Introduction and Mitochondria's Central Role

So welcome, Dr. Murray. Such a pleasure to connect with you, as always. My pleasure. I always enjoyed speaking with you and I know that your audience is a bit different.

They're highly motivated and highly educated, so I'm ready to go. Awesome. So this is this is for the mitochondria summit. So we're going to assume some level of familiarity, basic knowledge around mitochondria.

We're going to assume that listeners have already heard from a number of other speakers and experts on this topic of mitochondria. Now, with that said, one of the things that I've noticed is that many experts, including myself as someone who focuses on mitochondria, have different ways of speaking about mitochondria, are focused on different aspects of it.

And I think, you know, more broadly from the time that you were going through your your university and graduate school education and even during the time I was doing that, the mitochondria were kind of just, hey, these are one of many organelles of the cell and this is the powerhouse of the cell.

And their job is to take in carbs and fats and pump out ATP. But really, in the last decade especially, there's been all this science that's emerged around it, really positioning mitochondria as having this central role in so many things about how our physiology works of, of course, energy generation, but also having a role in immune function and cellular defense and having a role in, in, in many different aspects of physiology and having a role in mitochondrial dysfunction being linked to so many different diseases and to the rate of aging itself and to physiological resilience.

And, you know, mitochondria are just way more important than we realized. And I think in the last ten years especially, we've had this this large body of evidence that continues to show just how important they are.

But I'm curious sort of what your overall big picture take is on mitochondria and sort of their importance in human health. We wouldn't be alive.

Common Drivers of Low Energy and Mitochondrial Dysfunction

That was not for mitochondria and not the whole world would look a lot different without these important cellular powerhouses. And in naturopathic medicine, we've always placed a strong importance on energy.

And true energy. And in true energy is really determined by how well your mitochondria are functioning. And what I've tried to get across for for decades now is that our energy levels are a little bit like a dimmer switch and sometimes the light bulb has a lot of dust on it and we have to clean up the light bulbs.

But most often it's because they are dimmer. Switch is not turned fully bright, it's a little bit dim and it's really shows up not only in our energy levels, but also how well our brain is thinking and one of the things that I've noticed as I've gotten older is that I'm much brighter in the morning and as the day goes on, especially if I don't take some time to meditate or take a nap, I'm not as as bright as I was in the morning.

And I think that's a good indication of the importance of making sure we get enough rest and recovery to allow our mitochondria to rebound. You get a little tired if they're pumping all the time, you know, 24 seven.

They need they need that that break, too, to cleanse and to kind of reboot and recharge. Mm hmm. Yeah, absolutely. Okay. So what do you see as some of the big factors that are dimming that that dimmer switch or dimming the light bulb, dimming the energy output?

What are some of the big drivers of why there is a fatigue epidemic and an epidemic of poor mitochondrial function? Well, yeah, it's it's it's a number of different factors and it's kind of like the the blind blind men and the elephant.

You know, it depends on what expert you're talking to as to what they think is the most important. I try to step back and and look at the whole picture and recognize that it's really an interplay of a number of different factors that determine our mitochondrial function.

And particularly important are essential nutrients. If we're deficient in any nutrient, it's going to lead to impaired mitochondrial function. And when you when you look at nutrient deficiency, even in developed countries, you think, oh, you know, that there couldn't be people walking around with nutrient deficiencies.

You know, we were overfed, but we're undernourished. And if we look at something as simple as iron deficiency, which is the most common deficiency and in the world, it's, it's rampant in in, in certain groups in the United States, for example, in studies looking at endurance athletes, female endurance athletes are swimmers.

Over 80% are deficient in iron. But we have a population that's becoming more plant based in their nutritional choices. And as a result, we're seeing a lot of people becoming vegans and vegetarians.

And the rate of iron deficiency in those groups is really, really high. We have children with iron deficiency. As we get older, we don't absorb iron as efficiently.

And so just something as simple as an iron deficiency could be a big factor in why many people aren't having high energy levels and are experiencing low mitochondrial function.

