Introduction to nutrition dogma

So welcome, Dr. Chris Masterjohn, such a pleasure to have you. Thank you for having me. It's great to be here. Yeah. So first of all, I feel like nutrition has become a topic that is almost inaccessible at this point to to to speak on this topic of nutrition to the masses.

You're almost guaranteed to anger a whole segment or multiple segments of people because there's so many dietary ideologues out there, there's so much nutritional dogma.

And we have everything, as you know, from the vegan camps that say all animal foods are horribly bad for you to be the carnivore camp where they want you to eat nothing but meat.

And they think that, you know, broccoli and and Kirkman are out to get you. So can you just speak some maybe some some general words about your sort of where you land on the spectrum of nutritional dogmas and what your take is more broadly on optimal human nutrition?

I try to make everyone a little bit angry, but not angry enough to hit me. And then I and then I hope that it all evens out. But, you know, putt putt, putt putt another way.

I believe that, you know, there are some basic rules that you could rules of thumb that you could make for what a good diet is. So, for example, I think most people in most of these camps could probably agree that we should ditch the white flour and white sugar, you know, but but even even the best rules of thumb have some exceptions to them where you can imagine scenarios where someone does something that would seem obviously good and has some negative consequence to it.

So, for example, with ditching the white flour, you can have someone whose diet would otherwise be deficient in folate. And even though the folic acid fortifying the flour was not anywhere near the ideal form of that vitamin, it might have been the thing that's preventing them from getting a deficiency.

And so if they switch from white flour to whole grains, they're not getting any folate in the whole grains for the most part, certainly not enough. And if they switch to frozen vegetables, the vegetables might have been in the freezer so long before they even purchased them that all the folate was destroyed.

And so they are worse off by what would seem like an obvious rule of thumb that we created for them, that all of us would agree could make them healthier.

But then beyond that, you know, after you get from you know, after you make these rules of thumb, I think everything after that is is really keeping in mind what I would say are two overarching principles.

Mitochondria and energy metabolism basics

One is that your needs are not necessarily my needs and my needs are not necessarily your needs because you and me are different. And then also my needs right now might not be what they were 20 years ago, and they might not be what they will be in 20 years, because all of our needs change over time.

And so I think that you have to have a very fluid mental framework where you you know, if you find something that works, you do want to stick to it, but you don't want to stick to it to the point of an ideology.

You want to be open minded to the fact that your needs might change and and you want to be you want to be aware of that. We got it. So going into mitochondria, since this is the mitochondria summit, I feel like within the natural health, within the functional medicine community, the story around nutrition and for mitochondria has really

been sort of myopically reduced down to supplement with acetyl l-carnitine and also the black acid and de ribose and PKU and CoQ10 and B vitamins.

And that's that's pretty much how we support our mitochondria. Can you can you give us a broad overview of how you see optimal nutrition for your mitochondria?

Sure. So first of all, I kind of think of mitochondria in this context as a code word for energy metabolism, because when I think about why are mitochondria important at kind of the sort of pop science Internet level?

Mitochondria are the powerhouse of the cell. And, you know, why do we care about them? Because that's what's producing all our energy in the form of ATP or most of it, you know.

But it it if you are trying. And then the second thing would be if you relate it back to the basic laws of physics, I would say that nothing is more important to to life than the ability to defy the imperative of the second law of thermodynamics that that any closed system will add to further and further entropy unless you invest sufficient energy to overcome that.

And so if you think of any process in the body, not just the differences between health and disease, but even just all the variations of health or all the variations of disease, how healthy are you or how sick are you?

All of those will be fundamentally determined by the amount of energy that you can make. Even, you know, you can have a mitochondrial disorder where that is the primary problem, you know.

But on the other hand, you could get a screwdriver stuck in your eye and the immediate response to that is you want to safely, as safely as possible, and secondarily to that, as pain, painlessly as possible, however possible that may be, get the screwdriver out of your eye.

But in the aftermath of that, your body's going to try to heal. And one of the critical determinants of how you heal from a physical injury is just how rapidly can you replace the all the injured tissue with healthy new tissue and to the degree you can't do that rapidly enough, you're going to get irreversible or, you know, pseudo irreversible scar tissue laid down that is going to lead to a much worse aftermath of that.

So even if you take and I use that as something that's extremely unrelated to the mitochondria in terms of the causation, right? The causation is you got a screwdriver stuck in your eye that came from somewhere else.

But even in that case, how much energy that you can make to support the creation of healthy tissue rapidly is the determinant of the consequent, the potentially lifelong or at least long term consequences of that injury.

Now, as a result of that central importance of energy, then I would say, well, the mitochondria are the powerhouse of the cell, but we shouldn't lose sight of the fact that some of the energy metabolism happens outside the mitochondria.

So, you know, the breakdown of glucose for energy to feed the basic products down into the mitochondria happens outside of it. The creatine is centrally important to shuttling energy from the mitochondria to the rest of the cell.

So I would think of all the different things about mitochondrial health in a basket together with that energy metabolism that happens to be the adjunct of mitochondrial metabolism.

And so just broadly thinking about about energy metabolism on I would say, you know, look, there are you are looking at I guess three categories of things.

So you need to think about how your how you are physiologically regulating meaning on a whole body level, what's going on that is telling all the individual mitochondria within the cells what they should be doing.

And that's governed in large part by the brain's perception or the brain's executive control, taking signals from many

different parts of the body about what's coming in, what's going out, what are the needs in the current environment, and how much energy can you afford to spend?

Because if your brain decides that you're in a state of scarcity, then it doesn't really matter whether you have a healthy mitochondria or a genetic defect in your mitochondria or a nutrient deficiency in your mitochondria.

Your brain is executive disordered. Executive Lee decided that all the mitochondria are going to slow down and so chief among these chief among these signals that the brain is going to use are signals about short term energy.

Long term energy and the demands of the environment. And that's basically simple. You could simplify it into leptin made by your adipose tissue as a signal of long term energy stores.

Insulin from your meal is a signal of short term energy stores and cortisol and the related hormones in the fight or flight response is a signal of the stresses that will demand energy.

And if those if a healthy body composition and a good macronutrient composition of your diet and good management of psychosocial, financial, etc. stress are all put together.

