

Paleo Solution - 394

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Robb: Hey, folks, welcome back to another edition of the Paleo Solution Podcast. Huge treat for me today. If you want to go geeky on all things human nutrition and metabolism, you are hard -pressed to find a better person to engage with than Chris Masterjohn, PhD.

Chris has just been a luminary in the ancestral health scene for the better part of a decade, perhaps even longer now, I guess. Wrapped up a PhD several years ago in this nutrition related field; Was heading kind of down the tenure track professorship direction and then pulled the rip cord on that and has just gone all in on producing amazing content around nutrition and metabolism.

He's really done a particular deep dive getting beyond protein, carbs, fat and looking at nutritional status. I just learned a ton from Chris. He had a couple of different podcasts, one of them related to iron overload. I got in, started assessing my iron overload potential, started donating blood, felt better, had better recovery. So, just cannot say enough about what Chris has done.

We talked about one of his new offerings, which is a nutritional status cheat sheet. We'll get to that at the end of the podcast. Chris talks a fair amount about ketogenic diets and epilepsy and what we do and don't know and ditch into a ton of other stuff. We get to pull the curtain back a little bit and discover a little bit about his personal life including getting into Brazilian jiu-jitsu and having a passion for strength training. I think you'll really enjoy this one. Chris Masterjohn, PhD.

Chris, what's new?

Chris: Robb, great to be here. Thanks for having me on.

Robb: Hey, man, it's really a huge honor to have you on the show. You have been one of my beacons of hope and sanity in the greater nutrition scene particularly ancestral health. I guess, like you, Stephan Guyenet and then, of course, Mat Lalonde "The Kraken" have always been kind of my primary sounding boards when I get into deep water and I feel like I can't touch bottom and don't really know how to make sense of things. So, just really cannot say thank you enough for all the hard work that you've done for a long, long time now. I was really tickled to see you make the leap from academia into full time change in the world in the kind of online space. Thank you for making that move as well.

Chris: You're welcome. It's an honor to be here and it's -- Yes, sanity is hard to come by in something as complex and as emotional as nutrition. So, it's an honor to be able to provide any, if that's what I'm actually doing.

Robb: It's interesting. I know you've done several podcasts. Here's my fanboy-dom. I have a Google alert with Chris Masterjohn in it.

Chris: Yeah, I got that too.

Robb: I don't have a Google alert for me. So, that's comparatively important.

Chris: You never know what people say.

Robb: I just try to avoid even embracing that. Whenever you hop on a podcast it always goes into my download queue immediately and gets listened to from stem to stern. I know you talked a lot about leaving academia and whatnot and kind of the motivations behind that. I'm curious. You are one of those, in my opinion, rare folks who are able to pull in a lot of synthesis.

You pull from some pretty disparate areas and then make it your main to this topic of metabolism and human nutrition. What do you think it is about you that makes that happen? You seem to have an interest base also that is clearly much broader than just nutrition and metabolism which that's a pretty big pool to dive into on any way that you look at it. But why is it that you feel that you've got this kind of rare ability for synthesis and an interest in other areas besides just human metabolism?

Chris: I have no idea. I mean, that's something that's getting down to the first principles of my personality, I guess. I think at the core I'm a problem solver. In a different life path I could easily have wound up in the tech space doing programming and stuff like that. I mean, if you looked at me -- Like you could easily have predicted a path like that when I was a kid just because of the kinds of things that I was into.

I think that when you're trying to solve problems you're trying to look at things in new ways. When you're trying to look at things in new ways you have to step out of the details to see how does this new idea at the micro level fit into the whole and the macro level? Because if you don't do that, you're not keeping the big perspective.

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And so I think nutrition is something where we know, or really anything in biology, it's something where we know in absolutely astounding amount of detail at the micro level and we're really deficient in the synthesis. If you're looking at that from a problem solving perspective, you're probably going to pay attention to the synthesis.

Actually, I don't know, I mean, maybe the synthetic thing isn't a core part of my personality and really the problem solving space is. I know that when I -- One of the first classes that I had in graduate school was called Concepts in Nutrition. It was two-credit class where we just got our feet wet with the kinds of things that people should care about when they're doing a research career in nutrition.

One of the things that we talked about was that the people who were paying attention to the big picture of nutritional science were noting that deficiency there. They were saying like what we've done is we've gotten each person really, really good at their own expertise and hidden in this little tiny niche where they don't really communicate with other people.

