The Role Of Nitric Oxide In Mitochondrial Function Transcript

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Introduction to Nitric Oxide

Welcome back to the conversation at the Restore Your Mitochondrial Matrix Summit. I'm your host, Laura, for Ontario. I'm bringing you experts to help you boost your energy and fix your health so you can build the life you love.

Today, I have a special guest, doctor Nathan. Brian. Hi, doctor. Brian, welcome to the summit. Hi, Laura. Thanks so much for having me. Yep. This is going to be a great talk because you are an expert on nitric oxide.

And this is really relevant to cellular health, cellular energy and mitochondria functioning. Now you've been involved in nitric oxide oxide research for the past 20 years.

And you have made many discoveries in the field. So you truly are the authority to bring on this summit. You're an international leader in molecular medicine and nitric oxide biochemistry.

And we promise for all the consumers watching, Doctor Brian will speak in a way that makes sense. And for all of you practitioners, it will be educational for you as well.

So thank you so much for being here. Thanks. This is, as you said, a very important subject matter. Yeah. So let's start with what is nitric oxide. Because I'm sure people listening right now are wondering what is that?

Why is it important? And practitioners probably have heard of nitric oxide but may not know all the details about it. So what is it? We're. Well, it's a gas that's produced.

It's naturally produced in all female mammals, but it's a signaling molecules that cells in the body communicate with one another. It's best known for its its role in controlling blood vessel tone and vessel relaxation and dilation.

So when nitric oxide is providing in the blood vessel, it signals the smooth muscle to basically dilate, relax. And that leads to more oxygen delivery, more blood flow to downstream tissue.

But it's also important in our immune system. It's how our immune cells kill off, bacteria and viruses or any pathogen. We mobilize our immune response and we go to the site of infection, and we generate a lot of nitric oxide and kill those pathogens.

And then it's how cells in the brain neurons communicate. It's a neurotransmitter in the central nervous. So it's involved in every other function, the delivery of oxygen to regulation of blood flow and circulation.

The older we get, the less we make. And the scientific literature tells us that the loss of nitric oxide is what's responsible for age related disease.

How Nitric Oxide Supports Health

Okay, this sounds like mission critical learning. Nitric oxide sounds like probably one of the most important molecules in the entire human body. It sounds like if we don't have it, we're not going to live long.

And it sounds like if we decrease making it, we're going to age faster. Which leads me to think it's probably, the lack of it is a main contributor to chronic disease.

Now, you're exactly right. In fact, the earliest event in the onset of the progression of all major chronic disease is loss of nitric oxide. And if you think about it, whether it's Alzheimer's or logical disease or heart disease or even sexual dysfunction, the primary problems with those diseases are lack of regulation of blood flow.

So when an organ can't get sufficient blood flow, can't get oxygen and nutrient delivery to those cells and tissues in the metabolic waste products build up and that tissue becomes dysfunctional over time, it fails, and typically the patient will die.

So we've now recognized over 180,000 scientific papers published in the next books that field that if you can prevent the loss of nitric oxide production, you can prevent age related disease.

It's really that simple, as you say. So is let me just ask a common sense question. Is allopathic medicine looking at this or you know, trying to help people maintain nitric oxide?

Well, the only therapy used in adolescent medicine and the only approved indication for nitric oxide based therapies is inhaled nitric oxide gas. And that's for premature babies with pulmonary hypertension.

And then the other indication or drugs like nitroglycerin that are used for the treatment of acute and so squeamish heart disease, you have a restriction in the blood flow to the coronary arteries.

There's a pain that associated with that the chest pain the ischemia and the angina. And so for, you know, several hundred years now, physicians have prescribed nitroglycerin to leave alleviate the acute symptoms of angel.

So it wasn't until the 1970s that it was recognized that those drugs work because they're metabolized in the nitric oxide. So that's really the only indications and the only uses of it know we have a couple of drugs that are in phase three clinical trials.