Then the brain is going to be in, okay, let's invest energy in long term health. Let's invest energy in how we feel right now. Let's invest energy and fertility and everything else will flow from that, providing that you have what you need to support the infrastructure of your energy metabolism.

That's where you get into the basic how what does the cell need to do to make energy? And that's where you get into all of the b-vitamins, all of the electrolytes, iron, copper, sulfur, etc.

that are all micronutrients that factor into that. And of course, if the brain is deciding you have enough energy, it's probably because you have a good mix of incoming macronutrients.

And so that's the whole suite of nutrition. But then on top of that, I think there's a lot of individual tailoring to do on the basis that there are over 1400 inborn errors of metabolism, which are genetic defects in some area of metabolism.

And the most common among them, although you could you could broadly group them into several groups, mitochondria mitochondrial impairments are the largest of those groups.

So we're talking about hundreds of different and this is this drives me nuts when people say they have a mitochondrial disorder as if it's a diagnosis of something.

Low-hanging fruit: body composition and exercise

There are hundreds of mitochondrial disorders that are each on their own, individually rare or as a diagnosable disorder, but collectively having some impairment of that, that might not even lead to a diagnosable disorder, but might may impact your nutritional needs and may impact your quality of life is actually very common.

It's probably more common than not to have carrier status for at least a couple of these. And I would say and so you can have carrier status that might not be impacting your life because just the way your metabolism breaks even works out for you.

But I would say that among people who have health problems that are difficult to resolve, especially anything related to fatigue and neurological dysfunction, are not limited to that, but especially those probably have some collection of 1 to 3 or 430 to 50% impairments in some enzyme, and that may be completely treatable with a megadoses of a certain vitamin or something like that.

But in one person it may be that they need to megadoses thiamin in another person. It might be that they need megadoses riboflavin and in another person.

It may be that they need to be on a keto diet and in another person it may be that they need to be on his low fat diet as possible. And so you can't make generalizable rules that everyone needs to supplement with X.

And just to give you an example, I'm working with a client right now who has gotten seizures every time this person tried to supplement with carnitine.

So you can put in general rules that may on average, you know, as a rule of thumb like it may be, that the highest probability things that you can do when you have fatigue is to take this cocktail of five things, you know.

But my perspective is, look, everyone should always go for the low hanging fruit first and then, you know, start taking a crack at the deeper, more idiosyncratic things when you run it, when you hit a wall.

But everyone should be conscious that they're probably going to hit a wall at some point with whatever they're doing where the you know, it's just sort of like in the way that a, you can kind of like give a workout program to anyone who's sedentary.

They will probably take them from 0 to 1 in the gym. But but someone who's, you know, who's a professional, whatever type of athlete who wants to, you know, beat when the next event should probably be consulting with someone who's expert in how to get them from 9.9 to 9.99 or something like that.

And so I think it's very similar with, you know, overcoming fatigue or something like that. There's some basics that you should do. And if those were great, great, you know, chill out and enjoy it, you know, but when you hit a wall, you need to realize that there's a lot of idiosyncratic things about each one of us where we need to start looking deeper underneath the hood and figuring out what to do next.

So let's start with the low hanging fruit, because I think you tell me if you think I'm wrong, but I think with your client base, you might have in a misrepresented sample from the general population, meaning I know your work very well just for people listening, I, I feel I've been friends with and followed Doctor Master John for many, many years.

I've seen all of his work over jeez, probably seven, ten years at this point. And he's going to attract a certain clientele who is very knowledgeable, very health conscious, doing a lot of the basic stuff and is looking to his expertize to refine and tweak things when all the low hanging fruit doesn't work.

But I think when we look at the broader population, over 80% of the chronic disease burden are diseases of nutrition and lifestyle. We have a massive epidemic of the vast majority of the population that has really no idea how to eat well, or even if they do have an idea how to eat well, they're not actually implementing the those that that that knowledge.

And so most people, in other words, are not eating a good diet. So with that in mind, what do you think some of the key low hanging fruit items are as far as nutrition for optimizing energy metabolism and cellular energy production?

I think there are some obvious low hanging fruits and then there are some not obvious low hanging fruit. So I think the obvious low hanging fruit that anyone could could put forward would be optimizing body composition, not eating crap.

You know, so as I as I started out with, if I didn't go into the details of what I meant in the interactions between leptin and insulin and cortisol, for example, if you are, you can be underweight.

And so you can that can signal scarcity. But if you are over your personal fat threshold, then the extra adipose tissue that you're carrying at some point flips into being a liability because the it creates a sense of stress about how to healthily carry all the extra weight.

So if you look at something like fertility, where you have this very obvious, um, you know, fertility is, is very obviously something that the body wants to manage according to energy because getting pregnant requires the investment of enormous amounts of energy, the lactation after pregnancy and the same.

And then on top of that, to to some degree, we must have programed in ourselves wanting to bring children into a collective situation of abundance during development. For the years that follow.

And if you look at body composition versus fertility, you see that underweight people are relatively infertile and overweight people are are relatively infertile.

And so there's a U-shaped curve with fertility where distribution of body fat in a healthy range produces fertility and everything else produces in fertility.

And I think that you would I think you would see that broadly across other diseases as well. And including certainly energy like not it not well. I think that I think that if.

Subjectivity levels you would expect. Oh. Yes, right. So well, underweight and overweight people, too. Both have low energy issues or fatigue issues. Sure.

Because, you know, I'm using fertility as as kind of like the objective end point of the calculation, which ultimately is, do I have enough energy to spend?

Right. And so I think if the if the brain is calculating that there is a state of scarcity or, you know, and that scarcity can be driven by psychological stress, which is signaling that energy demand is high and we don't know what's coming next.

We don't know what we're going to have to deal with tomorrow. And in the overweight state, I think what's happening is just like job stress or, um, you know, marriage stress, that extra adipose tissue is also a stress on the body.

What am I going to do with this? How am I going to handle this and manage it? And, um, and as a result of the brain making that decision, all the energy investments are going to decline.

And you'll see that in some objective things like your skin health, or you'll also see that in subjective things like Do I feel good today? You got it.

Okay, so body composition is a big one eating. Oh, so that's an obvious one, an unbiased one I think would be, um, I would, I would look toward the work of Indigo Son Milan on zone two cardio training.

Yeah. Where I think what you know, what that says is that mitochondrial health is the best type of exercise to support your mitochondrial health is basic li uh, steady state cardio at sessions of at least a half hour if not an hour.

