Introduction and muscle as longevity organ

Dr. Lyon, my friend. Welcome to the mitochondria summit. It's such a pleasure to have you. Yeah, it's really great to see you. I'm so sorry that we don't get to sit down in person, but who knows?

Maybe over the summer we'll get this. For sure. I will see you in San Diego if you're there. Yes, yes, I'll be there. Cool. So where shall we begin? We need to talk about how all of your work around body composition links to mitochondria, real health and energy levels.

So how, how. What's your paradigm around understanding that connection? Yeah, well, the first thing that I want to say is that we know muscle is the organ of longevity, and muscle is the largest organ system in the body.

It's not the skin. It's not anything else. The heart, the you know, you name it, the endocrine system, skeletal muscle in and of itself. It's its own organ system.

And when you talk about mitochondria, as you can imagine, if skeletal muscle makes up 40% of our body weight, I don't know. Ah, you're pretty muscular.

So for you, maybe it's 50%, but the reality is, is the majority of our mitochondria make skeletal muscle, you know, in within skeletal muscle makes skeletal muscle a perfect way to study mitochondrial health because of just the sheer capacity in the way in which we can leverage skeletal muscle to improve mitochondrial health.

And that's really how I think about it as I was prepping for this summit, thinking about, okay, well, how do we focus on mitochondrial health for the individual and what can they do about it?

And just from a foundational aspect, what changes and why does it change? Yeah. So why do you call muscle the organ of longevity? What is the scientific basis of that?

Yeah. Well, the idea that muscle is the organ of longevity really focuses on the concept that the healthier our muscle is, the more that the more healthy muscle we have.

You know, people will say, well, bodybuilders don't live longer, that that may be true, but we're talking about within a physiological norm that the healthy are skeletal muscle system is because of its pinnacle role in longevity, body composition, energy metabolism.

The better off that we are, it truly is the organ of longevity. And when we think about mitochondrial health, there is a lot of discussion that as we age there are fundamental changes that have to happen within the mitochondria.

From a negative aspect we talk about, you know, this increase in free radical formation, this decrease in mitochondria is ability to clean itself. Mitophagy But the reality is, is we know that under a microscope, if you were to look at a very fit 70 year old and compared the mitochondria to a very fat 20 year old, you wouldn't actually be able to tell the difference, which is crazy.

But the reality is, is we often look at the healthy, sedentary, older population and there's no such thing as healthy sedentary. Any population is a misnomer.

It doesn't exist. And really, the healthier our skeletal muscle is by default, the healthier are our mitochondria. As we have a number of lines of evidence showing that with each decade of life, mitochondrial capacity in skeletal muscle declines by about 10%, which may not sound like that much when you phrase it like that.

But the average seven year old has lost 75% of their mitochondrial capacity compared to a young adult, 75%. So I

often tell people this is like going from a Ferrari engine in your cells when you're 20 to a moped, engine when you're 70.

And we also know that if you look at a 70 year old who is a lifelong exerciser, they don't lose 75% of of their mitochondrial capacity. They have the same mitochondrial capacity as a young person.

So we know that this is not actually a normal process of of aging, per se. This is actually the result of modern lifestyle. So what's going on there? Can you can you add some layers to that story?

Absolutely. What you're saying is very, very critical, basically, to sum it up for the listener, is that by the time someone gets to 70, they have lost the majority of mitochondrial function and overall mitochondria, especially as it relates to skeletal muscle.

I will say when we think about the health of mitochondria, why it's so important is we can actually feel it. And initially the cellular changes we don't feel right.

If you you know, from a fundamental process that happens from an individual who is sedentary, the ability of the mitochondria to replace itself to go through this process of mitophagy decreases again.

An individual who is not exercising the ability to utilize energy. So for beta oxidation, for fatty acid oxidation, so that's really energy utility utilizing the food that you're eating.

The other thing that happens, which is so interesting as it relates to mitochondrial health, is this decrease in flux within skeletal muscle, this decrease in flux that happens when we think about healthy skeletal muscle.

And I talk about it from a way in which we can all picture it. We can all picture what a fillet looks like, a fillet steak looks like it's red. It doesn't have a bunch of fat marbling.

It looks unified as individuals age, not even as they age, as they age and become sedentary as they begin to gain body fat. Body fat is not just in the periphery.

Right. It's not just visceral body fat. It's not just the body fat that you see.

Mitochondrial decline, aging, and sedentary muscle

But you get ectopic deposits of body fat and you get fat that infiltrates and deposits within skeletal muscle. So what ultimately happens and again, this is a very complex topic, there's all kinds of fat and, you know, metabolites that end up affecting skeletal muscle, which all increase the risk of insulin resistance and increase in damage to these mitochondria, the mitochondria, and decrease its ability to counterbalance what's happening so this fat infiltrates.

And then the other thing that happens is with the infiltration of fat, it affects the mitochondria, it also affects contractility. So an individual's ability to exercise to full capacity, the tissue changes and one third of all adults report fatigue.

That's one third they report some form of fatigue as it relates to muscle strength. Right. So if the tissue in and of itself is is unhealthy, is the house that the mitochondria live in is unhealthy?