And one of my important discoveries when looking at energy levels, there was a study that came out in the fifties looking at it how long a woman could stand a good stay on a treadmill, walking at three miles per hour.

And what they found was that it was it was directly related to their their iron stores. If their iron stores were low, their time on that treadmill was low.

But the better their iron stores, the longer they could they could stay on that treadmill. And, gee, I mean, I think every menstruating woman should have at least a yearly serum ferritin test that tells us the level of iron stores in the body.

And if it's below 50, they need to eat more iron rich foods. And there's two types of iron. We have heme iron, which is found in in animal products and we have non-human which is found in in plant foods.

And the reality is, is that him iron is much better absorbed. So for women that have really low iron levels, you know, maybe eating some liver, a calves liver or even fish liver, you know, once or twice a week is a great way to boost the boost iron levels.

And of course, there are supplements and and most of those supplements are the non heme we just have to use a sufficient level are usually 60 to 120 milligrams per day for a period of time until that level gets up.

But you know that little recommendation, Aria, if you're a woman menstruating and you're suffering from low energy, particularly if you're a runner or a swimmer or engaged in intense physical activity or exercise, get your serum ferritin level check to make sure that you have enough iron to make energy.

MM Are there any other notable nutrient deficiencies that that stick out to you as being common in people with chronic fatigue?

ATP Production, Flavonoids, and Cellular Protection

Any of the B vitamins, your B vitamins are really important in in mitochondrial function. And the mitochondria are at

a miniature nuclear power plant.

So there's a lot of chemical reactions going on there. And if we don't have a diet that's rich in protective factors like flavonoids, plant pigments or carotenoids or other plant based antioxidants, then those mitochondria can become become damaged.

And that that results in low energy levels as well. So, you know, eating a lot of the green leafy vegetables, a lot of a lot of colorful fruits and vegetables, those are really important dietary goals for enhancing mitochondrial function.

And then lastly, something that I look at is what is a person's exposure to damaging factors to the mitochondria? In my guess are if we look at one of the worst mitochondrial damages is Tylenol, acetaminophen and we have 50 million Americans that regularly use acetaminophen or Tylenol on a weekly basis.

And every time you take a Tylenol, it it dramatically reduces your lutathera in stores. And as a result, it makes your mitochondria more susceptible to damage and that leads to decreased function.

So that's an example of a really serious damaging factor to mitochondria is cigaret smoke. Vaping is absolutely deadly to mitochondrial function. Environmental toxins like pesticides, herbicides, heavy metals like lead mercury, cadmium, a lot of different prescription and illegal drugs are all serious damages to the mitochondria.

So we have to provide all essential nutrients. We have to make sure that we have a good array of antioxidants from our diet. We have to reduce exposure to damaging factors.

And as I discussed at the beginning, we have to take time for rest and recovery so that our mitochondria have a chance to to take a little break and cleanse, recover and then start putting out more ATP. Mm hmm.

Okay, here's a little here's a little trivia. This is something that the patients are always amazed at all. Do you know how much ATP your body makes in a day?

I want to say. It's I'm it's been a few years since I saw this, but I and I don't want to be a spoiler to your to your to the number. It's like 180 kilograms of ATP per day or 90 kilograms a day, something along those lines.

It's about your body weight. So if someone weighs £100, their body every single day is making about £100 of ATP. If they weigh £200, they're making £200 of energy every day.

I think that just really puts it into perspective. Your mitochondria are producing the amount of ATP that equals your body weight every day. And it's just just explained to people because maybe it's not obvious how this could be possible and for there to be no weight gain or weight loss while this is happening.

Okay. ATP is the chemical currency for energy in our body and it's the mitochondria job to produce ATP. And so ATP is produced and then energy is burned in the process.

And so this is just how that exchange works. The mitochondria produces that ATP. The ATP is then is kind of like the fire that burns the wood that that energy that is created is used for biochemical processes.

And that's where we burn calories. Got it. You mentioned phytochemicals, flavonoids and polyphenols and things of that nature. What do you see as the role of them in terms of in terms of physiology, in terms of biochemistry, and specifically as it pertains to to mitochondria?