At least a couple of times, if not four times a week. Where you are basically at subjectively, you're at the threshold of feeling like it's a little bit difficult to talk.

And if you were talking on the phone to someone, they could tell by how you're breathing, that your exercising, but nevertheless, you can carry on a conversation.

And I think that is that is sort of like consistent with like stereotypical eighties jogger type exercise and is completely contradictory to everything that's gone on in Paleo and CrossFit and the, you know, all the all the modern health culture, I think is that's just yeah.

I. Think that that would be a less obvious low hanging fruit. Yeah, I made your I read your your one of your articles that you put on your email newsletter regarding illegal somnolence work and, and that was actually what clued me into going and listening to some of his podcast that are out there.

So thank you for that. You were the one that actually sort of clued me in to that, but I think you and I made the same mistake on that for in my case, for like 20 some years of really just doing wake up.

And yeah, yeah. Weight training and high intensity interval training and thinking, you know, and I was, I was a personal trainer for many years teaching people, hey, cardio is kind of a waste of time.

Like it's not really useful for changing your body composition, you know, high intensity interval training and weight training. That combination is going to be much, much better combined with good nutrition for fat loss like cardio is mostly just a waste.

And I did that for maybe 25 years. And then to hear an ego sound, Milan, say, Hey, when, you know, when we test different kinds of athletes in our lab, we and we also test very overweight diabetics, people with metabolic syndrome.

What we see is that on one end of the spectrum are the endurance athletes with the most optimal metabolic health. And then on the other end is the the people with metabolic syndrome.

And he said, when we test athletes and this is the part that that hit me hard when we test athletes, you only do weight training and high intensity interval training.

Fasting, feeding windows, and blood sugar

You know, they have some of the signs of of insulin resistance and not so great metabolic health. And I was also the sentence that perked my ears. Right.

And I went, damn, I've been working my butt off for 20 some years to be this super fit, healthy guy. And I'm I've totally missed the boat on. I've been not only missed the boat, but I've been totally wrong in my beliefs and assumptions about this form of exercise.

So I completely agree with you on that. And I've actually been doing zone two. I have a little stationary bike with a fluid trainer set up outside my office.

Okay, so looping back into nutrition, let's say we've got body composition. I want to talk more about this other piece, this sort of individualization piece.

We'll come back to that later. But we've got body composition. What about what do you think of feeding and fasting windows and the interplay of nutrition and circadian rhythm?

And what do you think of nutrition as it pertains to blood sugar regulation? And that to two different questions, but I'll let you answer you want first.

I think from my perspective, you didn't put off the individualization for light for later because I think the fasting feeding cycle is something that should be very individualized.

Um, I, you know, I think that, um, in as a broad rule of thumb, I think that everyone should go through a fasting feeding cycle and most people aren't so. You know, zoom food at all times a day, 24 hours a day.

Right. So so this is sort of like a broadly applicable rule of thumb until you get to the question of, well, does that mean that you eat three square meals a day and no snacking, or does that mean that you eat one meal a day?

Or does that mean that you eat two meals a day on most days, but twice a week or you do one meal a day? Or does that mean that you do three to a three day fast each quarter or what?

And I think I think all those questions are things that need to be very individualized. And I also think that people's fasting tolerance can be impaired for different reasons, and one of those might just be not fasting.

Um, but I think some people are going to get, their health is going to get worth worse with too much fasting and too much fasting for one person might be what's just right for someone else.

And so I'm extremely agnostic on how far someone should go. But I but I am very much on board with everyone needs to do some form of a fasting feeding cycle.

We got it. And do you have any rule of thumb as far as the ranges someone might experiment with or what context? My my rule of are you. Yeah. My overweight, sedentary person versus a fit athlete, for example.

Well, I think generally people who are more overweight can usually tolerate fasting more, although it depends. I mean, some people are some people are overweight because their blood sugar is constantly crashing and they're constantly trying to fix it.

But, you know, I think most people will find that the that that they fast more easily when they have like I don't know about obesity, but when they have, you know, if you've you'll probably find personally that when you have five extra pounds, it's a little bit easier for you to go without food than when you don't when you have when you've lost five, £5 more than you should have or something like that.

Um, but I mean, my general rule is that you shouldn't feel hangry and you shouldn't and you shouldn't be obviously unhealthy. So if you're developing peripheral neuropathy when you're fasting, then you shouldn't be doing it.

But also, if you just feel like crap when you're fasting, I think you should, you know, ease into it, do a level of fasting that feels natural to you and and doesn't feel like you're fighting some kind of grand battle with Satan.

But having said that, yeah, is there is somewhat of an adaptation period, you know, in the initial phases, whenever you're deviating from whatever your norms are, there's going to be some.

Yeah, that's true. And I feel like what you said needs to be balanced with maybe the expectation that, hey, if you're if you're currently doing something that is not a very healthy pattern of eating, you can expect to experience some degree of discomfort for a week or two as you transition towards a healthier pattern.

I think that's fair. Yeah, but probably could also be minimized by doing it and baby steps rather than one big jump. Right? Yeah, I agree with that. Okay.

So in blood sugar sounds, that was your other question. Yeah, but that sounds kind of broad. I mean, I guess I guess are we talking about people who are measuring their blood sugar at home or are we what's the what's the context of this?

Yeah, I mean, the proportion of people who are actively measuring blood sugar are either going to be diabetics or people who are health geeks who are just into wearing CGM.

But there is a would you agree that there's a large portion of the population that does have difficulty managing blood sugar levels and that might experience chronically high fasting blood sugar and a tendency towards maybe reactive hypoglycemia after eating meals.

And that this generally goes with poor metabolic health and insulin resistance. Um, well, I think it's, I mean, I think we can, I think no one can dispute that there's a large proportion of people that have elevated fasting glucose.

Those are the people that are classified as pre-diabetic. And there's a enormous number of them. Right. I know that from the data. Um, I, I don't, I'm very opposed to anyone assuming anything about their blood sugar based on how they feel.

I actually think that there's millions of people out there who think that they when they feel like crap between their meals and they eat, it's because their blood sugar is low and they it goes away.

It's because their blood sugar is low. And I think that they're probably prob they're probably many of them and possibly most of them are wrong. What do you think is a better explanation for that subjective?