Now use nitric oxide, one for Covid, one for Alzheimer's and one for a scheming non obstructive pulmonary disease. So we're trying to get these drugs into the arms of our Catholic physicians so that they can make the patients better.

And then on the non pharmaceutical side of things you can get nitric oxide supplements as well. Right. You can you know, since the Nobel Prize was awarded for the discovery of nitric oxide in 1998, and since then there have been, you know, nitric oxide, they supplements that have hit the market and there's dozens, if not hundreds of them.

You know, I've tested the majority of those products and 99% of the products out there that are marketed towards nitric oxide do nothing with nitric oxide.

And so, consumers, consumers have to be careful because it's a lot of creative companies out there who do a lot of creative marketing with really no science behind those products.

You know, fortunately, we've made a number of discoveries, discoveries.

How the Body Produces Nitric Oxide

And, you know, I've got products in the market that actually generate nitric oxide. Yes, we can detect it, quantify, verify it. And so those products actually work.

But, you know, consumers have to be aware and get informed so they can make informed decisions and actually get products that generate nitric oxide. Okay. So let's talk about that.

How is nitric oxide made in the body. And I'm assuming that these supplements can support. But you know what's the basic physiology of this. Well there's two we recognize there's two ways the body makes nitric oxide.

One as I mentioned is in the in the female cells. Those are the cells that line our blood vessels. There's an enzyme called nitric oxide synthase. And that enzyme takes L-arginine, which is an amino acid and then converts that to nitric oxide.

And that's what regulates the second. The second, blood flow and circulation the other way is through the diet. So we've known for a number of years that a plant based diet, Mediterranean diet and Japanese diet and self-promoting, and about 20 years ago has recognized that it's inorganic nitrate that's found in green leafy vegetables, that the body, actually the bacteria I humans don't have an enzyme to metabolize that molecule.

So we're relying upon the oral bacteria. So when we eat a salad, for example, 90 minutes after we consume that nitrate, it's concentrated in our salivary glands.

The bacteria respire on that and it reduces it down to nitrite and nitric oxide. Okay. Once we understand how the body can make nitric oxide, we then understood what goes wrong and people can't make it.

And once you understand that, you can rationally design therapeutics to overcome those limitations. So what does go wrong in people who cannot make their own nitric oxide in levels that are important to maintain, you know, good health?

Well, there's a number of contributing factors. So poor diet, poor lifestyle, a high, you know, carbohydrate diet leads to the glycation of the enzyme.

If you're under a lot of stress or oxidative stress, or don't get a lot of antioxidants from your diet or supplements, then the last enzyme kind of becomes dysfunctional.

And we call that endothelial dysfunction. So that's one of the enzymes to convert running to nitric oxide becomes uncoupled and you develop endothelial dysfunction.

And so that's the older we get the less byproducts that we make that happen. The other problem in the other production pathway is, you know, we're not getting enough nitrate from our diet.

We know that you need about 300 to 400mg to see any changes in nitric oxide collection. The standard American diet, which you follow, said that you're only getting about 150mg per day.

So just like most Americans are deficient in selenium and chromium, magnesium and either we become deficient in nitrate. The other problem, which is kind of an eye opener for many people, is the use of mouthwash.

The 200 million Americans wake up every day and use mouthwash, and there's 200 million Americans have an unsafe, elevated blood pressure we and others have published.

If you use mouthwash, you disrupt the oral microbiome. You disrupt nitric oxide production, your blood pressure goes up, you lose the protective benefits of exercise, and you put yourself at an increased risk of heart attack and stroke.

Then the third what the third step is antacids. You know, again, over 200 million prescriptions written for antacids every year. Yeah.

What Disrupts Nitric Oxide Production

When you should shut down stomach acid production, you step down nitric oxide production. Well, you're not very popular with the mouthwash producers, are you?

Or the, major pharmaceutical companies that produce antacids, which is one of the most purchased products over the counter acid reducers. Yeah. And, you know, there's data revealing now that people who have been on, PPI, a specific form of an acid called a proton pump inhibitors for 3 to 5 years have about a 40% higher incidence of heart attack, stroke.