And I'm curious if you're familiar if you're familiar with the field of research called Zino or Mrs.. Yes, you know, flavonoids are a big part of my love affair with with nature.

I, I really fell in love with flavonoids when I was at Bastia studying naturopathic medicine. I had a great professor at Madison and just looking at the, the wondrous ways in which these chemicals work in our body, there are over 8000 avenues that have been identified chemically.

And these plant pigments are responsible for many of the medicinal effects of of of the medicinal plants, you know, from ginkgo St John's Wort, Bilberry, blueberry pomegranate berries in general.

And what we know about these compounds is they are nature's biological response modifiers. What that means is they modify our response to the environment and they are extremely pharmacologically active in nature has a way of making sure that that they're under control. So it's really kind of a miracle when you when you look at it.

So let's say that this is a flavonoid if if if when we ingest the flavonoids and. Also just describe it for people listening who may not be watching the video.

Okay. Oh, okay. So a flavonoid when I have, I'm just holding up a little little clicker, a little remote. And when we ingest a flavonoid, it is quickly bound to a another molecule.

I'm going to grab a paperclip so the paperclip gets down to the the remote or the flavonoid it's bound by sulfur or glue, chronic acid, and then it's then circulates in our body in a bound form.

It's inactive. So for years they thought, well, flavonoids aren't that important to human nutrition, because when we unjust them, we get bound and they become inactive.

Well, nature has always believed that nature has a way of providing the benefits of these flavonoids and so it was discovered that in areas of inflammation or damage or low mitochondrial function, cells start secreting a compound called Lucca Rainy Days.

And what that enzyme does is it breaks that bond and it frees up that flavonoid that then gets transferred into the cell. And we did a really interesting study in Spain a few years ago that proved this concept.

And what they did was they they took cells and they damaged their mitochondria in these showed that when they damage that mitochondria, it it causes the cell to release that glue chronic acid that broke the bond between the flavonoid and the chronic acid.

Rethinking Oxidative Stress and the Role of Nrf2

And that allowed the Flavonoid to get into the cell and not only get transferred to the cells nucleus, but also to the mitochondria in both the nucleus and the mitochondria, the flavonoid exerting effect on the cellular genetics or the mitochondrial genetics to reduce inflammation and to promote repair.

So they they showed that these that flavonoids in this particular case, they looked at quercetin was able to repair that mitochondria, which, you know, that was not thought possible prior to that.

So flavonoids are really important and they've been a mainstay of my diet for well, for over 40, 43 years. If I first started hearing about them, which is a long time ago, but I've been at this a while, I turned 65 in a month.

And I want to be like you. And I'm 65. Well, I'm sure you'll be even better. You know, like you said, we're learning so much more than we knew before.

But I feel really blessed that I, you know, kind of some people would think it's obsessive, but I don't think so. I've made a goal. I've had a target of a flavonoid intake every day for the last 45 years, practically.

And I think if and I have this on my website, Dr. Maricon, you just it just go to search and take flavonoids. I have an article in there and I talk about them being superfoods and how to calculate your diet, your dietary intake.

And I give you an idea of what my targets are through diet and supplementation. But, you know, when we talk about superfoods, we're really talking about foods that are really rich in flavors.

Why is cacao or dark chocolate so important now? It's the the flavonoids. What about berries? You know, what

about pomegranate? What about green tea? What about Saint John's where ginko, grape seed extract.

It goes on and on and on. It's these these flavonoids. And there are different types of flavonoids, but they all share some common features. And one of the most important features that they share is an ability to improve mitochondrial function.

Okay. I want to I want to go one or maybe two or maybe three layers deeper into this into territory that is almost never discussed. And I think given your very long expertize in, in natural health and nutrition being the legend of natural health that you are and your unique interest in flavonoids and my unique interest in flavonoids, there's there's some there's some stories here that I think might be worth delving into that I'm pretty sure won't be touched on by any other expert.