Well, I think some of those people are getting hypoglycemic, but I actually I'm not sure that I've ever talked to anyone and I don't have a good enough sample size.

I didn't actually try to pull people on this, but anyone that I've ever talked to who thought that they were getting low blood sugar between their meals, they got better with eating wasn't when they actually measured it.

But most people don't measure it. And so, for example, I remember talking to one person who was, you know, thought every time that she was thought she was getting high but low blood sugar, she started testing and her blood sugar was high and concluded that she must have had a high cortisol response to the do you know, to perhaps to the low blood sugar or whatever, you know.

But I I've recently done a very extensive metabolic testing on myself. And one of the things that surprised me was that I had a very distinct idea of what feeling hypoglycemic felt like, which I connected to what it feels like when I haven't eaten enough and is fixed by eating.

And under no circumstances was I ever hypoglycemic under those conditions. And so I'm not saying that my case generalizes to other people, but I found through very extensive testing that my blood sugar has absolutely nothing to do with what I feel like in any circumstance.

So do you think that. Those subjective states of what you previously assumed was hypoglycemia are more mediated by changes in neurotransmitters and hormones that are created?

I think no, I, no, I think it's a low energy state below ATP. Okay. But it is not caused by low lack of blood sugar caused by just anything in particular.

Or you just feel that sort of a generalized symptom of a low was. Caused by, um, caused caused by not look there only the only reason that your blood sugar ever dictates whether how you feel is because you used glucose to make ATP.

You know. So when you feel like crap because your glucose is low, it's not because your glucose is low, it's because your glucose is low and you don't have enough ketones to make up for it.

You know? So like if you have someone who's got no ketones in their blood, sugar is 50, they're, you know, they have a pretty reasonable chance of having a seizure from it.

But if you have someone who's like exceedingly keto adapted and they're and their ketones are 5 to 10 million molar in their blood and their glucose is 50, they're going to have no problem at all.

And so all these things are the the main thing is, is, does, is your brain getting enough energy? Um, and, you know, you, there are many things that like modify that in a normal person.

So whether you're on a keto diet or whether you have medium chain triglyceride oil on your salad or on your pasta or whatever, all these things are going to dictate ultimately, like how much energy is getting the brain that's going to have a big impact on you, how you feel.

But it's just it's it's it's not always it's not always glucose at all. You got it. Are you are you familiar with the distinction between reactive hypoglycemia and idiopathic postprandial syndrome?

So like in, in the context of somebody who is getting very noticeable, very consistent symptoms after eating a meal where they get low energy 30 minutes or 60 minutes after eating maybe 90 minutes after eating, do you have you have you looked into that that literature of the literature around that?

I read about it in your book. I haven't I haven't chased down the references on it. But I think that and I'm aware of the hormonal hypothesis as you outlined it.

Um, but I, I have a very strong suspicion that those are people with impairments in mitochondrial energy metabolism who are producing toxic metabolic intermediates from their food.

Reactive hypoglycemia and post-meal fatigue

Interesting. Okay. Yeah, the the literature is far from settled. I'd say, like, I don't think that there's any sort of scientific consensus, but there of the literature, the little literature that does exist, as you said, that the best the best hypothesis, I think that scientists have come up with is the idea that, okay, blood sugar levels are maintained in the normal range, but it takes this exaggerated surge of adrenaline and glucagon and all these things to to to maintain blood sugar levels in that range.

And then you experience this anxiety and shakiness, jitteriness, fatigue as a as a consequence of sort of these exaggerated concentrations of stress hormones.

But that's that's an interesting hypothesis. I yeah. I mean, anybody promoting that well. In my in my particular case, in my metabolic experience experiments of last year, I was trying to understand why I had the precise opposite problem, which is that when I'm under eating and when I'm fasting, I have, you know, neurological consequences of that.

And I always feel great regardless of what I've eaten after I eat. So what makes me feel the best is a meal made from nutritious food. But if I if I just do a glucose tolerance test on myself, I feel much better than when I was fasting.

And if I add protein to it, it's sort of like glucose will provide a third of feeling good. Glucose plus protein provides two thirds of feeling good and needing a real meal is the real deal.

Um, and I, and so I measured my, my cortisol over a very extended fasting period in order to investigate whether there was a hormonal component to it.

I was looking at my salivary cortisol and it was just totally normal the whole time. And I'm not I don't look all these all these things are not mutually exclusive.

And in fact, if you have a metabolic problem and of course, we're here to talk about mitochondria, right. So, you know, cortisol and adrenaline are physiological and endocrinology and chronological.

But the mitochondrial angle of that is that if you're if your mitochondria can't produce ATP efficiently from the food that you're eating because one or more biochemical pathways inside the mitochondria is impaired, whether it's due to a nutrient deficiency, a toxic overload or a genetic impairment or some combination thereof, which, like I said before, I think is common rather than rare.

Um, then of course you can have a stress response to the, to the fact that you're producing toxic byproducts instead of ATP from your food. But I just think that the, you know, consistently feeling like crap after eating is a very strong sign that you're producing toxic components from your food and having having a similar response to fasting is a very strong sign that you have an impaired ability to maintain normal ATP levels without food.

And I and I think that those, um, I think those are two sides of the same coin that are primarily mitochondrial and origin rather than physiological. Um, but I also, I mean, my particular bias is to not give the primacy to hormones under any circumstances ever, because all hormones ever do, they're never in charge of anything.

And all they are doing is communicating what's going on in one tissue with another tissue. And that that means that biochemistry always trumps physiology.

Um, even if you have something like a congenital hyperinsulinemia, you can it sounds like you have a primary defect in an insulin secretion, but actually if you go look at what causes it, what you have is a primary defect in the biochemistry of the pancreatic beta cell.

So the insulin is not the problem. Insulin is a consequence of the biochemical problem. And even if you have like a tumor on a, on your pituitary and it's over secreting something because of the physical pressure, still a lot of hormonal problem at its root, it's the tumor, right?

Like what? It's whatever. Cause the tumor is the root cause there, you know? So what is like what's insulin or adrenaline doing? It's it's communicating between one tissue.

How even if you so consider this even at a biochemical level even insulin in a pancreatic beta cell is not even a response to glucose. It is a response to the ATP made from glucose.