So, wow, drugs were never these drugs were never approved for chronic use. They were only approved for acute use for gastroesophageal reflux disease. But yet, you know, doctors prescribe these and patients are on them for

three, five, sometimes ten years.

Oh, and now they're not, you know, without stomach acid production. And now they're available over the counter where people can just self use them and it becomes a crutch.

Right? I want to have my lifestyle. I want to drink the alcohol. I want to eat the, you know, the pizza or the whatever the thing is or this or whatever's causing the disruption in the, you know, esophagus and making you feel uncomfortable.

And now people are using it. Well, if I take this, then I can have that lifestyle. And, you know, yeah, we knew proton pump inhibitors, you know, were associated with a higher incidence of hip fracture, higher incidence of pneumonia.

This is the first I've heard about the higher incidence of heart disease as well. Yeah. I think the data clearly show that these are some of the most dangerous drugs on the market.

And now, as you mentioned, you can get them over the counter. Yeah. They don't have stomach acid production. You can't absorb calcium. They can't absorb iron.

You can't absorb B vitamins zinc selenium. And now it's disrupting nitric oxide production and causing increased heart attacks and strokes. Yeah I would say a little disclaimer, a little asterisk if you have Barrett's esophagitis or something or, you know, esophageal cancer or something along those lines, then probably a proton pump inhibitors are going to be supportive to you.

But definitely don't use it chronically without, you know, the advice of your gastroenterologist or, a physician. Yeah. But I think, you know, what we have to do is understand disease to the extent that you can fix it.

And when you do that and understand that, then you can start weaning people off pharmacotherapy. Here's our body's never designed to take a drug. The rest of our lives.

Yet most Americans are taking one, sometimes half a dozen, a dozen drugs, you know, for ten, 20, 30 years. And the disrupts normal physiological function.

So the best thing you can do, the best thing a physician can do is give people some drug therapy, because then their body can then do what it's designed to do, which is heal itself.

The body cannot heal when you're given some therapeutic for some drug, it's inhibiting. And most drugs are inhibitors of critical enzymes. Right. It's just not how the body's designed to work.

It's not. Can you shed some light on why nitric oxide is a key mediator of mitochondrial ATP production? We have a lot of, you know, bio chemistry people speaking on this summit about, mitochondria, ATP, Krebs cycle, electron transport chain, all of that.

But why is nitric oxide so important? There? Well, number one, it's mitochondria. Nitric oxide is what causes mitochondrial biogenesis. So through this pathway through nitric oxide production primarily through this R two ends in the PGC one alpha pathway.

That nitric oxide then tells the mitochondria needs more mitochondria. So you get mitochondria biogenesis. And then a complex one and complex for nitric oxide regulating ATP production or the flow of electrons.

So when you have sufficient nitric oxide production, you prevent the electron leakage across the electron transport chain. So you decrease the oxidative stress.

The nitric oxide also reversibly binds to cytochrome c oxidase. The terminal step in ATP production. And what that allows is allows oxygen to diffuse further in the tissue.

So nitric oxide occupies that space. So then oxygen can diffuse further in the tissue. You extend the oxygen gradient and you improve ATP production. So you can make more ATP with less oxygen more efficiently.

If your body can make nitric oxide. Right. And we've established in the many talks on this summit that mitochondria biogenesis and healthy mitochondria are truly the key to preventing chronic disease or truly I mean, I've had people say, you want to know how not to die, create an environment where your mitochondria can thrive.

That's how not to die young, right? That's exactly right. Yeah. It's it's the it's the energy powerhouse of the cell. We have to generate the energy for those cells to perform their function.

And every as you mentioned, every major chronic disease has one common denominator. They have a dysfunctional mitochondria. We have to fix the mitochondria in order to fix the end organ dysfunction in organ disease.

Now you you had mentioned that Americans aren't eating enough foods that help them produce nitric oxide. You mentioned spinach. Are there some other foods I know people are going to want to know?

