even running.

Wow, this is such a great and comprehensive overview. I think a lot of us know that we have mitochondria. It goes back to sixth grade chemistry class or seventh grade class, but this really gives us an idea of all of the things that are needed to support healthy mitochondrial function.

Now, when in my training, I've primarily learned that people can have mitochondrial dysfunction that's like genetic disorders.

How Mitochondrial Dysfunction Shows Up

So like Lee syndrome, and there's some healthcare professionals out there that believe like you can only have my mitochondria dysfunction if it's, like, a serious genetic issue generally diagnosed when somebody's first born.

But there is a lot of reasons. why people might have underperforming mitochondria. This is something that I know I started utilizing the organic acids test about a decade ago with my clients, especially for clients that just weren't getting better with the standard of care of addressing some of these nutrient deficiencies, maybe getting on thyroid meds, getting off of certain foods, and we were like, well, what's going on?

A lot of times they might some mitochondrial dysfunction, including deficiencies in carnitine that prevents the mitochondria from working properly. Could you speak to maybe some of the symptoms that a person might have that would point to mitochondrial dysfunction, perhaps some red flag symptoms?

Sure. I'll also touch on what the—this is where the essential philosophical divide between hardline Western medicine and functional medicine. So Hardline Western Medicine, which you shared, was like, mitochondrial disease doesn't exist unless it's a hardwired pathology that you can track to one gene.

And it is a philosophical difference that Western medicine actually was born out of triage military medicine. That do you either have the thing that's going to kill you or risk killing you, or not?

And if you don't, stop complaining, go to that group over there and just tough it out. You know, rub some dirt on it and get back to work. And so the Western medicines philosophically is ideal for emergency care.

It's ideal. Is literally emergency Care philosophy. The problem has been mission creep and expansion into non emergency situations. And it's also. Uh, kind of adhered itself, like gene gene, Western genetics has modeled itself after Western germ theory, where it's one germ causes one disease in Western.

Genetics is one gene causes, one. As opposed to like the milieu approach to infections, which was the, the difference between the argument between pasture and.

is the same argument you're seeing now in Western genetics and what I call functional genetics, where you are looking at hierarchies of genes and gene clusters that work as kind of like an orchestra, and if one section is out of a tune, it affects the entire sound.

As opposed to one section is like overtly missing or broken, it's just one. Section is not properly harmonized with everything that needs support in the form of nutrition and lifestyle, better sleep, etc.

So the, when you're looking at functional medicine, I find functional genetics. It's kind of this estuary of the best tools of, it's the Best of Western Medicine Diagnostic Tools with the BEST of Natural Medicine Lifestyle Diet Nutrition Interventions.

And that's not really an emergency care model. It gets people from chronic to normal and normal to optimal. Our sandbox is outside the, whereas Western medicine is from getting people from emergency to stable.

So we have two very different goals here. Western Medicine is ideal from Emergency to Stable. Functional medicine and functional genetics is From Chronic to Normal to Optimal.

And when they're saying we're not doing, what we are doing is bogus, they are just looking at it from their emergency lens. which then I can understand why they're saying that.

And I say it's equally problematic if people over here on the functional side of things start encroaching into the emergency care side things. So I think the sandbox is big enough for all of us.

We just need to stay in our corners of the medical sandbox. Yeah, I do agree with you with Western medicine. It's like if I am If I break my leg or if I'm in a car accident, please take me to the hospital.

I want to have some life-saving measures and Western medicine is so excellent at that. But if, um, if i'm somebody with chronic fatigue and a chronic thyroid issue that doesn't get better with medications, like that's where you want To look into more functional medicine and some of these functional causes where, you know, You're not dead, right?

You're walking around, you're not in a hospital bed, but perhaps you are stuck to your own bed. And so we're trying to figure out from a functional standpoint, what are some of these imbalances and how do we optimize things?

So I would ask for us to maybe get into some the red flags and dumps of mitochondrial dysfunction. I know we mentioned fatigue. This is going to be a really, really big red flag, right?

So fatigue, so there's a couple of things that come up with mitochondrial dysfunction. There's fatigue of kind of, now there are different types of fatigue.