So there's a story around antioxidants and oxidants that is a very distorted and oversimplified story that has been widely circulating for many, many decades.

And the story is very simply oxidants and oxidative stress equals bad. Antioxidants are good. And the more antioxidants we have, the better. And there are a variety of lines of evidence that have made it clear that this story is overly simplistic and that there are many layers that are that are incorrect.

For example, there are many studies published online debunking the whole free radical theory of Aging. Harman's free radical theory of Aging that's been around for for many decades.

And there's many, many studies as, as you probably know, Dr. Murray, where they have tested various kinds of antioxidants and found them to not be particularly effective and some in some cases to actually be counterproductive.

As far as disease prevention or extending lifespan, both in animal models and in humans. Conversely, we also have the examples of things like exercise and water medic stressors which increase free radicals or reactive oxygen species, and yet paradoxically have a lifespan enhancing and disease prevention effect.

So this this basic again, just to recap, this basic model of oxidants are bad, antioxidants are good. And the more that we have antioxidants quenching the oxidants and the more we we do things to avoid big spikes of oxidants, the longer we live, the slower the aging process is, the more we prevent disease.

And again, we have these lines of evidence showing that many antioxidants don't actually work to prevent disease or extend lifespan and many things that, despite that, create large amounts of oxidants, paradoxically extend lifespan and prevent disease.

I'm curious to what extent you've spent time like looking at this whole story and and how you reconcile all of those things. Okay. So a lot of times when we're looking at an antioxidant or antioxidant, we're looking at a chemical reaction or in a in an in-vitro or test tube study.

It has really no bearing. You know, so fruit, for example, if we look at flavonoids, flavonoids are generally referred to as antioxidants in a in as in a chemical reaction or in a test tube study, they show antioxidant activity.

The problem is, is that you cannot achieve the level of concentration to produce that antioxidant effect in the body. Does that mean that they don't have on antioxidant effects?

No, they have indirect antioxidant effects. And the things that you were talking about being stressors to our antioxidant system, they have the same effect as the beneficial compounds that exert systemic antioxidant effects, like antioxidants.

We have the genetic controllers and we have very unique set of feedback stimuli, kind of like thermostats in the form of receptors on our cells that will activate signals to our our nucleus to activate certain genes.

And, you know, I don't know if your if your audience or this audience is familiar with with Nerve two, but Nerve two is kind of the body's Antioch innate response.

And that's really what we want to be looking at. And again, if you look at what stimulates nerve to activation, it's both stressors to the and to the antioxidant system and natural compounds that support the antioxidant system.

So you eliminate that. That's what seems to be an enigma, but it's really not because you just look at what happens on a cellular level and exercise. This is a great example.

So, so just just your spot on everything you're saying is the way to reconcile it. But just for for listeners, explain nerve to in a little bit more depth and explain the concept of, you know, like, let me put it this way, let's say that you had just a simple machine like a hunk of metal, like a car or something like that.

The more stress you apply to it, the more that you take it over bumpy dirt roads and, you know, subjected to different forces acting on it and getting dirty and getting wet and taking big, you know, taking it off jams.

The more it's going to break down. But the difference between that and the human body is we are a living, intelligent, adaptive machine that is designed to respond to the stressors that we're subjected to and make adaptations to it.

And we we have a system in our body built into our biology that is designed to respond to stressors by becoming stronger and more robust. And as you alluded to, that one of the primary pathways that happens through is the nerve to pathway and the the endogenous antioxidant system.

So just assume people have no knowledge that there is an internal antioxidant system and explain how all of that works. Yeah, that was very well done.

That was beautiful. That's a great analogy and I'm going to steal it. That's so good. Yeah. We are designed to have stress in our lives to create one.

Now, if you take a single celled organism like an amoeba and you put it in what we think is a perfect environment, it would die because it needs that stress in order to grow and to to thrive.

And we're the same way. We need stress in every aspect of our life in order in order to grow and thrive and evolve both individually and as a race. So our our our bodies and ourselves have mechanisms to take stressful situations and help us adapt to that stress.