We know that left alone muscle strength declines by 1.5% per year from the ages of 50 to 60. I think that it's more. But again, just looking at the literature between 50 and 60 years old, you're losing 1.5% of your strength per year.

And then, as you mentioned, over the age of 70, 75, an individual lose 3% per year. Okay. And when we think about that, that actually coincides with an increase in the rise of diabetes, cardiovascular disease, Alzheimer's disease.

And I always frame it as these are diseases of skeletal muscle, but you've provided an opportunity to say why?

Why are these diseases that over 80% of individuals over a certain age are getting?

And it's because of the health of skeletal muscle. I often talk about it as it relates to muscle mass and strength and its metabolic impact. But on a cellular level, what is it?

And it's it's mitochondria. So hopefully that kind of lays out the foundation of the potentiality of what can happen. And then when an individual is not moving, that skeletal muscle that we can think of as a suitcase becomes overpacked and it's really this decrease in flux of energy utilization, whether it's doing resistance, exercise or, you know, as it relates to mitochondrial health.

So I did my fellowship at WashU Washington University in Saint Louis and Hallisay the guy, it was like the godfather of exercise and mitochondria, ill health.

I mean, he was 80 at the time. He was still there. And he, I think in the sixties began to publish published this research about cellular health, mitochondrial health and exercise.

So anyway, that kind of gives the big picture and lays a bit of a foundation as to what happens and hints to what can we actually do to prevent it. You mentioned this word flux.

Can you define what that is? Yeah, this idea of flux is that when skeletal muscle, when individuals become sedentary, there's glycogen glycogen, which is a storage form of carbohydrates, fatty acids.

So skeletal muscle uses a lot of fatty acids, fatty acid metabolism. One primary site is skeletal muscle. Glucose utilization is in part largely done by skeletal muscle.

Flux is the ebb and flow of these substrates, the ebb and flow of the fatty acid metabolism and the ebb and flow of moving that glycogen out. Right. You just don't you know, if you think about it, if you have, I don't know, an item and you leave it around for a long period of time, dust accumulates on it, you know, and then like things stack up, it looks as if you're constantly dusting it, you're dusting it off.

And that's essentially through exercise, through resistance exercise is through walking, even, you know, walking and doing some type of endurance training.

And then, of course, you layer on hit high intensity interval training and sprint interval training. It increases the flux. The skeletal muscle must use these substrates.

And that is one of the keys to overall health. If we believe the paradigm that skeletal muscle is this organ of longevity and obesity is a consequence of unhealthy muscle.

And ultimately all the other things that we're seeing are really they're anchored in skeletal muscle. It's the only thing that we can leverage. I mean, are can you go exercise your liver?

Don't say drinking is right. You can't you can't you cannot exercise your liver. Can you exercise your heart? Yes. But you have ball and you couldn't sit here.

I mean, you're kind of a very in tune person. You might be able to sit here and raise your heart rate, 100, 250 beats per minute. But I can't do that. The majority of people can't.

But I can pick something up and do a bicep curl. I can go and run, you know, do a sprint around the block, not effectively. And I look ridiculous, but I can still do it.

The skeletal muscle is this organ system that we it is the only organ system that we have direct control over. And that becomes critical to understanding if we want to improve skeletal muscle energetics and we want to improve mitochondrial energetics, how do we get ahead of these cellular changes that we've been fed happen with aging?

And it's not true. If you look at some of bright good pastors work and the original work biology and we stand on the shoulders of giants and we look at the evidence, we know that we can impact in a positive way through nutrition, through exercise, through even supplementation.

There are some very interesting nutraceuticals that are very good evidence, which is incredible. One is something called Urolift in a which I've been very interested in and looking in the research about ways in which we can come in to affect that mitochondrial biogenesis, that the health of the mitochondria.

Yeah. Yeah. Beautifully explained. There is an exercise physiologist named Inigo Sound Milan. I'm sure you've probably heard of him and he studies in his lab metabolic health and he studies athletes of various kinds and particular focus on endurance athletes.

And he also studies what he terms are the opposite end of the spectrum of metabolic health, which are obese diabetics, people with metabolic syndrome.

And he has found in his lab that there is about a 400% difference in the number of mitochondria in the mitochondrial capacity between athletes and people with metabolic syndrome.

You literally have four times the 400% bigger engine in the cells of your skeletal muscle if you're an athlete compared to a person with an overweight person with diabetes or metabolic syndrome.

So, you know, again, Ferrari engine versus moped engine, this is not a small difference. It's not five or 10% difference, it's 400% difference. And there's you made me think of this because you mentioned the word flux.

And there's actually a couple layers that I want to go go into this with you on. But one thing that he found that's interesting is this this weird paradox where both people who with metabolic syndrome and the endurance athletes but.

Actually where you're going. Interestingly not the general population of sort of, you know, the typical average person who's not an athlete and is not very overweight and with metabolic syndrome, that doesn't apply to them.

But both of the extremes, the endurance athlete and the overweight people, have large fat drop deposits in their cells, in their muscle cells. And and so this was this sort of it seemed to them a weird paradox that the athletes would have the fat droplets, the same as the overweight person.

But they found that the difference is flux. The difference is, though. So you since you know where I'm going with it, you describe it. Yeah. I'm not surprised at how well-read you are on this topic.