So people who have more, like, HPA axis fatigue their fatigue is sinusoidal. It kind goes up and down, up, and people with my mitochondria fatigue it's kind this chronic all the time fatigue that may have specific crashes with moments of lucidity, but it's not this up-down consistent wave pattern.

People who have what have more like liver toxic fatigue, which is related to mitochondrial fatigue is that they're okay, they are okay. Then they exposed to some toxin, whether it is mold.

Mold is kind of this hybrid between toxins and infection. It's kind the worst of both worlds. Talk, whether they walk into a new carpet, new paint area, or there's some spray that happened, agriculture, whatever it is.

They have, before that happens, they have like kind of okay levels of energy and then they get exposed and their fatigue just tanks and it stays down.

And it kind very painfully slowly creeps back up over days, weeks or months until it's maybe back to baseline. and then until they get another exposure.

So it's not this daily sinusoid, and it not necessarily the chronic levels of fatigue. It's more of exposure crash. and then it goes up. Then you've got like more digestive styles of fatigue that really vary based on the type of foods you eat and how much time you put in between, whether you do intermittent fasting or not.

And then there's kind of infectious based fatigues, which are most that do absolutely affect the mitochondria, where you have people that if their mold gets active, then suddenly all these weird symptoms come up or they don't have their immune system shuts down because they were stressed out, it didn't sleep well or whatever it is.

Testing for Mitochondrial and Related Issues

And then there's like this kind of heavy blanket fatigue that you feel this additional sinus, usually sinus issues going on. So those are kind different kind subsets of fatigue.

With mitochondria, if I were to put multiple tags on mitochondrion, you can have pain syndromes, with mitochondria dysfunction, particularly migraines and headaches, because your cerebral arteries that irrigate your brain with blood, they dilate to bring more nutrition.

And the nutrition is that your neurons run on mitochondria. The neurons have almost no ability to survive with an improperly functioned mitochondrial factory.

So what happens is, if you need more nutrition to rush to the neurons in the brain, The only way to do that is to dilate the blood vessels to bring more nutrition to the brain.

But the problem is the Blood vessels can only dilates so far before they tear. Like there's like there are the cells inside. The blood vessel is like a burrito.

It's a one cell thick and they only can open and dilated so. So there is an emergency system wrapping the. Blood Vessels. of what's called C fiber pain fibers.

They're like chicken wire that wrap the blood vessels and if the Blood vessels dilate too much, it'll stretch the chicken wiring cause headaches. And that's a safety mechanism to protect your brain because when people have crippling headaches, what do they want to do not move not talk not hear.

Be in the dark. Don't do anything. Just leave me alone. I don't want to move, say, speak, nothing. And that's because I want open my eyes. Because every time you listen, you look, You speak.

You move. you must fire the brain. It has to fire. So by putting you in a massive headache, your body will self cripple you as a safety mechanism to require less and less nutrition.

Therefore, letting the cerebral arteries not be dilated so much. Now, the way to help that is you fix the mitochondria in the brain so that you can use fuel more efficiently, because there's a big difference between getting two units of energy per one unit of fuel and 36 units energy, per 1 unit fuel.

And if you can improve the efficiency of how you burn fuel, then you need less nutrition to get equal or more amount of electricity. So therefore your blood vessels don't have to dilate.

I'm sure there's a meaningful percentage of people listening or watching to this that struggle with migraines and headaches, and I'm not sure if they've ever heard a technical explanation as to why your headaches and migraine are actually trying to protect you in some way.

Now, there are different types of headaches like cervicogenic, like they can be muscle tension and referral pain, but I am talking about strictly mitochondrial-based ones.

That would be why. Other signs of would-be, you can have poor vision because your eyes use, it's like your eye, your kidneys, heart and your frontal lobes use the most amount of mitochondria.

And if you have poor mitochondrial function, then you can have dysfunction in the areas that require the most of it. When my beloved nanny, when she was much younger, she wasn't treated properly for an infection and her lungs were slowly eroding over decades.

And as she dying in hospital, She couldn't take in enough oxygen And one of the things that happens is that she starts to go blind because there just wasn't enough oxygen to feed the mitochondria to make the energy to the eyes run.

That's a very stark, tragic example. I mean, deeply personal to me. But that does illustrate the point. And that's very extreme case, but it does illustrates the points.