Well, what should I be eating to support this? I mean, obviously, you know, our viewers are pretty savvy.

Nitric Oxide and Mitochondrial Energy

They're probably not, you know, eating pizza and burgers on the regular, they're interested in their health. But what are the things that that they could be adding to their diet that would support this?

Well, it's typically the dark green leafy vegetables. The darker the greens, the higher the nitrate content typically. So things like kale, removal of spinach, those are probably the highest, you know, there's a popularity around beets now, beetroot mean being a good source of nitrate.

But the problem is and we published on this in 2015, is it depends on where the vegetables are grown. So we, we, we went to five cities across the US and we gathered vegetables from the shelf, brought it back to the lab and analyzed it.

And for example, there's as much as a 40 fold one season. There's as much as the 40 fold difference in the nitrate content in celery and spinach in Dallas, as opposed to celery in spinach in New York.

Well, so a lot of this is depending upon the farming conditions, the soil conditions, the amount of lightning in a given area, and the other considered, oh, wait, did did you wait, wait, did you say the amount of lightning.

Yeah. Lightning fixes nitrogen in the air. You know, the air we breathe is 78% nitrogen. So that triple bond takes really high energy to break in. It occurs primarily through lightning.

So in regions where there's a lot of lightning and thunderstorms that enriches the soil and nitrogen and nitrate so that native vegetables or plants grown in that soil are more enriched in nitrate than regions that don't have a lot of lightning storms.

Wow. Okay. That is a fun trivia pearl of information. Oh my gosh. Remember that next time you're at a dinner party. Okay. And then the other interesting concept is organically grown vegetables.

You know, organic is good because you're not getting exposed to herbicides and pesticides, but to get an organic label, you're not allowed to add standardized nitrogen based fertilizers to the soil.

So as a consequence, the soils are deficient in nitrate. So you cannot eat enough organic vegetables to get enough nitrate in your diet. This is the first time I've ever heard anything negative about an organic produce.

So I mean is are fertilizers with nitrogen dangerous for us? When why can't you farm with with no nice. The only

way to ensure you're getting enough nitrogen in the soil to support nutrient assimilation and the growth of the vegetable.

Well, you know, for for organic, you can add like organic compost and manure and things like that, but there's no standardization of the nitrogen. Like, for me, when I fertilize my pastures, I use a standardized amount of nitrogen so I know how much nitrogen is going into that.

So to support the growth of the grass or the vegetables that we grow in organic labels unfortunately don't allow that. So I think there needs to be a happy medium.

You need to have, you know, vegetables that are grown in nitrogen based fertilizer but are without any herbicides or pesticides. Then you get the benefits of the vegetable.

Another question what do you have to say to people who are on long term carnivore diets? I mean, this is really popular right now.

Diet, Lifestyle, and Deficiency Signs

You know, I have a lot of people speaking about all different topics here. And, you know, I have experts saying, you know, carnivores. Fine. Just not meant to be forever.

Others say, yeah, you should have it forever. So what do you say about that? Well, I, I'm a big fan. I'm not a big fan of extreme diets, you know, not a strict plant based diet, not a strict, strict carnivore diet.

I think as we've evolved, we've we've evolved to eat a balanced diet in moderation. You know, I think, meat and protein is essential. The fats from meat and protein from animal fats, it's good for us.

There's certain nutrients that are missing in meats that we only get in vegetables the same thing. There's certain minerals that are in meats that are missing in vegetables.

So we have to combine eat a balanced diet in moderation to get all the minerals and nutrients and vitamins that we need as humans to make new cells that work properly.

That's excellent. And I think we can all agree, just eat real food, right? There's a ditch. The processing, the factory made food, real food. And don't overeat. Yeah, yeah. Okay.

So let's say someone is not making enough nitric oxide in the body. How might they know. What are the clinical symptoms of the deficiency. Yep. Well, you know we have to rely on symptoms because it's you know, if you want to know what your cholesterol or vitamin D or that is, you can just pull labs and and measure the nitric oxide, we can't measure because it's a gas and it's gone in less than a second when it's produced.