And so if you have a defect in your and again, when I say defect, it could be from any cause, it could be you're missing a vitamin, whatever. If you have a defect in your ability to make ATP from glucose in the pancreatic beta cell, you're going to have a deficient insulin response relative to the glucose coming in because your pancreatic beta cell doesn't care how much glucose is there.

It cares about the ATP that's made from it. Um, and so I, you know, my, my gut feeling is that even if you, even if you had a black and white case that all these hormones are dysregulated in the idiosyncratic postprandial syndrome state.

And keep in mind it's called a sorry idiopathic. Keep in mind it's called idiopathic and it's called syndrome because no one knows what is going on. But you know, even you have an airtight case that those hormonal disturbances are there.

I would just say why why are there some hormonal disturbances there? Because that's unanswered. Like, oh, your your cortisol. So the why the hell is your cortisol?

Do the regulator do anything? Because there's an underlying biochemistry that happened inside whatever cell release that cortisol or in whatever cell release something that went over to that cell and told it to release cortisol.

There's there's something underlying at the level of the cell. And if it's energy metabolism, you know, 95% chance at the level of the mitochondria that is causing that the.

Okay. So so going back to this idea of toxic metabolite is being produced after eating what would be and I know this could probably be a super lengthy answer but could you give maybe one or two make.

It short or. Long. I'm an examples of scenarios where that might occur. Yeah. Um, so one example, I mean, very broadly speaking, one example would be whenever you eat protein, you, you can't handle the ammonia load on.

And so you, you have increased circulating ammonia, which is going to cause central nervous system to depression and fatigue. And if it's I think if it's if it's bad, you'll probably smell at least your breath will probably smell like ammonia.

But if it's, you know, it can be not bad enough to do that and still bad enough to give you fatigue. Another, another example would be, um, well, I mean, lactate is not a, a, a poison, but you will have acid base imbalance and you have deficient ATP and some other consequences if when you eat your lactate goes through the roof.

Um, but then also in, in any breakdown product, I would just say very broadly, if you're break, if you're breaking down fatty acids for energy or you're breaking down amino acids for energy, you have a string of, you know, 6 to 12 reactions that are taking place and you're trying to get to the end product that you can fully combust for energy.

But if you get stuck in the middle, all of those things are are toxic in many ways. And we could talk for hours about why they're toxic, but we can just leave it at that and say that, generally speaking, when you don't finish breaking something down fully for energy and you get halfway, you wind up with toxic intermediates as a result of that.

You just you just reminded me of something when you mentioned acid acids and bases, something that I feel is

almost never talked about. And it has this really interesting controversy around it, which is the idea of eating an acidic versus an alkaline diet.

And sort of there's a surface level conversation that I've noticed around this, which is certain components, certain people in the general public and certain diet book authors have promoted the idea that generalizing that animal foods are generally acidic or processed foods are generally acidic, and that sort of unprocessed plant foods, particularly fruits and vegetables, are very alkaline rising.

And therefore we alkalis our body by consuming more of those foods and avoiding the acidic foods. And then there are people in evidence base circles, self-proclaimed evidence base circles who yeah, as you call them, evidence based Internet trolls.

That's right. Who have said no, that's a bunch of pseudoscience. All you natural health hippie types have got this all wrong. And actually the body maintains page very precisely.

Acid-base balance and urine pH

No matter what you eat. And they will cite data to support that view. And they believe that the case, they rest their case. The idea of the acidic and alkaline stuff has been debunked.

But what's interesting is actually there is this body of literature that most of those evidence based Internet trolls don't seem to be aware of around something called potential renal acid load.

And there are a number of studies where they've shown that sort of reconciling these two views that foods do seem to have an acidic or alkaline effect on the body.

But the body also has buffering mechanisms to maintain page in a very narrow range despite what we eat, but what we eat also taxes the buffering system in a particular way that can lead to consequences.

I've actually been exploring the research on how this actually interplays with how we breathe and how we offload. And there's an interplay of nutrition and breathing habits as well.

But I'm curious if you've looked into that area of sort of acidic versus alkaline foods and if you, you know, sort of what your conclusions are about that.

Yeah, I, um, I don't, I don't even I'm not even, I'm not sure how to be polite about this, but the, the, the exhibits have no idea what. They're talking about there's no.

Evidence based Internet trolls for people. That's right. Yeah, that's right. Oh, I forgot that you gave the long version, but not the short. Yeah, no. One of the textbooks on back on the shelf there is is a renal physiology text book that's that actually it's on the, it's on the clinical acid based balance disorders.

And it's there's no there's no controversy over the fact in physiology or any of the literature that you have acid base buffering systems and you have taxations on that by what you eat and that you have compensations that have health effects.

And so, you know, the fact that your blood is going to always be in a narrow range is itself kind of like wild the irrelevant. So you can have, you know, that that that's just testimony to the fact that you can have like exceedingly small changes in blood with, you know, disastrous consequences.

And that's why it's maintained so tightly. So even blood is not constant enough to have no consequences of changing blood. It's just that you're never met.

You're not measuring it when you measure your urine or your saliva, you're measuring your urine or your saliva. And so you can but also, I mean, even your urine is it's not even only an inference about what might have been

happening to make it change.

It's also a primary determinant of your risk of kidney stones. So, for example, when your urine is alkaline, you're much more likely to have calcium phosphate stones.

And when it's too acidic, you're much more likely to have calcium oxalate stones. And most kidney stones are calcium oxalate stones. And so most kidney stones are influenced by most people's urine being too acidic.

And, you know. Yes, that doesn't mean their blood was 5.5, but what the hell does that have to do with anything? No one said that it's the urine being 5.5 is a major risk for calcium oxalate stones, you know, but on top of that, as you were saying, you can have you can have you have compensations that are driving the blood age to stay relatively stable.

And those include what you're urinating out and those include how you're breathing, but they also include your metabolism of energy. So it's it's totally non-controversial in exercise physiology.

It is controversial, like whether production of lactate is like correlates with DOMS and stuff like that. Delayed onset muscle soreness like that stuff is very controversial, but it's not controversial that that acidity shuts down glycolysis.

So, you know, it's very well worked out at a biochemical level that acidity shuts down glycolysis. And the reason that you export lactate from your cell when you make lactate under conditions of intense enough exercise to generate lactate is because your energy metabolism will shut down and you will not be able to sustain the exercise if you don't export the lactate.