And what you're describing is this. It's called exactly what you're saying, the athletes paradox. There's all different ways in which fat can be stored in skeletal muscle.

There's intermediate cellular that there's intramuscular fat, there's internal, you know, fat tissue. It can be in the tissue, around the tissue, all in all the different places.

And one of the things that's so important to understand is, is fat is a good fuel source. And those endurance athletes rely on the fuel source above and beyond glycogen, muscle, glycogen, which, by the way, is is one way in which muscles get energy.

It is not actually directly available in the bloodstream. People will say, well, you know, my muscles will help stabilize my blood sugar. Well, it doesn't directly.

And these amino acids have to go to the or these substrates have to go to the liver to then help maintain blood sugar. But they the flux is what keeps these athletes healthy.

Right. They they have designed their body. And, you know, as we think about mitochondria on muscle, it's

adaptable, which is very interesting. It's adaptable.

And the fat droplets within muscle are adapted for the athlete to be able to execute any span of endurance type activities. And it is healthy because of the flux.

It's not just sitting there. It's not just sitting there, you know, with sedentary behavior, with decreased flux, comes increase in reactive oxygen species, increase in these what's called die or glycerol cells, increase in these ceramides.

These are byproducts that build up. And you know, there's a whole bunch.

Flux, fat infiltration, and metabolic syndrome

And listen, if you were to go on PubMed, you were to Google mitochondrial dysfunction, you'll see probably a thousand different theories and a thousand different reasons.

Why is it, you know, endoplasmic reticulum, stress is a decrease in nadir is it a decreasing good if I on you name it and the reason I point that out is it really highlights the complexity of the scientific literature out there.

And what we can do is, is we can simplify it in a way that we understand that the body is adaptable and we can train our muscles directly and subsequently train our mitochondria.

And it's probably the biggest mover that we have individuals with metabolic syndrome. And when I think about for the listener what they would do and they would say, well, how do I know if I have metabolic syndrome?

It's a collection of symptoms or not symptoms. It's a collect a collection of signs and some of those signs would be looking at blood work and seeing an increase in triglyceride levels or an increase in fasting glucose and an increase in fasting insulin and potentially elevated levels of body fat and hypertension, these kinds of things.

So if you have those things, you can say that on some in some area, on some degree, your mitochondria is likely not healthy. Certainly your muscle is not healthy.

And again, it's not a black or white picture. It's just like flux happens and doesn't that this spectrum of change is not linear and this spectrum of change is what we call the catabolic crisis of aging, which we can, of course discuss if you want.

So when we are doing activities like endurance type activities and high intensity interval training and getting out, moving and let's say, I would say 3 to 4 days a week, someone should be involved in resistance type activities that really pushes their body.

It's not you know, I'm not calling Ari on the phone, doing a bicep curl and not fatiguing my muscle because again, we can't say, okay, mitochondrial turnover, but I can say, well, I'm going to work hard enough so that my muscles are fatigued over the week.

If we break it down into a week and then doing some kind of high intensity interval training and some kind of longer endurance to improve that flux. So this was a long winded way of saying that there is a paradox of what we see.

If someone were to look in the literature that, yes, it is a fuel source for those that are highly active and it is something that is deadly for individuals over a lifetime.

And the difference is that the fat that's in the muscles of those athletes is moving constantly all the time. It's all the times it's there. The fat that's there is temporarily there before, only for a few hours before it gets used up, whereas the fat in the overweight people is just stuck there producing all these toxic byproducts.

Exactly. Exactly. And and what are these toxic byproducts? That leverage and what do they do? Well, again, if we

believe muscle is this organ of longevity and muscle is the home to mitochondria and we know that as it relates to glucose disposal, utilizing of glucose from the diet, it has to go to muscle.

And if that muscle is already overpacked, we're going to start seeing increase in blood sugar, we're going to start seeing an increase in triglycerides.

We're going to see an increase in fasting levels of insulin so we can directly see the impact from skeletal muscle as the primary site of our metabolism.

Essentially. So another thing that came out of my my listening to the work of of Inigo son Milan this exercise physiologist researcher that I mentioned, he said something that struck me in a in a really in a bad way, which was he said that when he tests the metabolic health of athletes who just lift weights and do high intensity interval training, that they don't have nearly as ideal metabolic health as the ones who are endurance athletes.

And as someone who had just spent at that time 20 plus years only doing resistance exercise in high intensity interval training and not doing any endurance training.

I went, Well, damn, that really. Sucks. So, but, but the thing is for you. There's I have since dramatically upped my endurance activity because of that. But what's interesting about this is, is I just want to impose like kind of the the cultural narrative, the dominant narratives, popular narratives within the evidence based fitness nutrition movements.

For the last 20 plus years, it was very focused on, hey, you know, endurance training is kind of a waste of time. It's silly cardio. It's it's not really effective for fat loss.

It's kind of worthless. If you want to waste your time doing that stuff, that's fine. But it's not really needed. What you really need to do is lift weights and control your diet to look good.

And now, you know, you have this this very smart exercise physiologist saying, actually, it's it's pretty important to overall metabolic health. So I'm wondering if you you have any thoughts on that.