So we have to rely on symptoms. So what are the symptoms of nitric oxide deficiency. The first sign and symptom is usually erectile dysfunction or sexual dysfunction in both men and women.

So if you can't dilate the blood vessels because you can't make nitric oxide, you can't get an erection, you develop sexual dysfunction. So that's first and foremost.

Number two is you see an increase in blood pressure. As I mentioned earlier, two out of three Americans have an unsafe elevation in blood pressure, mostly due to lack of nitric oxide.

Nitric oxide is important and required for insulin signaling. So if you have insulin resistant type two diabetes, you're nitric oxide deficient. If you're exercise intolerant and you get on a treadmill, or you get really winded when you're walking up the steps, then you're nitric oxide deficient.

So if you have low energy chronic fatigue syndrome, again it's a sign of nitric oxide deficiency. So every major

clinical symptom and present in that you go to the doctor for is typically a nitric oxide deficiency.

It's contributing to that disease. And I'm assuming you don't have to have all of them. It might be a couple. You might you might not have erectile dysfunction, but your blood pressure might be going up or right.

It doesn't mean everything doesn't have to be there. Yeah. No. That's right. And so what we have to teach people and what we're trying to do is teach people to be proactive, you know, because medicines are reactive practice.

People don't make changes until there's a fear or in an event. Right. So we I think that we have to change course and be proactive. So we have to take the steps now to prevent the loss of nitric oxide production before we get sick, because it's much easier to prevent disease than it is to treat it.

Yeah. So let's talk about prevention and and also restoration. So you know I know people want to know well how do I prevent this from happening. And there's probably less people listening who are already pretty deep into this.

And they want and they want to restore their nitric oxide production. So how do we do that? Well, it's very simple. You only have to do two things. Number one, you have to stop doing the things that disrupt it.

So what is it you have to stop using? If you're using mouthwash, you have to stop. The other is you have to get rid of fluoride. Get rid of fluoride in your toothpaste, buy fluoride free toothpaste and stop drinking, cooking and bathing in municipal water.

It's fluorinated. Fluoride is a neurotoxin. It's an antiseptic and it kills your thyroid function. So it's a poison. So we have to get it out of our out of our products.

And then the third is that stop using an acid. Using an acid, you absolutely have to stop and not again, 40% higher chance of heart attack and stroke.

So when you start, stop doing those three things. Then you're you'll notice a difference. Your body will thank you for that. And then secondly, you got to start doing the things that are clinically proven to promote nitric oxide.

So moderate physical exercise on some more green leafy vegetables, sunlight. You know, there's certain wavelengths of light to stimulate nitric oxide production, ten, 20 minutes of sunlight every day.

Or I like an example. I sit an infrared sauna every day that stimulates mitochondrial, function and stimulates nitric oxide production.

Restoring Nitric Oxide and Product Demo

And then when all else fails, you can take one of our nitric oxide products that, you know, we can demonstrate that it actually generates nitric oxide. Yes.

I want to talk about this because that's actually how I met you. I was at a I was at a conference, and I met you at a nitric oxide booth, and you were swarmed with people.

I like getting to the front of the booth to actually experience. So you were actually testing people's nitric oxide levels right there. You were testing saliva, and then we could sit.

I want you to talk about that. And you and there was a couple products. You even had a beauty product, a skin product. But there was also nitric oxide supplements.

So share share with us about that. And the company and it's fascinating. So tell us more. Sure. So about 12 years ago when we brought to market a nitric oxide product, the first question was, how do I know if I need this?

And so there weren't any labs or any way to tell what nitric oxide levels were. So I developed a test strip, the saliva

test strips. You can apply your saliva to the end of this test in a matter of 2 to 3 seconds.

It'll give you a color change. So the darker the pink, the the better. Than I said production is. If there's no change in color, then you're completely devoid of nitric oxide.

So it's a great point of care diagnostic that'll tell you how well your body is making nitric oxide. So it's a great conversation starter. And then we developed nitric oxide products that are you know, we developed a lozenge, an early disintegrating tablet.