If people have poor functioning mitochondrion, what happens, is they can retreat into their emotional limbic brain. Because you need mitochondria to run the frontal lobes, which inhibit your more animalistic limbic centers of the brain.

So, for me, I just got out of a very nasty moldy apartment. I left it in March and one of them first signs that I saw. that I noticed that was no just crippling fatigue, and that i had to take multiple naps a day.

And then I also noticed muscle loss. Despite working out more, I started losing muscle mass. Then I ran a mitochondria test and Look, I've been involved in mitochondria testing since 2017, and I teach other practitioners how to interpret mitochondrial tests.

I looked at my results and started crying. And I was freaking out. Like, my mitochondrion are dying. What is going on? What could be happening? The only way that my Mitochondria could die given my lifestyle, my profession, the quality of my diet, everything that I do, is if I'm being actively poisoned.

And that's when I ran a Swiffer test to check if had mold, endotoxins, or actinobacter in my apartment, and all three came back really high. So I was being poisoned in own apartment.

That's what was killing my mitochondria. The thing about mold. Mold destroys mitochondrion, so does Lyme disease. And so there's endotoxins, actinobacter, like it really does a number on mitochondria.

So one of the signs I had aside from crippling fatigue, aside, from muscle loss is I was emotionally very up and down. I having waves of grief, waves, of anger that was just just like a rocket out of nowhere.

It was a massive emotional up and downs. And it was much harder to recalibrate back to a more centered state of mind. The other things that were going on when my mitochondria were failing is I just felt like I was fighting off a cold all the time.

My sinuses were stuffy and runny. I would just fighting a sore throat almost every week. It's just like, why do I feel so sick? like I'm fighting things off.

And again, I found out that it was the mold endotoxin actinobacter that was in March. I was actually six months ago today as of this recording. So now I am in this journey of not only getting rid of all the molds, actinobacter, and endo toxins from my system, but now, also have to repair all of the damage.

that was done to the mitochondria. And all these things that we're seeing listed out here, all of these vitamins, nutrients, everything, this is literally my checklist that I'm using lab tests to find out specifically what stuff am I missing?

Like which amino acid building blocks, which fatty acids, you know, what minerals, vitamins et cetera that needs to rebuild. So those are some major signs of mitochondrial dysfunction.

Functional Genetics and Personalized Diet

Yeah, I'm so sorry for the recent exposure that you've had. That's so challenging when we really attempt to dial in our health and we feel like we're in a good place and something like a mold exposure can really set us back.

I call it an equal opportunity destroyer because you can have the healthiest lifestyle and it could still really impact you. With regard to my clients, some of the red flags that I've seen with mitochondrial dysfunction would be A lot of fatigue and low stamina, we kind of talked about that.

Yeah, they also struggle with a lot muscle weakness and exercise intolerance. So these are the people that can't necessarily sustain activity. They're going to struggle like, okay, I'm walking around the block or I am doing exercise and I just can not really keep it up.

Might be prone to more muscle cramps. Struggling with brain fog, memory issues. Some other things I've seen is like drooping eyelids. This is kind of a big red flag for me when I see that because our eyelids have a lot of mitochondria in them.

Fertility issues can be very much related. A lot times they might have low blood sugar issues or hypoglycemia. Sometimes they may have trouble with fasting, so it's like sometimes intermittent fasting can be helpful for a lot of things, but these people really struggle with that.

I've seen also hyperreactive hyperglycemia, where they just have massive dysglicemia in general. And the reason why is that sugar should burn in the mitochondria for 36 units of energy.

And if it can't, it burns only for two units of energy. So if the mitochondria is not working properly, this can lead to lots of sugar cravings. And then people having these big swings in their blood sugar swing up and then crash down because they're trying to burn, they have to burned 18 times as much sugar to make up for what they should have been able to generate in the mitocondria.

I had massive brain fog also, I forgot to mention that. When I was back in the apartment, and I totally agree with you on the muscle issues. I mean, I actually losing muscle mass.

So my result, my muscle endurance was going down. My muscle masses going. You need a lot of mitochondria to be fertile. of building another human, and that requires a ton of energy.

And if you don't have healthy mitochondria, you cannot create all the energy you need to grow another humans. The pharmaceutical companies have their giant charts that can be like the side of a five-story building.