And maybe like me, you've. Maybe. Changed your your relationship with endurance exercise. I love that you're bringing this up. It's interesting the narrative swing, right?

Initially, it's Jane Fonda. Let's just do cardio. You got to get a great bandanna and amazing leg warmers and that's all you need to do. Yeah. And for the longest time, that was what everybody did.

I mean, you and I were not doing that. But you understand the picture. Everyone was eating the food guy pyramid and doing lots of cardio and no weights.

And now over the last I don't know what would you say, but maybe the last ten years or so, maybe not quite that long. It's been don't do any zone to cardio, don't do any endurance training.

All of that is an absolute waste of time, which is not the case at all. And that's not what the evidence would suggest, especially as it relates to mitochondrial health resistance.

Exercise, high intensity interval training is great for flux utilization, it's great for strength and hypertrophy. But as it relates to overall mitochondrial health, mitochondrial health and say VO2 max, which is the amount, you know, is a way in which individuals are measuring output, right?

Like this respiratory quotient. And this output is all about endurance training. Endurance training is a critical component of overall health and wellness.

And actually the combination of endurance training with resistance is key. And, you know, it's interesting, if you go back and you look into the literature in, you know, the majority of literature when it talks about input into input and

outcome in about and around mitochondrial health, it's all about endurance training. Hmm.

So you are absolutely correct in saying it's super important. In fact, my husband just ran the Boston Marathon speaking of endurance training. So and this was a, you know, a former Navy SEAL who is, you know, kind of like a tank ish dude who for him, it was always about weight training.

And as we all think about longevity and what is it going to take to not just have longevity, but also to have an energy for increase in energy and a decrease in fatigue?

We have to think about endurance training. And I'm curious as to how much endurance training you're doing nowadays. You know, I started actually riding a bike.

I started using a friction trainer, set up a bike with a friction trainer and then measuring my heart rate. I started measuring my heart rate for the first time so that I could be in zone two.

And do you know, 45 minute sessions on the bike? But the problem was right now I'm doing so much. I'm doing so much surfing almost every morning for two plus hours.

So rough and gory. And I started playing tennis and I'm doing jujitsu and I'm doing capoeira, that thing. I then I realized I'm doing so much endurance and high intensity interval training, plus I'm doing weight training like four days a week.

So I realized I just don't have the bandwidth to fit in the dedicate gated zone to sessions. So I'm doing many, many hours, sometimes three or 4 hours a day, of a combination of endurance and high intensity interval training.

But it's not perfectly zoned too. But I just don't have the bandwidth to fit in extra zone to work beyond all the stuff I'm doing. And I figure, you know, I probably got it covered at this point.

Yes, very active. Very active. I think you bring up a good point. I mean, you know, when we think about the current recommendation and what do we know, we know that 24, only 24% of adults are meeting the daily activity requirements, 24% are meeting both exercise aerobic activity and resistance training, 24% of adults.

That's insane. Why is that? I think part of it is cultural. Part of it is time. And then the question is, is knowing what to do, there is a lot of distraction that happens when individuals are distracted, then they don't execute.

So what can we do to mitigate some distraction and execute in a way that is meaningful? And to me, if the current recommendation is 150 minutes of moderate to vigorous activity a week plus two days of resistance, resistance type training, you're doing way more than that.

So you've met your needs, right? And I would say I probably get that per day. Not per week. Which is incredible. And if we know that that baseline recommendations, which is the minimum to prevent and eliminate active disease process, that, you know, you're probably right on the money.

And I would encourage everybody to do something where their heart rate goes up a bit over a period of time. It doesn't have to be something crazy. Even if it's speed walking, you're still getting some kind of activity.

It doesn't have to be this running a marathon or running, you know, long distances, but doing some kind of endurance type activity which could easily be also riding a bike everyday, 30 minutes to 30 minutes a day.

You can do what do you. What do you do personally for for endurance? Well, right now, for me, I am adding in one longer endurance session, a zone two session a week, and that's 45 minutes on a Saturday or Sunday.

And that's I've had to really work to do that because my normal proclivity would be to do some kind of resistance training, which Ari and I, you and I have been friends for many years.

You know exactly how I train. I do some kind of resistance and I'll do some kind of high intensity interval. But I won't be spending long times doing these endurance type training.

Endurance training versus resistance training

But because of the literature, it's so serendipitous that I've also been thinking about and reading. I have added in that one day, as well as starting to add to other days where I'm just doing so, we have an airline bike and instead of doing all out sprints, just doing a pacing, you know, maybe it's 120 beats per minute.

Nothing crazy where I can have a nice conversation. So awesome. Yeah, awesome. Yeah. The airline bike to do all out is is pure torture. You got to recharge a serious masochist to do without intervals on that thing.

Yes. All which I think is really, really, really critical. But what I love about what you're saying is that it's all free, right? These are free ways in which people can move the needle if they understand the science.

And they're motivated by the idea that people often think about fatigue as, I'm not sleeping well enough, or maybe I eat too big of a meal and all of those things are true, right?

But what about doing that activity that truly moves the needle? I'll give you an example. So an individual could sleep all they want, like sleep great and eat well.