And as you said, you know, exercise is such a great analogy because the more load you put on body, the stronger it's going to become, because it has to be a reasonable, overwhelming stress.

But that continued stress leads to an adaptation of improving our ability to have endurance, stamina and strength. And and that same thing happens on a cellular level.

And when we look at what are those cellular mechanisms that are responsible for helping a cell adapt to stress, it's really interesting in this nerf to system is kind of a stimulus to our antioxidant system.

And we have we have compounds in our body that exert antioxidant activity. We also have enzymes that exert enzymes attack antioxidant activity. So there's a lot of vehicles that our body produces that nullify oxidative stress and we be in it.

Like anything in nature, it's always a double edged sword.

Drugs, Inflammation, and the Emerging Health Paradigm

We have we our body can also produce oxidants because that's what we use to kill infecting organisms and things

that might do us harm. And there are situations when our body is desiring to produce inflammatory processes because they're important in in promoting a healing reaction.

So we don't want to shut any of that down. I just want that I want I want to emphasize what you said there, just to pointed out to listeners us as because it's a big key of why this story of oxidants are bad, antioxidants are good is is is so misguided because those oxidants are, again, as you said, serving a purpose.

The body is designed to produce them. It's not a mistake. They're not just bad guys. The body's not producing them by accident. Does some some horrible thing that's gone wrong in the design of human beings.

It's intelligent. They're there for a purpose. They serve many vital signaling roles. They serve in immune defenses, and they serve as part of the adaptations system in response to exercise and other hermetic stressors where the presence of those reactive oxygen species is used as a signal for mitochondria to grow bigger and stronger and for mitochondrial biogenesis.

So when you quench too much of those free radicals, for example, when they did studies many years ago where they supplemented antioxidants to people doing exercise, what they found is that it actually canceled out or mostly negated many of the metabolic benefits of doing exercise.

So, you know, again, those reactive oxygen species, these oxidants are not just bad guys. They're they're they're serving a purpose. We don't want to just be constantly trying to pound as much glutathione and antioxidants, exogenous antioxidants as we possibly can to suppress those reactive oxygen species, because that that is actually based on a mistaken and naive ignorant view of human physiology.

That's that's incomplete. And that's I think, part of the magic of these flavonoid molecules, too, is they're they're not just indiscriminant Antioch direct antioxidants.

They're working with our endogenous antioxidant system. Yeah you know, we've seen a lot of different areas of focus in research and in nutrition and in medicine in general.

And it it's it's been really interesting to to view it, you know, and, you know, it was. Yeah. So one of the the latest was is looking at everything, you know, an anti if it's something it's anti-inflammatory it's going to it's going to promote life extension because boy, you know, inflammation plays such a big role in so many detrimental aspects of human health.

But I came they did a study is this is really this is this is a paradigm shifting. They looked at the the art of the there was an editorial that basically I'm paraphrasing the article, but everything that we thought we knew about pain relief was wrong because what they found, what they found was, is that the treatment of acute pain led to an increase in chronic pain.

And it's the chronic pain that's created this opioid problem in and what they found was, is that if you're using natural anti-inflammatory drugs like ibuprofen, you know, after surgery or whatever, you know, it may be a trauma injury of some sort that it reduces the the the acute inflammatory process.

And in the process of suppressing that inflammation, it also suppresses the formation of compounds in our body called resolved. And these are compounds that resolve inflammation and I think they're going to be treating pain a lot differently in the future than they are.

What we're doing now, we have a tendency to think that pharmacology drug therapy is at the pinnacle, but we're in the dark ages still. I think it's foolish to think that that that we're not.

Because if you look at any class of drugs and you look at the the mechanism of action in the long term effects, you know, whether you're talking about sleeping pills, whether you're talking about anti-inflammatory drugs, you're talking about antidepressants, you're looking at, oh, they just discovered that all these cognitive enhancing drugs, they actually increase the loss of cognition.

And we see that with blood pressure medications. We see that with with just about every class of medication they end up creating the problem that they were originally designed to address.