In the center of the bullseye of every single chart is the mitochondrion. That's the center of the bullseye, is that all things can, you can track almost always back to how it's going to affect the mitochondria in some way, whether directly or indirectly.

And now saying all the things is a bit hyperbolic, but when you have the centre of a bull's eye for all of giant chemical charts is the same thing, that's literally the central bulls eye.

Yeah, it's really quite underappreciated what the mitochondria are responsible for in Western medicine. And I think even a lot of integrated functional medicine practitioners aren't really aware of this.

So I'm really grateful for you taking the time to shed the light on this, we kind of mentioned, you know, different infections and toxins can impair mitochondrial function.

And we also talked about, you know, nutrients that might be required for proper mitochondrial function. Can you tell us, like, how do you dial that in?

Do you test everybody that you work with for mitochondria issues? And what kind of tests do use? and then, um, You know what you use to support them. Do use a specific kind a diet and I would love for you to kinda like walk us through the process because some people might I have a lot of these symptoms now.

What kind of a diet do I need to eat? What kinds of supplements do i need? How do we figure that out if we have all of the symptoms? We probably have mitochondrial dysfunction.

There's probably something driving it. And what are we doing to repair the mitochondria? If someone's specifically looking at mitochondrion, then there are specific mitochondry tests out there.

Genova has like the ion profile, the metabolomics, and the nutrivel. I prefer the Ion panel. If you're wanting a more core test that has fewer nutrients, but that's just fewer things you are testing for but is more accessible to certain people, you might want to do the oat test from Mosaic.

Diagnostic Solutions Lab has the OMEX, which is both the core mitochondria test and then some amino acids. And when you're doing a mitochondria test, it's usually urine and blood.

Blood is like what's fuel that's going in the tank and the urine test is the emissions test because your body's like three to ten percent mitochondrion.

The emissions from the mitochondrial can be tested in an exhaust pipe or the urine to see how the whole thing is functioning. And that is why you can test for mitochondry in urine.

Then you've got all the other blood chemistries, like checking for anemia, you need the oxygen to travel to get to the mitochondria to burn, cardiometric bollock markers, blood sugar regulation, and so on.

So there's a whole constellation of A test that that can be done to check for mitochondria and then you've got what we mentioned before, like, gut testing in order for you to get the nutrients you need to digest and absorb them properly.

When I work with people, I want to make sure I'm covering all the different possibilities of where. where the mitochondria can be the problem, but we're also looking at how did it become the problems.

So if people have problems in digestion and absorption, their mitochondrion are going to suffer because they can't break down the fats in order to deliver the fat to the carnitine shuttle to feed the mitocondria.

When working with people, the number of tests can customized based on what their what they're presenting with. So people who have mitochondrial issues, you can run their mitochondria test, but then infer also, do they need additional gut testing or is it, and gut test can be broken down into the bigger gut tests, SIBO and food sensitivities, or you go back and see, is there a problem with the mitochondrion that they are under so much stress?

that the thyroid is being shut down, then the mitochondria aren't even being leveraged because under stress, you're under short-term survival, and your body will switch from that, let's make 36 units of energy from sugar to let to make two units, which doesn't make sense when you first hear it, but to burn one molecule of sugar to get those two units of energy is logs faster than a slow, efficient burn in the mitochondria.

So if you're in an emergency, you need lots of the energy right now. And you are going to burn through a ton of your sugar quickly to multiple more quicker than waiting for a single molecule sugar, to 36 units energy.

If someone is adrenally stressed out, your mitochondrion can suffer because your body's prioritizing short-term survival. And it reflects that in the metabolism, that you're going to switch away from mitochondria-burning efficient to inefficient, but rapid, what's called anaerobic without oxygen glycolysis, where you are breaking down sugar without oxygens just much, much faster.

But it's very inefficient and it creates a lot of lactic acid, which is where chronic fatigue and fibromyalgia are linked. That's why you see them together.

So then when you have people who have chronic fatigue, it's, in my world, its mitochondria failure. And that because you can't generate electricity efficiently, but why does chronic fatiguing and fibromyalgia go together?

Is because when your burn sugar inefficiently, you create tons of lactic acid, which is that burning feeling you get when work out. But when people have fibro myalgia, they have the burning without the benefit of working out, They just have a burning feelings.