And if they are not moving and if they are not actively recruiting skeletal muscle and focusing on what they need to do for strength, resilience, mobility, mitochondrial health, they'll still feel terrible.

They'll still feel tired. Yeah. Don't care if you were eating perfectly and laying out have you gone on vacation where you've totally relaxed and you're, you know, in Costa Rica on the beach doing nothing?

The more you do nothing, the more tired you get, even if you're sleeping, getting massaged and eating well. So I think that the way that the body is designed is we have these homeostatic processes which homeostasis is really just being in balance and the homeostatic processes which we normally go to is how do we influence the things that are easy?

It's easy to eat well. And people argue with me now. It is. I mean, I think so. It's easy to get sleep, even if you're not disciplined. To do it doesn't mean that it's a difficult thing.

Right. You know, we're not talking about, you know, the barrier to entry is, for example, I just came back from Special Operations Week in Florida, flew home.

I could have easily gone to bed at an appropriate time because I had to wake up at frigging five in the morning to go train. But I did it right. I woke up at five to go train, but I didn't do the easy thing, which is get sleep right?

Then difficult thing is actually leveraging the physicality to be working hard enough and putting the effort into actually move the needle. The hard thing actually is exercise.

So especially as it relates to if you were to think about the body, the body is designed for challenge. Nothing is more powerful than exercise, no medication.

And the reason is, is because exercising skeletal muscle not only impacts the mitochondria, but exercising skeletal muscle secretes these meio kinds, which is which.

There are peptides that travel throughout the body, that interface with the immune system. We know that as individuals have a healthy skeletal muscle, they also have a healthier immune system.

So skeletal muscle, leveraging this house of the mitochondria does everything else. So challenges the homeostatic balance and and that challenges is what's necessary.

So in the same vein of the example that you gave of sitting on the beach doing nothing and that not being energizing, it is also the case that if you, you know, provide more fuel to your mitochondria, like your mitochondria depend on mostly carbs and fats for fuel.

And if you say, hey, maybe the reason I'm not energetic enough is my mitochondria don't have enough fuel, maybe I'll provide more carbs and fats. And of course, that not only doesn't energize you, it actually is the opposite.

When you have a chronic excess of those fuels, it's actually toxic to your mitochondria. So to your point, the body likes balance and I would add the body likes flux.

Going back to the earlier point, the body likes to be in movement with these ebbs and flows, with things flowing through it. It likes to be in movement with nutrients flowing in and out, not in a static state.

Where. We talk in the body stuff. We have to because that static state would essentially be a disease state. You know, if you know, I know that your community is very astute and they're very interested in the research and you do such a good job at providing that.

If they go back and they look at the literature, they will see populations of people defined as healthy, sedentary individuals. I would argue that that in and of itself is a disease model.

It's a disease model. And as we begin to think, what does health mean? It does go back to muscle. It does go back to mitochondria, because these are the things that we can leverage and especially from a nutritional aspect, excess calories, regardless of where you're getting it, is very challenging.

It's very challenging if you are not utilizing it and you know, whether it's in the form of carbohydrates or fats, protein is very difficult to store as energy.

But a fatty protein meal would be challenging for the body. Right. Because now you're you're talking about it over consumption of calories and those kinds of things.

But lean proteins alone, those amino acids are very difficult to store. So if we were to think about how would one eat for mitochondrial health, there's the bigger input, which is movement and exercise.

If I were to say that's probably 75% of the equation, but 24% of people are doing it yet 100% of people are, 100% of people are eating. So how do we get the low hanging fruit, which is really nutrition?

How do we get the thing right? That 1% of people are doing? And we have to think about how do we fuel for mitochondria and how do we fuel for mitochondria is how we fuel for muscle health.

And I've often talked about dietary protein to help maintain muscle health and this is very suiting for the conversation of mitochondria because inactivity and as we age again, could you overcome the, quote, aging process through activity?

You could. And the evidence you quoted is there aging is not a thing that happens. Is it potentially a you know, are there normal things that potentially could happen? Yes.

Do we know what a amazing, healthy 80 year old looks like now? That's probably 1% of the population as it relates to nutrition. There are certain things and I say this cautiously, because I've always talked about this concept of anabolic resistance.

And anabolic resistance is the inefficiency of skeletal muscle to sense dietary protein. And why is that important? And just to take a step back to lay the foundation for the listener is skeletal muscle as an organ system is a nutrient sensing system and it's exquisitely sensitive to dietary protein in particular amino acids.

And one of the things in the literature that we see that happens with the, quote, aging population, which now I have

to rethink the way in which I speak about it, is the aging population is that we see a decreased ability for skeletal muscle to recognize these amino acids.

The efficiency of utilization goes down and this is called anabolic resistance. So we've seen people that we love that are older get sarcopenia and and small.

And, you know, that's often why people come to the clinic because they say, oh, my gosh, I don't want to age like my parents age. But this idea of antibiotic resistance can be overcome by dosing dietary protein correctly.

And I've always talked about this even distribution of dietary protein. And, you know, what does that mean? I often recommend one gram per pound ideal body weight for dietary protein as it relates to muscle health, which then relates to mitochondrial health.

People will say, well, what's my ideal body weight? I will say, I have no idea. Ari doesn't know his ideal body weight and I don't know my ideal body weight, but I could say I'm £110.