And if you look at a biochemistry textbook, you may be misled into thinking what you usually do with it is automatically send it out into the blood, to go to the liver, to be converted back to glucose, to come back to the muscle, to be turned into lactate again.

But what an ego, Sam, a lot has pointed out is that generally in, for example, zone to cardio training, what you're mainly doing with the lactate is just spilling it out into the nearby cells such as like the fast twitch fibers, muscle fibers will generate lactate and then feed it to the slow twitch muscle fibers.

And so if you're lactate going up in your blood, that's generally the excess above what the slow twitch fibers can consume. And one of your aims in zone two cardio training, one of the adaptations is to have to need to do more and more intense exercise to generate to get yourself into zone two based on your lactate level.

And the reason that you're adapting is because you're slow twitch fibers are becoming generally better and better at consuming lactate. But the point that I want to bring that back to is if you're relying on glycolysis to get ATP and acidity shuts down your glycolysis, then what's going to happen?

What's going to happen to your subjective sense of energy is going to shut down because the one means that you had to generate ATP is now off. And so if you're look, you know, so even at that level, it of course, is going to have implications for how you feel, whether you can handle the acid acid base load.

So trends of some of what you said is going to be over the head of of people who maybe don't have that strong of a nutrition background or physiology background.

It's bring it down then. Can you can you translate what you just said into maybe a simple rule of thumb around how people should think about the acid versus alkalinity load of of the foods they're eating?

I think I think the simple the simple thing that's actually actionable. I mean, I think you can break it down to a level of simplicity. I think is is not useful.

But I think the most simple, useful thing that you can take out of it is that if you measure your urine with you with strips or with a meter, if you don't want to make a big investment, strips are real cheap.

So 5.5 to 8 strips usually should be good enough unless you're yearns to ascetic. And generally what you should see is that the urine post-meal should be pretty consistently 6.4 to 6.8.

And if it's not, you can probably change something about how you're eating or how you're supplementing. That can improve how you feel. And, and, and I think if you're not measuring your urine page, I think it's pretty hard to make it useful.

I mean, you could you could generally say that you want to do well. So like generally foods that are high in potassium are high in organic acids that are alkaline and are and are good balances of the sulfur amino acids in animal foods that generate the acidity.

And so I have Chris M. D. on Page Decon. If you go to tools in the menu, I actually have some databases on that have like the protein to potassium ratio of different foods and some recommendations on that.

But I guess the most I guess the most simple actionable thing would be that you should balance your protein with potassium rich foods and that, you know, generally speaking, not because not because of the potassium, but because the food potassium content is is very tightly correlated with the other things in the food that are alcohol and icing.

And so generally brought, you know, to make broad strokes, uh, fruits and vegetables are generally high in potassium tubers and legumes are generally high in potassium.

Grains are generally a poor source of potassium, but refined grains are extremely poor source of potassium, and the lean portions of animal foods are generally good sources of potassium.

But cooking makes you lose the potassium in the juices. So for example, meat that is cooked in a pan and you throw away the juice, you lose 50% of the potassium, you know, so that if you wanted to if you wanted to be very potassium deficient, you could eat like a burger on a bun.

Um, that would. That would be horrible. Your dog. That was potassium deficiency. Yeah, yeah. Yeah. Whereas, you know, whereas if you made, if you made like a meat stew with lots of vegetables, you would that would probably be very good source of potassium.

You got it. Okay. I have before we wrap up, I have two things I want to talk to you about. And I know you're resistant to creating rules of thumb. You like that?

I can make it rules of thumb. I'll. I'll just insist on breaking it down. That's okay. All right. Okay. So two things are macros and then and macros. So if you have any general thoughts on sort of ideal macro ranges that people should experiment with or any maybe common mistakes in terms of macro nutrients that you think might lead to fatigue.

Or I think the most I think common mistake macronutrients is you just express protein as a percent of calories instead of grams. But but I guess at a very simple level, if you make your plate a third of it, protein food, a third of it, a diverse group of vegetables and a third of it like a diverse types of starch.

And when I say diverse, I don't mean like different types of white bread, but, you know, the crop across more high calorie, starchy vegetables, you know, potatoes, legumes, carrots, things like that.

That'll probably be pretty good for a macro range to put it in a little bit less, uh, a little bit less simple mode, I would say. You want to hit a half a gram to a gram of protein per pound of ideal body weight, severe overweight or underweight?

Look, use what you should weigh. If you weigh yourself in kilograms, cut that in to weight. Whatever one £1 is 2.2 kilograms. So just adjust it. Correct. The and then I think carbs and fat is very individualized.

Macronutrient balance and protein concerns

I think, you know, if you're not measuring stuff at home, you should just play around with the card fat ratio until you find something that works for you and feels good if you are, you know, if you've got your CGM plugged in, it's continuous glucose monitor you want to avoid spikes of.

But I would say you want to avoid consistent spikes of above 140 milligrams per deciliter in your blood sugar, you know. But for the people that are not geeking out, I think just the just, you know, third protein, third, third, low calorie vegetable.

Third, high calorie vegetable is is a good rule of thumb. Do you do you think that there is a segment of people who are maybe into fitness and building muscle, who are consuming too much protein and therefore maybe suffering the consequences that you alluded to earlier of the excess ammonia?

Well, there's eight or 9% of the population has a single nucleotide polymorphism in the urea cycle, which is the metabolic pathway that helps you get rid of the ammonia from the protein in your food. And I think that they you know, they might they would be prime candidates for having a problem with with too much protein, whether they don't feel good after it or they don't smell good after it or they don't or they well, I guess those would be the two big problems.

I've heard. A. Report, particularly when they go into the sauna, they notice a very strong ammonia smell. Yep. And I assume you think that's related maybe to to this issue of either too much protein consumption or too much protein consumption in an individual who is not processing it?

Well. You would probably want to test that against a protein that they eat. Like if they if they smell like ammonia in the sun and no matter what they eat, they might have some kind of skin microbiome problem.

Um, you know, but if it's, you know, on a high protein diet, the ammonia smell comes out in the sauna and on a low protein diet, it doesn't that I think that's that's a urea cycle problem.

Okay. Got it. All right. I want to make sure that we talk about micronutrient micronutrients a little bit. And I know that this is something you could talk about for like 10 hours, but Well, and the people listening, I will say, doctor, Master John is, in my estimation, having studied nutrition and health science for 25 years.