And if they're yoked, it's a similar process where the burning is inefficient and you get all the lactic acid as a result of your mitochondria not being used.

And you're just burning sugar anaerobically. So all testing can also include adrenal testing. It can include sex hormone testing because if you've got If you've got estrogen dominance, then you're going to be affecting like, there's a higher correlation with.

With autoimmune thyroid issues, so then that's going affect your mitochondria. And then. I would also, depending on their history, how they've been exposed to molds.

And so there are several labs that test for mold, like Mosaic, formerly Great Plains, is the mycotox. Vibrant Wellness has mycotoxins. Or are they exposed heavy metals?

And we talked about how heavy metal are basically bad computer chips that are being swapped into the healthy chips, that're ruining the machines of the mitochondria.

So there's different types of heavy-metal tests that can be done. If it's mercury that you suspect, I really like Quicksilver Scientific's Tri-Mercury test.

There's also many other metal tests out there, whether it's from ZRT Labs or Genova or other places, or Vibe in America. And then Lyme, if they have a history of Lyne or being in a Lymen area, Lyma really affects the mitochondria.

So you can run Lymed tests. Then the final one is Genetics is a real personal favorite of mine because when you run genetics, you can run this test once and then you've got the data for life.

And you now understand the underlying… Genetic tells people two things. How you should ideally live and what are the risks that may manifest unless you deal with them.

And everything we've talked about has to be filtered through genetics. And if someone is really wanting a place to start, genetics is an excellent place start with almost anything, because the value of the genetics testing can apply to almost everything that people are dealing with.

The value they have of that test is for life.

Working with a Functional Medicine Approach

and as it relates to mitochondria and Hashimoto's, is that you can find out, for example, if someone's an overinflamer like I am. And if there's very specific things you could only really learn from genetics, like what happened to me, before I did genetics testing, I had chronic joint pain like an 80-year-old man.

And then when I ran my genetics, I realized that I was a hyperinflamer genetically. And doing one little gram of fish oil, even though I've been doing it for over a decade, didn't do anything for me because there's a difference between nutritional dosing and nutrigenomic dosin.

Nutrigenomics dosiing is higher doses of singular nutrients that change the expression of your genes. Like one gram a fish, oil is gonna throw widgets into the machinery.

But like two to four grams of fish oil is going to change the machinery. And that's the difference between nutritional dosing and nutrigenomic dosage.

Now, I didn't know about that until I ran genetics. Then once I massively upped my fish, oil, my joint pain went away that had been bothering me for years because I had changed the inflammatory anti-inflammatory machinery and People don't realize just that, and this is going in direct to what you were saying before, that oh, there's got to be this one gene that's affecting your thing for mitochondrial dysfunction.

No. Functional genetics is you look at the clusters. This is the 16 most important genes for inflammation because they're the upstream genes. And that's a real important distinction for anyone looking for a genetics test.

You wanna do a genetic test where you're looking at the upstream genes, not just like all of them that sound good. And you wanna work, and you want to find the lifestyle interventions that help the most number of red and yellow dots, or what we call gene variants.

The fewest number, so you have one lifestyle that can affect 10 out of these 13 red-and-yellow dots. I would rather do like a couple of those lifestyle changes and try to find 13 separate ones.

And so this is where functional genetics comes really powerful is that if you have a really good analysis of the highest prioritized genes, you can find the fewest number of lifestyle interventions that create the most benefit to the important genes that are specific to your genetic needs.

If you control inflammation, then it's hard to find a chronic issue that isn't beneficially affected by controlling inflammation better. Lastly, you can use genetics to determine your optimal diet.

And if people can really genetically dial in their optimal diets, are they keto, paleo, Mediterranean, or high carb? That genetics test exists now. It's not a test you could get through 23andMe or Ancestry, it's a different type of genetics tests where it is looking at the number of duplicates of a specific gene, not the version of it.

For me, I was eating a perfect Mediterranean diet where I knew the names of my farmers and their chickens and go to the farmers market and all that. But I still having really bad energy ups and downs, digestive problem, embarrassing digestive problems.

And it turned out that genetically I am a very low carb paleo bordering on keto, genetically. Once I switched my diet, within a week my digestive issues went away.