And when we when we're looking at mitochondrial function and and longevity, you know, I think finding alternatives to conventional medicines is the way to go.

That's one of the basic foundations of my latest book, The Longevity Matrix. And now we want to we want to we want to support our body with all these wonderful longevity aids. But from what I look at, whether you're talking about proton pump inhibitors for treating esophageal reflux or sleeping pills or Tylenol or whatever you look at, you look at those sorts of drugs and you look at their impact on life extension and their mortality risk.

These are putting people into the grave sooner. And just helping people get off of these drugs is a great way to extend their their life. And that's one of my big missions in life to help people live a long and healthy life.

And it's hard to do that if you're on a medication, a drug. I think this really gets into a difference in paradigms like the foundational paradigms through which you are seeking to improve human health or within conventional medicine generally.

It's not about improving health. It's about trying to fix disease and reverse pathology or stop pathology. And the general paradigm is oh is based on a model of let's do this sort of biochemical analysis of what what's going on, what are the pathways and the specific molecules that are out of whack that are driving this disease process.

And then let's create a drug to interfere or to interrupt with that cascade of chemical reactions. And that paradigm is distinct from one of saying, one of looking at the body as an intelligent system and saying how, or why is the body doing this?

Why is the body just making this shift in this direction? And how can we what what can we do? What how can we understand the root causes of that of why this intelligent system is feeling like it needs to respond in this way, such that we can coax it back into its healthy regulation rather than interrupting the dumb that's randomly sort of gone astray and is making this accident, these accidents, by having high cholesterol or up regulating hormones that act on the kidneys such that now you have high blood pressure or changing neurotransmitters in the brain's levels of the brain, such that now you have depression or anxiety, and therefore we need a drug to fix this, this mistake that the body's making.

It's a paradigm of saying, well, why is the body regulating neurotransmitters in this way or regulating blood pressure in this way? And and and why are these cholesterol and triglycerides being regulated by this intelligence system in this way?

And how can we work with this intelligent system to bring it back into balance? And the the the treatments that one arrives at are wildly different depending on which one of those paradigms you operate in.

Microbiome, Gut-Mitochondria Links, and Healthy Aging

And it's very unfortunate in my mind that the dominant conventional medical paradigm is which which most people associate with, quote unquote, the science, you know, as the more scientifically advanced one is one that sees the body as a dumb machine, that makes all these mistakes, that requires drugs to interrupt all of these pathological processes, disease processes.

So anyway, I just thought I'd add that to echo your sentiments, though. Yeah, it's it's it's going to be I want to stick around as long as possible because it's exciting. The the route that science is taking.

If you really have your pulse on on the research is it's clear that a new paradigm is is is emerging. And I really like this focus on not only our physiology but also the microbiome.

And I think we're going to be looking at ways to influence the microbiome in a much more sophisticated and

meaningful way than than what we're doing now. And I'm excited to see what what that might lead to, because there's such a symbiotic relationship between our health and the health of our microbiome.

And it's not, you know, probiotics are there. They're really not all that important. And we focus on them way too much. It's almost like a reverse germ theory.

I don't know yet. Yeah, because it's the microbiome is like a like a like most often it's it's like a very rich environment, kind of like an Amazonian forest.

And you're trying to change the Amazonian forest by throwing some grass seeds out. There's there's no room for it. So there has to be ways of altering it.

And there there are. And we're learning more and more what's important in terms of or or lifestyle or diet or thoughts or hormonal levels, all these things that have nothing to do with, you know, taking taking probiotics.

And there's a microbiome mitochondria access as well, a gut mitochondria access. And we know that, you know, for example, microbe interact with some of these plant phytochemicals and flavonoids in ways that ultimately affect the mitochondria.

And that if you maybe don't have a healthy microbiome, those things can't can't function as well. For example, the conversion of of, of fibers plant, plant food fibers into short chain fatty acids and butyrate, which heavily impact on mitochondrial function or the conversion of ellagic acid into Europe within a which is a powerful promoter of Mitophagy.