I don't think there's maybe anybody on the planet who knows the biochemistry around nutrition and around vitamins and minerals, as well as doctor John does.

If there is, I have certainly not found that person, but he's extraordinarily knowledgeable in this area. And with that said, and I know that you've already alluded to this vast issue of of individual genetic differences that will lead to maybe issues with one particular vitamin or mineral cofactor.

But are there any generalizations that you might make in this area of vitamins and minerals that are maybe common deficiencies, that relate to mitochondrial energy production, in particular?

Yeah, I don't I don't like making bleak at statements about the commonness of deficiencies because I think that that's highly population dependent and you know, a lot of like the go to place for that would be like and Hain studies the National Health and Nutrition Examination Survey where you're looking at what are the most common nutrient deficiencies in the U. S.

and I think those are highly likely to not be the most common deficiencies in people who listen to health podcasts and go to and go to any type of health summit.

Um, so I think of it more like what are the most common deficiencies on certain particular types of diets? Because generally if someone's listening to me, they're at the point where they've chosen some kind of niche diet, you know.

So to start with, I would say from mitochondrial health and energy metabolism, you're really looking at all of the B vitamins, all of the electrolytes, which is sodium, potassium, calcium, magnesium and bicarbonate and phosphate and phosphorus.

And you are looking at iron, copper and sulfur. Those are the those are the big guys. So if I were to pick out a couple of those that are common nutrient deficiencies on particular types of diets, I would say that, um, I would say molybdenum is needed for proper sulfur metabolism and you are going to wind up with not the right type of sulfur you need for your energy metabolism.

If you are eating a diet that is high in animal protein, does not contain any liver and does not contain legumes. And so I think a lot of people on paleo diets are eating in that way.

And that's not to say that you need to eat legumes, but if you're eating a lot of animal protein and you're not eating liver or legumes, you are very unlikely to be getting enough molybdenum pick.

Another example. I would say that, um, potassium, I think potassium runs low across the board. If people aren't paying attention to it. And I think that's because what people are told about potassium.

Potassium is, is so misleading as to be able to be incomprehensible. So most people who think anything about potassium think that they can get their potassium if they eat billion every day.

And that's that's wild the far from the truth. And there is no source of potassium that you don't need in high volume in order to to get it. And so I think that I think that many people are running and also the potassium requirement is so poorly characterized as well.

So even though I think that someone on, say, a vegan diet or a or a paleo diet is probably less likely to be potassium deficient than someone on a standard American diet.

I still think that there are a lot of people who just aren't getting the volume of some of those foods, especially if they're not conscious of how they can lose it when they're cooking their meats.

Um, people who are on very fat centric keto diets are likely to be deficient in many of those nutrients. And that's just because that can be a good source of certain fat soluble vitamins.

And that's about it. And, you know, if you're if your diet is 80% fat and you are not micromanaging your your micronutrients, there's no way on earth you won't have multiple deficiencies.

And that's you know, that's that's true. Despite the fact that thiamin, for example, is is much more important for burning carbohydrate than it is burning fat, though you can find case of people who develop spontaneous diamond deficiencies on keto diets because they're because they're eating 80% fat and they didn't have they they didn't have enough of anything that was very rich in vitamins, you know. So those are a few examples.

But I, I do, I do think like pick the diet and look at the pattern and pick the nutrient that that's most likely to run deficient and is is much more helpful to most people in the health.

You know, the broad ecosystem of health spheres. Then looking at population data is for that for that purpose. Do you think magnesium is a is a common issue for many people?

Well, I think there's a very large cult around magnesium, and I think that there is also a very large degree of magnesium deficiency. But but what's weird about magnesium is, is that it's the cult has primarily infiltrated the least magnesium deficient people.

So I've just people. I don't I don't mean this I don't mean this to be insulting. Almost every nutrient has a cult around it. So like thiamin has it's just the magnesium cult is way stronger than the thiamin cult.

But there's a thiamin cult where they think everyone needs, you know, everyone's health is falling apart because no one's megadoses 300 milligrams of some obscure type of thiamin.

Which is I wanted to ask. You, this is totally insane, right?

Micronutrients for mitochondrial health

So so look like most, most if you wanted to become magnesium deficient, the best way to do that would be to eat white flour or white sugar meat and make that the base of your diet.

And so and so the, you know, the the the average person, the standard American diet has to be profoundly magnesium deficient because they're literally they're like using the how do I make myself magnesium deficient playbook?

And they're like they're like it's like their cookbook is like they did something copied over the cover and like wrote like what to eat on it. And then like after 30 years, they like peel back the, the thickness but pasted it.

It's really just out of become magnesium deficient and this is like their cookbook, right? Yeah. Or what they used for where they go to navigate the menu at at Starbucks or whatever.

And so yeah, of course these people are magnesium deficient, but even these people are not profoundly magnesium deficient. The reason that, you know this is that at a population level, one of the biggest.

So if you go to a textbook case of magnesium deficiency, one of the things that you see is hypercalcemia as a result of becoming resistant to vitamin D and to parathyroid hormone and to everything in the vitamin D calcium economy.

And and a most people are hypercalcemia. So people are obviously not that that I'm not saying they're not deficient magnesium. I just told you they're all deficient magnesium, but they're not so deficient in magnesium as to be affecting their vitamin D and calcium economy.

The biggest part of that is someone with frank magnesium deficiency that's impacting their calcium metabolism as low beta and broadly speaking, we have and we have endemic levels of osteopenia and osteoporosis driven by high the overwhelming problem with people's bone health is driven by parathyroid hormone being in the top half of the reference range, which is the opposite of what would happen in a frank magnesium deficiency.

But not only that, the way that you become, um, magnesium deficient is just to eat a broad spectrum of unrefined plant foods. And so yeah, I think magnesium is, is probably going to be a nutrient of not even probably is magnesium, is a nutrient of concern on a carnivore diet, but on a on a, on people who are broadly consuming unrefined plant foods in volume, which is not true of some people.

It's very common in vegan, it's very common in paleo, it's very common in in the sort of non carnivore sectors of keto. These people are among the least likely to be magnesium deficient.

But you you even have the the magnesium cult even permeates directly into the center of all of these communities and tells them their vitamin D isn't working because they're not supplementing magnesium.