So as I mentioned nitric oxide is a gas. And so the challenge for us in developing, whether it's drugs or any type of product technology is how do you make a gas in a solid dose form it, what generates the gas when consumed?

And the only way to do that is through a lozenge. So this laws that you put in your mouth, it dissolves over 45 minutes. And over that 45 minutes we generate nitric oxide. Yes.

We can see dilation of the carotid arteries within about 15 seconds of putting it in your mouth. And so that was our first technology. And then we moved into, you know, skincare and beauty because just like the heart and the brain, the skin is an organ.

And without sufficient blood flow, that organ fills. So failing skin looks like, you know, fine lines and wrinkles appear. You start to lose hydration, you lose collagen scrub, develop acne, dermatitis.

So our thought was, if we can generate nitric oxide topically and restore blood flow to the skin, the skin would regenerate. Fine lines and wrinkles would disappear.

And you could resolve a lot of, you know, dermal dermatological issues and, you know, restore the skin to where it looks young and healthy instead of age.

So those are our primary products. And we've since recently launched another product called nut. You know, beets, which is an interesting concept because there's now dozens, if not hundreds of products on the market.

Most of them don't do anything, but very few people like the taste. The beets. So when our, you know, beets, we've taken the beat pulp, the B color, the beet taste out of them, and we actually put mitochondrial, ATP in that product.

And then we put electrolytes in there because most Americans are dehydrated. So this product, when you, it's a powdered key dissolved in water and take it as a shock.

And then when you consume it as a shot we generate nitric oxide. We stimulate mitochondrial ATP production, we improve hydration. And it's an unbelievable energy product.

And I think we'll probably replace Father Energy in these, really unhealthy and dangerous, energy drinks. Can you question, can you overdo it on nitric oxide, or is this pretty safe?

Now, you can just like anything too much nitric oxide leads to to, low blood pressure or hypertension and really too much to start to develop ment hemoglobin anemia.

So the first signs and symptoms is your blood pressure. What. You'll have an unsafe drop in blood pressure. But the nitric oxide that we develop when taken as indicated is extremely helpful because we've dial in the amount of mass one would normally make in a healthy 70 or 80 kilogram person.

So just giving back to the body what's missing, and I thought is never give the body something that it's not used to see. So two little nitric oxide is then too much nitric oxide can be bad.

But nitric oxide at the right time, at the right place, the right dose in the right location. It's probably the most beneficial thing anyone can. Great.

So can you share with us what the name of the company is and where people can find these incredible products. Yeah, the supplements in nutritional products are from a company called Brian Nichols that's awaken.

Oh, to you that, it's, you know, the number two, the letter Yukon. And then for our skincare, we developed a completely different company called pneuma nitric oxide.

And the skin care products can be found. And in 101 account, that's one nitrogen, one oxygen in 101 cup. Oh, great. We'll make sure that we have links for that.

In the, in the, on this interview page. This has been just so enlightening. Doctor Brian, thank you for coming on here and making this so easy to understand for people I know.

Practitioners and health consumers alike got a lot out of this talk. And any final words as we wrap up on people on this journey of improving their health, aging in a healthy way, having the life where they are present with their family, where they're still being active and productive in the world.

That's what I hear the most from people that they want. They just want to be present, in their lives. And they've got more to give to the world. So what would you say?

Well, your body cannot. It will not heal or perform optimally without my production. Because without nitric oxide, the cells of your body aren't getting the oxygen and nutrients they need.

You mitochondria aren't generating the energy that it needs. And so people become lethargic and chronic disease ensues. So it's a very simple thing to do.

It's a very potent, very important molecule. I think every single person on the planet Earth should be taking some form of nitric oxide. Thank you so much.

You have been amazing. I really appreciate you contributing to the conversation here on the mitochondria Matrix Summit. And, can't wait to collaborate more and learn more from you.

Thank you Laura. Look forward to you. Take good care now. Thank you. Bye.