And then my energy started to level out and, uh, and like, I started be able to put on more muscle better. Like it was like my, my body was actually eating in the way that my genes were ideally suited for.

So there's when, when working with people, there may be a big emphasis on mitochondria, but we can't ignore. All the other tests, just like if you're focused on thyroid, you can't ignore the.

Other possibilities of where. Where the root causes or the contributors may be coming from and and really that when anyone's working with a practitioner.

Just make sure that whatever practitioner you are working. With has a system. Of being able to pick out the right labs and a. System of lifestyle analysis.

And then when you combine lifestyle analysis, which is looking from the outside in and labs, just looking for the inside out, that's holistic medicine.

And you just want to make sure that your practitioner has a system, not necessarily. Well, everyone comes in, gets this exact test. You can make that one exception somewhat with genetics, because everyone can get their genetics tested regardless of what's going on.

Um, but when it comes to the more functional stuff, like you'd really want to find a practitioner that has a system to understand what are the other possible labs and possibilities out there that might explain what you're seeing in a mitochondrial lab, uh, cause it, or at least contribute to it.

Dr. Sam, thank you so much for getting into it. I know sometimes there's, on the interwebs, we try to say like, okay, this is the best thing to do for everybody.

We'll say if you, everybody needs to to intermittent fasting or everybody to be on keto or everyone needs be a vegan or every needs do X, Y, and Z. And I feel like you've really showed us how functional medicine and personalized medicine helps to dial things in.

you know knowing your farmer eating the mediterranean diet knowing knowing you're farmers chickens this is a great place to start but if you haven't had a lot of luck with that direction and you are still feeling unwell there's a whole host of tools and resources that can help people feel better and really dial things in figuring out your carb tolerance figuring if your mitochondria are not working and so I really appreciate you giving us a little bit of a a bit of a deep dive, maybe like a preview into what functional medicine can do for people, because a lot of people are not sure why they might want to work with a functional medical professional versus working with an endocrinologist.

An endocrenologist will take a look at a person's TSH and put them on thyroid medications, but they're not going to look into why their body is producing antibodies.

If a person is still tired, or if they're still having symptoms, they might send them to like a psychiatrist to say, oh, you're so tired or anxious or depressed.

Why don't we just go to a psychologist for that? Or if you are having pain, They might get sent to our rheumatologist or different type of specialist.

And the answers are generally going to be prescriptions. Sometimes the answer is your labs came back normal and there's nothing that we can do for you where with this functional medicine, we can dial things in and say, you know what, there's actually these other labs we could pull up and then we figure out why you're not responding so well to these thyroid medications because you have genetic variations or you nutrient deficiencies or perhaps your mitochondria are not working properly.

This has been such a wealth of information. I really want to thank you for taking the time to be here with us today. For people that wanted to get more information about working with you or your work, are there some resources and links that you could send us to?

Sure. It's just DrSamShea.com and there I have a couple options for people. We've got a three-day lifestyle nutrition guide. If people want to do the functional genetics, we've got a DIY program that's a whole self-directed course to integrate everything, or there's group coaching options.

And then there are opportunities for people to a free application call to see if what they're dealing with would be a good fit for this approach to data-driven functional medicine testing.

If they are really struggling, then there's an opportunity there to see if this type of approach would be a good fit. I'm also got plenty of videos on my YouTube channel.

I've got my one-hour comedy show is on there. Despite the academic veneer, I am a stand-up comic. And I got lots and lots of resources on YouTube. But if people want to get started with taking more action, then just go directly to my website, DrSamShea.com, and I'd be happy to see how I can support you.

There's many reasons why people have Hashimoto's. Figuring out that you have it is important, but figuring out how you got it and ways to reverse it is arguably even more important.

So the way to do that is to find all the different sources that aggravate or cause an autoimmune reaction, whether it's gut testing or contributing via estrogen dominance or hypothalamic-tuitory adrenal axis dysfunction or mitochondrial breakdown, where it not necessarily Hashimoto's, it more mitochondria dysfunction that's masking as Hashimoto's, or you're prone to genetics that make you hyperinflammatory or other reasons to make your more prone autoimmunity.

All of these lab tests are really, really important to help you deal with the thyroid issue and at its root cause. Thank you so much for sharing that.

And thank you for being here with us, everybody listening. I hope that this has been helpful on your healing journey.