Right. So anyway, just to amplify your what you're saying about this connection between the microbiome and everything else, including mitochondria. Yeah. And we were talking about flavonoids, so when everyone knows that dark chocolate is good for the circulation.

So researchers looked at nine different metabolites, parts of the flavanols in dark chocolate. And what they found was, is that these metabolites and an objective measurement of the effects on blood flow, they were 16 times more powerful than what they thought was the active compound in dark chocolate.

So yeah, so the type of gut bacteria that we have is if we have the right type of gut bacteria, it seems to lead to even more beneficial effects from various food components that we know were healthful.

So yeah, it's, it's an emerging science and it's going to be fun to see how it all it all works out. And, you know, I'm just I'm really thrilled for myself, as I say, head up to my my 61st, 65th birthday because, you know, I, I, I had a lot of these epiphanies, just as you've had in that has allowed us to create our own individual philosophy of diet, lifestyle, attitudes, spirituality and it pays off.

I know it. It's paid off for me. And, you know, I have been hanging out with some some high school buddies that chose a different path with their lifestyle in, diet in and they're they're they're they're not as vibrant, energetic and they don't have the quality of life that I have.

So, Dr. Murray. I'm 39. I graduated high school about 20 years ago. And a lot of the the guys that I went to high school with looked like you know, middle aged men.

You know, I still feel like a young guy. You know, I'm I'm very fit. I have tons of energy. I'm lean, I'm in great shape. And I look at some of the people I went to high school with and I'm like, oh, my God.

You know, living a healthy lifestyle and eating a great diet really makes a massive difference. There is there is no question. But you maybe can't see it when you're 20, but you can definitely see it when you're 40 and beyond.

Yeah. And if you're if you're, if you're older, it's never too late to, to get on the path. It's, it's never too late, you know, it's not about living longer.

It's about living better. Now, if you take care of living better now, the longer part is just going to going to fall into place. I didn't, you know, when I was was, you know, in my twenties, I didn't think about, yeah, I'm going to do this because I want to live longer.

I did it because I want to feel better now. I want to be I want my body to be functioning as best as it can now. And if you always take that approach, the longevity part should just fall into place.

Yeah. So I want to I want to wrap up with your thoughts on maybe some of your top superfoods, your top flavonoids and your top supplements that you would advise people to, to, to consume or to perhaps experiment with if they're dealing with fatigue issues or poor mitochondrial function.

Yeah, I think I think it's really important. A lot of times people look for that magic bullet. It's like sometimes a magic bullet. It's like a beautiful piece of art.

But you have to have the framework of the house and you have to have the drywall and you have to about foundation. When I was in practice, I would ask patients to try to bring in all of their supplements, and sometimes they would come in with two big shopping bags full of all the the the supplements they're taking.

And by the way, we had a name for these people in the health food industry. We called them good customers. But I found a lot of times they were taking a lot of basically accessory items and not really having a strong foundation and their we can build upon a foundation, but at the very least, everybody should be taking high quality, multiple vitamin and mineral formula.

And if a woman is menstruating, I would recommend getting a yearly serum ferritin test because of the the importance of iron. And sometimes just the amount of iron is in a multiple vitamin and mineral formula is enough to keep those ferritin levels up.

We've learned a lot about vitamin D3 lately. I think it's really important. So get your vitamin D3 levels checked in and you know, just do it a couple of times and you know, if you're in the range or not and most people need about 2000 to 5000 I use daily of of D3 then I'm a big fan fish oil taking a thousand milligrams of EPA and DHEA daily and then take some sort of the flavonoid rich extract a grape seed extract or pain marker or a resveratrol product.

We have a lot of overlap. These sorts of products could be a curcumin product, but some sort of broad spectrum plant based antioxidant could be a super greens.

And then it's just a matter of flooding your body with all sorts of wondrous plant compounds by eating lots of green leafy vegetables, mixing it up with your berries.

And I'm a big fan of nuts and seeds. As long as you have allergies, they're they're they're great foods and they're they're really nutrient dense. And then for people that need more support for mitochondrial function, just the basics.