I'm happy with that weight. I'm what a very low body fat percentage because that's just the place that I live. I'm good with 110 grams of protein. So if you know where you are happy, you can say it's one gram per pound of your ideal body weight.

Make up that number the last time you felt amazing. You do that now. For the longest time I've said, okay, well you need to have 30 grams, a minimum of 30 grams of protein per meal to get enough of that those amino acids to hit this mechanism within skeletal muscle to create this muscle protein.

So I'm sure the listener home is going. What is she talking about? Well, 30 grams of protein, that would be four ounces of a steak or four ounces of chicken.

That would be the minimum requirement to stimulate this tissue.

Daily activity, recovery, and exercise as medicine

Well, turns out, you know, that it's actually the first meal in the last meal that are most critical for overcoming this anabolic resistance, which simply means you are improving the efficiency of dietary protein to be recognized by skeletal muscle, to protect skeletal muscle.

Again, you're eating dietary protein because skeletal muscle is made up of protein. You have to eat that to lay down to do tissue turnover. We turn over 250 grams of proteins a day.

We're only eating 100 grams and maybe a bigger person is 350 grams of protein. So that for, you know, if someone is thinking and listening and they want a tangible takeaway in their thinking, well, how do I protect my mitochondria?

By protecting my skeletal muscle and I would say that first and last meal of the day is most important and your protein target can be between if you really want to get crazy with it, 40 and 50 grams of dietary protein, which, you know, would equal a five ounce or six ounce protein serving or some kind of protein shake with the person last meal.

You will protect your tissue. And it's probably worth pointing out to people that our body it's not this protein intake isn't just important for sort of building muscle, but a huge portion of our body is made of proteins.

Yeah, nearly all. Nearly all of it. Exactly right. Exactly right. Including much of what goes on in it over time. Will. Including much of what's in mitochondria as well?

Yes, absolutely. And when you eat with a protein forward perspective in mind, you support skeletal muscle and subsequently support mitochondrial health.

And by really keeping calories in check, we know obviously gaining weight, decreasing blocks, excess calories really become toxic to just the overall metabolism and, mitochondria in and of itself.

Right. Because you are now increasing free fatty acids and you're increasing glucose and all these things that really destroy mitochondria. So how do we design a diet that optimizes for mitochondrial health?

And the way that you design a diet that that optimizes for mitochondrial health is really two twofold from my perspective. Number one, the foundation and that foundation is dietary protein and dosing that correctly, quite simply, 40 to 50 grams, probably closer to 50.

If everyone was thinking about doing it at that first and last meal, I don't really care about that middle meal. And it allows individuals to eat within a restricted window, which is very big for people.

You know, there's a lot of talk about autophagy and there's many ways to get there, which is really this body's renewal process. But I don't care about that middle meal.

And the reason I don't care about that middle meal is because the mechanisms of the input of the amino acids are still going. And I think that this this might be a part to conversation, but quite simply, the middle meal doesn't matter that that middle meal does not likely need to meet a threshold.

It's interesting that you say that. I've never heard somebody say that before. And I've noticed through my own self experimentation and partly this results from being living in a warm climate like I do in Costa Rica.

During the time that I'm year of year that I'm here, I eat less. And there's some research suggesting that when you're in a hotter climate, it tends to reduce appetite, which is what I found.

I get super lean, super easily when I eat too, when I combine, you know, sort of doing a lot of exercise. I'm very, very active here. And I combine that with eating two meals a day.

And I really I don't focus on eating a third meal in the middle of the day. I just focus on my first meal, maybe it comes after surfing, I get home at ten or something like that, 1030, and then I eat a second meal at 630.

I can get super lean like that within a couple of weeks of doing that. I can lose, you know, multiple percentages of body fat doing that. And and I find actually that if I incorporate a third meal in the middle of the day, it doesn't really do anything significant as far as muscle mass.

But it does seem to prevent me from losing body fat. Isn't isn't that amazing? You're already doing you know, you're very tuned in and you're actually by mistake or by design doing the things that we've now started to teach and move forward for practitioners, which is exactly that.

I just gave a lecture at Obesity Medicine and we about this everyone's thinking about and you know, for the longest time it was all about this even distribution.

Well, it's kind of about the even distribution in in some regards, protect skeletal muscle. But do we need that middle meal? You don't. And there's only two ways to stimulate muscle, exercise and diet.

You're already hitting that balance. Yeah, I would encourage everybody to try what you were doing and what you're talking about, those two big meals and then spacing it within an 8 to 9 hour window.

I would suggest everybody try that. I want to. All have like 60 or 70 grams of protein in each meal. I would love to point out something people were going to sit will say, well, are you can only absorb X, Y and z 30 grams of protein. That's not true.

So are you are utilizing all of that protein from a muscle perspective at about 55 grams, you're probably no longer gaining muscle benefits, but you're gaining benefits from everything else.

All those other tissues that you talked about, which include liver, gut, skin, all the other tissues, all the other hormones, all the other cellular processes are now getting benefit.

So once something caps out for skeletal muscle, we're not. The reason I talk about eating for skeletal muscle is because that's our foundation, but we need all of it.