That's flat out asinine because even the person who's eating McDonald's is not making is not magnesium deficient enough to have low h, which is which is sort of like the central sign of magnesium being so deficient that it's tearing apart your calcium, your vitamin D calcium economy.

So I think that I think that, Meg, it's quite possible that a lot of people watch that. A lot of people could use more magnesium. And it's you know, it is very possible like, look, ATP can't do anything without being an ATP magnesium.

KELLY Whenever you see ATP does something in any textbook or paper, it's a code word for magnesium. ATP. And so, yeah, I mean, it's always possible that if you're fatigued, you'll need more magnesium.

And I think some people, when they're very stressed out or losing a lot of magnesium, so, you know, probably what I said about diet might be mitigated by someone who's under extreme stress.

I remember one time I was under the most stressful period of my life and I was having GI problems and I went in for a sigmoidoscopy, which is kind of like the end of the colonoscopy.

And they gave me a bottle of magnesium citrate to drink, to give myself to push everything out of my bowels. And so I drank it and it didn't move my bowels at all.

And I went in and the doctor wrote on the thing that I didn't drink the magnesium because he didn't get a clean sign of what was going on because there was too much food in there.

And I think what I think what happened was my stress level was so high that I drank the whole bottle of magnesium citrate and absorbed all the magnesium.

So that's that's out there. It's but but what is more out there is, is people telling people inside the inside the sort of like magnesium central hub of the diet sphere, that they're all magnesium deficient and they all need to be taking hundred to 800 milligrams of magnesium.

And I think that's crazy. What do you think's behind the the firemen called now that we're cycle. Every every. We're psychoanalyzing the different dietary proteins that are formed around different micronutrients. It's I think that well first of all, it's much less common than the magnesium carbs.

I but I think it's the same rapidly growing. I see a lot of practitioners now that are really hyped up on. Well it's yeah I mean I, it's, it's a combination of, of, of good PR and also it also that when people get results, they, they start putting their faith in the thing that gets results, right.

So like if you were never, if you're a practitioner and you've given everyone magnesium and the people that you were giving the magnesium like generally weren't that magnesium deficient.

And you were like, well, it helps, but it's not, it's not a cure all. And you didn't know about thiamin. And then someone tells you everyone's got take firemen and you start seeing these miracle cures from from megadoses thiamin, then you're going to, you're going to be like, holy crap, I've gotten the best results I've ever seen in my life using thiamin and, you know, and, and if you get overexcited about it, you're going to give it to everyone and the, the people who felt like they were, you know, at the time in church when they were with you and they tried to thiamin and and they didn't they didn't have a conversion experience.

They probably stopped coming to you for a second appointment. And so you just get selection bias. That's like all my clients, all my patients this year have told me that they're, you know, they they too saw the light.

But I think I think you can do that with with with anything. And it's just it's just yeah. There are some people, like I said this at the beginning, there's there are lots of idiosyncrasies where when someone and someone's wall might be like, you know, oh, I like I went from first place to third place, you know, I went from gold to bronze at the Olympics because I, you know, now I'm 26 and just downhill from here.

And another person's wall might be like, I can get out of bed once a week, but, you know, after I get it, get to the door. I got to go back, you know.

And so but what I'm saying is, like, everyone has a wall that they hit where understanding their idiosyncrasies better is the key to advancing across that wall.

It's just for some people that might be it might be it might be big to everyone personally, but some of that might be

seem trivial or privileged. Like the person who's like, I'm in bronze this year.

Like the person who can't get out of bed is probably the charity tears for them. But nevertheless, I think it's true of both of them that if they want to advance beyond where they hit the wall and the low hanging fruit stop working, they probably do need to understand their idiosyncrasies better.

And there are there are many people for whom high dose thiamin might be overcoming that idiosyncrasy, and many of them may have a chronic health problem that they spent ten years going around doctor shopping in.

And the one who told them to do a TFT form of thiamin at 300 milligrams a day are like, Holy crap, I've never done anything that. That, that had that effect.

And they were just a case of they needed thiamin and they were waiting to be found by someone who would tell them. But that doesn't that doesn't mean, you know to the person who recommends the thiamin, that's the first time they've ever gotten these great results like that.

I think it's a mistake to be like, Oh, everyone needs 300 milligrams of thiamin. That's not that's I assure you that's not the case.

Superfoods and closing remarks

Yeah. Chris, there's so much more I want to talk to you about, but in interest of respecting your time and not doing a two hour long interview, I want to suggest a few topics to wrap up on.

What? Choose one of them. Yeah, right. One of them that I thought to ask you was your thoughts on phytochemicals and their importance in relationship to mitochondrial health, particularly through xeno or medic pathways.

Another one was phospholipids as far as not just cofactors and energy production, but actually there's some research around repairing mitochondrial membranes and things of that nature.

And I have a question that I know you're going to hate, but I'm going to love, which is what are your favorite super foods, if you have any, so you can choose or maybe two of those if you if you want.

And and then Wolf will wrap up with that. I actually love the Super Foods question. So so let me let me take a stab at that. Okay. I think that I think that if you were trying to make a very micronutrient, robust diet, that the addition of one or two ounces of liver per day, one clam, one oyster and a tablespoon of nutritional yeast would be the top superfoods that would really robustly protect you against deficiencies.

And and they would they would do so better in that sort of like little bit each day than they would being more intermittent than that. So like one or two ounces of liver a day would be better, would be that die would be more robust against deficiencies than to eight ounces of liver on Saturday would.

And so I think that type of cocktail would would go a long way towards just meeting basic micronutrient needs for most people. And I like that. Dr. Mouse, John, thank you so much for coming on the summit.

It's been an absolute pleasure. There's 500 questions more I would love to ask you, but I'm really appreciative of giving extra time here and going way over our allotted hour.

And this you are a wealth of knowledge. You're a brilliant guy. And as always, I'm very grateful to know you, to call you a friend and to be able to have these conversations with you. So thank you so much.

It was great to be here. Thank you so much for the opportunity. And finally, can you tell people where they can learn more from you? Get in touch with you.

If people want to work with you, tell them. Tell them where to reach you. Yep. Chris Master. Jon, PhD. That subject come up in the menu, you'll find all the options of what you can learn from me, how to work with me, how to contact me, and so on.

Beautiful. Thank You so much, my friend. Thank you.