Top Foods, Supplements, and Finding Purpose

ANKER And acetyl cysteine. I like coke you ten and PCU. Q They're kind of like the spark plugs of mitochondria, and they have been shown to increase energy levels.

They work very, very well together. Usually 200 milligrams of coke, you ten with 20 milligrams of p q. Q And I don't know if people have talked about PCU.

People are probably familiar with Coke Q10, but P Q Q stands for parallel quinoa, lean quinoa. That's why we call it PCU. And it it's literally been found on intergalactic dust.

So it's, it's from Stardust and it's something that we can't manufacture in our body. So it will be designated an essential nutrient at some point. It's it's a very powerful mitochondrial enhancer, but we don't need a lot of it.

10 to 20 milligrams a day is more than enough. And it's been shown to improve cellular energy levels. It activates an enzyme called Ampk. We were supposed to talk a little bit about that already.

I got off on other subjects, but hopefully someone else talks about the importance of Ampk for mitochondrial function. But I really like PCU carnitine alpha lipoic acid.

These are all really, really important ones. I'm not a big fan of antman or in our these nicotinamide products. I look at it and have a different view on that.

It again is listening to the wisdom of the body. You know, this is something that it's such a critical component to mitochondrial function. Why is it dropping as people age?

It's not dropping because it it it's a lack of dietary intake. It's it's dropping because there's an enzymatic imbalance that's associated with aging and flab and ways like Quercetin have been shown to, to activate this longevity gene that naturally boost nad plus levels.

So I just think it's a more elegant in rational way. It's kind of like you have a boat and it has a bunch of holes in it and those holes represent ways we lose.

And man, and you're throwing more and more man in the boat, but it's leaking out. Why not patch up those holes? And where do we patch up those holes is to have a flavonoid rich diet in.

You know, I know people are going in for IVs for need and glue to thigh on and I've never done any with any of those IVs. I think they're to me it's they're you're you're filling up a lifeboat that is leaky and it may be important in certain situations where it's critical to get those nutrients.

But, you know, let's let's let's fix all those holes in the boat and then they don't have to be getting those IVs. That's that's my that's my thought on it.

And I. Agree. I agree with you completely. I Dr. Murray, is are there any final words that you want to leave people with and and tell people where they can find you and follow your work?

They can follow me at Dr. Murray dot com and they can find all my work there. My, my final words are this and in working people and trying to help them improve their health or to live longer.

I came to the realization that the most important thing is to have a reason to live. A reason to live longer. So find your your reason why, find your purpose.

Create a vehicle in your life that makes a difference in the lives of others. Practice gratitude, express appreciate and share of yourself, give of yourself.

These things are self nurturing and they promote health. I think they also promote longevity and a reason to be here as well. So all these are covered in my book, The Longevity Matrix.

I start off with with some exercises that help people identify why they want to be here. And I, I go through my, my ten biggest reasons to live on a regular basis.

They just keep me fired up. And, and that creates energy. We can create energy. We've all had that experience where we've been dead tired, but then something excites us and wow, we're just flooded with all this energy that wakes up our mitochondria everything is connected.

Our mind, our heart and our body. They're all connected. And when we are flush with passion, flush with energy, everything works better. There's a field of research.

I don't know if you've seen any any of this. The studies from this area, it's called mitochondrial psychobiology. Oh, I

love it. And it is on the mind.

Mitochondria connection. I am I am going to Google that when we're done. There's a great there's a great researcher who I've interviewed named Martin Picard.

He's he's one of the primary researchers in that field, great guy, brilliant and has done some really amazing research. And and I believe that there is a ton to what you're saying about the sort of the ikigai the reason for being what is your what is your purpose?

What is your passion? What what gets you up out of bed and makes you want to get up and live? And I think not only is that important in some sort of mystical or purely psychological way, I think it ties directly in to our mitochondria and our cellular energy production and pretty much exactly the same the way that you just described there.

100%. Dr. Murray, thank you so much. It's an absolute pleasure to connect with you, as it always is. And I look forward to our next conversation. I do, too, as well.