So now to the second part of how do we eat for mitochondrial health? I like to think about phytonutrients and I like to think about, you know, antioxidant capacity.

And I'll throw in there gut microbiome, which is this compound you're with an A. So when I think about what are some things in the evidence that we know can improve mitophagy and I would encourage everybody to go back and look at these the literature on your within a it is a post biotic and 30 to 40% of individuals don't even make it.

And so basically we think about your life in a there are these ellagic tannins that they come from pomegranates and other kinds of foods that are high polyphenol foods and the gut microbiome.

Convert it to your olefin, but not everybody can convert it, which is so fascinating. And you're probably thinking, Well, why do I care about your within A?

Because in the literature there are multiple there's 20 years of data that would support its impact on Mitophagy, which is the capacity of the body to regenerate and renew mitochondria.

It's incredible. I'm taking it Shayne's taking it, and I think it's going to be the next biggest thing after fish oil. You know how fish oil came out in these omega threes and we were seeing all of it's a fact, you know, some very good evidence that improves strength and it improves endurance and VO2 max things that are incredible.

So I think that combining dietary protein, understanding that there's a phytonutrient component, which would be reds and greens, and if individuals are not interested in eating high volume, which I'm not, that you can do a red or green powder.

Right? That's easy. Again, how are you going to eat your fiber? One should consider that. And then this post biotic addition which would be your and a another supplement that I think is valuable is is good advice on whether you're eating it or getting a shot.

I think there's evidence to support utilization of kind of that triad. This is this is a big thing I've been debating for the last few minutes in my head whether we should open this up.

But I think it's important. I know it's something you could talk about for 2 hours. So you might not know the answer, but I might not know. You do, because we've talked about it in person before.

Protein timing, nutrition, and mitochondrial support

So the you know, the world is filled with lots of competing dietary cults, dietary religions, dietary ideologies, and they really are like cults, unfortunately.

And there's also a lot of shady stuff that goes on, a lot of cherry picking to support particular dietary narratives where an ignoring of evidence that that conflicts with that and a lot of people wanting, you know, strong financial incentives for people to have the next big secret diet.

Hey, everybody else is stupid, you know, Kito and Paleo and veganism and they all got it wrong and really this is the greatest new thing. So we've now got, you know, virtually every I think everything other than water has been demonized at this point. And the we have everything from that that the carnivore people who are convinced that broccoli and lentils and blueberries are trying to kill us and the vegan people who are convinced that your protein recommendations are deadly.

Right. So let's let's just speak to to that component. This idea that high protein consumption is harmful to health is going to lead to increases in mTOR, is going to promote IGF one and cancer.

Just summarize kind of the latest thinking on that. Well, the first thing that I would want everyone to think critically about is what is actually considered high protein.

What number would that be? We know that high protein is what in the literature is not defined. But we do know that the bare minimum to prevent deficiencies is 0.8 grams per cu, so point eight grams per K. G..

I don't know what that comes out to be. A pound, I don't know. You're good at math, but we eight grams per cage is a minimum to prevent deficiencies. Saying around 0.4.

Point four grams per pound is the bare minimum to prevent a deficiency would a high protein diet. And that's so basically how that set up. It's two standard deviations between what would be deficient, right?

So it's two standard deviations above of what would be considered deficient. So if we were to if that's the bare minimum and we were to double that number and we would get 1.6 grams per CG, would that be considered a high protein diet?

No, that would be considered from a definition standpoint. If we double the minimum, then that's moderate. So we now double them. So or now we know that 1.6 grams per CG may be more in line with optimal health, yet people would say, well then that would be considered high protein.

It's not high protein would likely be considered above 2.2 grams per K. J.. Right. Or one gram of protein per pound for four. Yeah. So that would be considered more of a high protein diet in terms of evidence to support dietary protein.

Every study out there would suggest that if you look at body composition changes and body composition would be a decrease in body fat and the increase in skeletal muscle mass, or at least the maintenance of lean body mass, which I wish we had more time, we would talk about that.

But Lean body mass is all tissues outside of adipose tissue that every single one of those studies people do better above the RDA, above the minimum. And in fact they've landed on the general recommendation is between 1.2 to 1.6 grams per CG.

Okay. So this is now in a more optimal range. So if someone were to say, okay, what is the issue with a higher protein diet, I would say, well you're now at 1.6 grams per CG.

Is it really that much higher? Not not terribly. And at what point do we see any detrimental effects in the literature? And we've never seen detrimental effects even above 3.3 to 3.4 grams per.

Now, I'm not saying people should eat that, but if we were really to say what is the evidence support and the evidence doesn't support any known issue with a high protein diet.

And people need to take a step back and realize that the way in which these recommendations and these definitions came out were really to prevent bare minimum disease states.

So there is no evidence to support that. And in fact, the lower your protein intake towards the RDA, the more animal based products that you need because you have to be able to overcome, you know, you have to be able to compensate for the nutritional value, meaning you have to be able to reach your bioavailable zinc B12.

You know, B multiple kinds of B vitamins, iron. So the lower an individual's protein intake is, the more it should actually be high quality sources, animal based sources.

If an individual is choosing to just eat a plant based diet, they're going to require more total calories if they're eating

whole foods and a higher amount of dietary protein, which goes against if protein is bad, you're now needing to consume higher amount of protein above and beyond that minimum amount of point eight grams per CAG.

Just to cover the amino acid need. And again, it's kind of complex, but just to simply understand, there's no evidence to support that a quote, high protein diet is detrimental.

In fact, it's used for modalities for individuals that have to undergo surgery. It's used for individuals that have to undergo healing. A higher protein diet is used for those who have been injured or burned.

There's a whole in in the academic arena, there is a whole host of reasons why a higher protein diet is better. Okay, so there's that piece. Then there was this whole big thing about red meat and cancer, which has largely been retracted.

And then the Annals of Internal Medicine examined this body of literature. The lead individual was named Johnston. And for those of people that are not aware, Annals of Internal Medicine is like the Super Bowl of journals.

There were multiple, multiple studies done with multiple individuals for checks and balances. They had no investment into outcome. There were vegans, there were vegetarians.

They all examined this evidence. It was run through a process called the grade process in which evidence is evaluated. And they found no high quality evidence in with the addition of Red meat not processed but whole red meat and cancer.

Yet it's pervasive in. I'll just leave them with one more thing is that people will say, well, you should reduce red meat because you should reduce cholesterol, you should reduce your eggs because of cholesterol.

That cholesterol recommendation was taken out of the dietary guidelines in 2015. We don't have a cholesterol recommendation if something is repeated over and over, enough people believe it to be true and they don't.

And these myths die hard. Yeah. So. Yeah, 100%. Dr. Lyon, are there any I mean, I could talk to you for another 5 hours, but we're we're pretty much at the end of our time here.

Is there any final words that you want to leave people with, or do you want to maybe provide a quick summary of sort of your key recommendations that you've gone over here?

Yes, certainly. So number one muscle is the organ of longevity, and it is your only organ system that you can directly impact. The way in which you are going to do it is the obvious physical exercise and nutrition as it when it comes to physical exercise, resistance exercise is key.

Also endurance type exercise and just sprinkle in one day of doing something that you really don't want to, whether it's high intensity interval training that could be different for everybody.

But really doing the difficult thing is exercise. 24% of the population are meeting the recommendations now moving to dietary interventions for healthy mitochondrial and mitochondrial health and muscle health.

100% of people are eating in order to leverage food for muscle mitochondrial health.

Protein myths, red meat, and closing recommendations

I like to intertwine them because, again, skeletal muscle is the the home of mitochondria for the most part is optimized for dietary protein separate into the first and the last meal.

As your primary targets, the middle meal, I don't really care really thinking about that. I strongly recommend high quality proteins because of the nutrient density, especially when you're keeping calories controlled.

Right. You don't need a ton of calories, but you do need a ton of quality. And then sprinkling the adjunct things on. Like if you have a beautiful home and now you're going to add drapes, you'll add in some kind of phytonutrient, whether it's a red or green powder or even a purple powder.

And my favorite might be pure or you're within in a this compound and potentially, you know, if you wanted to get crazy with it, you could even also add in omega threes.

But thinking about those things, so it's the exercise piece of the recommendation, it's the dietary piece of the recommendation. And I will say leaving individuals without confusion do not be distracted.

There are core fundamental principles that are evidence based that you can execute on. It doesn't have to be confusing. Remember that confusion is a distraction and as you age, the window of time in which you can get better closes and that's intense to think about yet true.

So do not be distracted by the shiny objects. Focus on evidence based information and move that needle forward. And may I recommend two resources? Please try and tell people where they can.

They can learn more from you and follow your work. So I had a TEDTalk come out recently where I explain muscle as the organ of longevity and really as a as a key component.

Maybe you would be so generous to link it. They can find it in your TEDTalk. I have a book coming out called Forever Strong, where it takes these core fundamental principles and it breaks it out into very easy pathways.

And there are pages and pages and pages of high quality references there, so that if individuals are interested in evidence based information I have I done what I feel is a very good job in doing that and providing that people can find me on Instagram.

Dr. Gabrielle Lyon My YouTube, my podcast. I'm hoping, Ari, you will come on my podcast. Love is Gabrielle Lyon Show. We have a great newsletter and we're going to be doing 30 GS, which is recipes, weekly recipes, which is going to be cool.

Nice, awesome. When is when is your book come out? October 17th. Okay. It's available for preorder right now. And what took two years and two babies to do that is awesome.

Dr. Lyon, thank you so much for coming on, sharing your brilliance. I really appreciate it. It's always amazing to chat with you and to everybody listening.

You know, you should feel very blessed to to get this information because, you know, this was an hour talk. But the the methods that she's outlined, she's given you very explicit advice on practical things to do each day and each week.

And implementing this advice versus not implementing it literally can add years and decades to your life and certainly massively increase your health span the length of time that you have a functional brain and body.

And this is not an exaggeration. When I say decades, I mean this this advice may be the difference between dying at age 63 from a heart attack versus living to age 93, you know, in pretty good health.

So it like the tools that she's given you here are truly foundational to good health, to great energy, and to a long life and a long health span. So I hope you will implement it.

Thank you so much, Dr. Lyon, as always, I look forward to our next conversation. Saying thank you so much for having me.