And what we really need to do is have like three levels of engagement that everyone has which is their expertise at the core but then they need to be fluent or competent in this much larger sphere of stuff around them and then they need to be familiar with this enormous sphere of science around them. And then we all need to talk to each other and communicate so that as a collective at least we can synthesize these things.

I came from the background, even before I got into graduate school, I was developing my own hypothesis about nutrition. I kind of got my lead in trying to answer questions about whether things were good or bad. So, one of my early tasks in doing nutrition research was to tackle -- I was very involved in the Weston A. Price space at this time and everyone in that space is taking cod liver oil.

There was Noel Somons who ran the vitamin A fortification program in Guatemala who was saying that cod liver oil has too much vitamin A and it's going to make your bones shrink. This is like an exasperating statement to the Weston A. Price crowd. They're like, "Hey, Chris, can you look into this?" And so I'm like, "Okay. Is vitamin A bad?"

What I wind up uncovering is that there's decades and decades of research, not a lot of it, but just in pieces across the decades hinting at these really important interactions with other vitamins. And so there are studies showing that all -- In fact, all the animal studies showing that if you get too much vitamin A it is bad for your bones are all showing that vitamin D protects against that and that

vitamin D causes other problems like soft tissue calcification and vitamin A protects against that.

I'm like are we narrowing in way too much on one vitamin instead of looking at the way these interact in a system? So, that's my background when I'm coming -- I'm already thinking like this. When I come into graduate school and then I find out that the people in the science are talking about how we don't pay enough attention to how these things interact as a system so if me as a core personality, as a problem solver, is coming to this, I'm saying, "Well, hey, wait. The big thing that's missing is we need to put Humpty Dumpty back together again. So, why don't I find my problem solving niche doing that?"

Robb: That's brilliant. I have a question. I don't want it to be too leading but I'll just kind of spit it out because I'm not sure how to ask a non-leading question with this. I have this kind of sneaky suspicion that if folks want just at least a stab at understanding the world that we live in, if you've got some stepping in evolution, economics and thermodynamics, that you've got at least the beginnings for being able to deconstruct like is this a good idea or a bad idea? What are your thoughts around that?

Chris: I think that's true. I think that--

Robb: I know that's a massive loaded question.

Chris: Yeah. I think the first capitalists were the first self-replicating molecules.

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You didn't really ask this but I'm going to go into it anyway. I think that the concepts of economics and exchange are basically really rooted in biology, the way that you look at -- When cell start -- Well, probably not even cells -- when molecules started replicating the whole concept was you have some resources that you can consume or you can conserve some of those resources to invest in the future.

If you become a self-replicating molecule, you're acting on that economic principle that there are these resources in my environment and I'm going to apportion some of them -- I'm attributing consciousness that isn't here but to anthropomorphize, I'm going to apportion some of these resources into the replication of the information I have to the next generation.

I think that when Darwin was coming up with his version of evolutionary theory that is now basically become the modern foundation, he was studying economics. He was studying Thomas Malthus. He was talking about the

economic principles of food distribution. I think these are very tied together. I don't know, we could probably talk for hours about that but, certainly.

Robb: It's interesting to me. I do an occasional skree, the lab-grown meats and the vertical farming of lettuce and stuff like that are really popular and things like soylent and these are put forward as these sustainable food alternatives and then animal husbandry is painted in a very poor light which a lot of that is true like the CAFO operations have all kinds of knock on consequences that are not well accounted for in a whole ecosystem kind of a holistic economics story.

I find it devilishly hard to get any nuanced conversation around those topics. It's like, okay, this lab grown meat looks kind of cool but where are we going to get the nutrients to grow that stuff and how much energy goes into that? In bringing that stuff up, occasionally folks are like, "Wow, I never really thought about that." There's really this sense that you're just kind of magically grow some meat in the lab and that then we can retire all of our herds of cattle and sheep and whatnot and it's going to be okay.

It's a really, that kind of tech oriented solution is really sexy. It caters to -- I don't want to beat up on them too much but this kind of vegan view of vegan averse and, man, it's sexy, it's kind of intuitive on a kind of non-reflective basis and I found it really hard to get in and engage folks and get them thinking about that. What are your thoughts around that stuff? I know you do a few forays in those topics occasionally too.

Chris: Yeah. I mean, I thought a little bit about it. I don't think I've spent as much probably even a fraction of what you have been thinking about it. I mean, my first impression is that I think a lot of people are thinking about the tech problem as figuring out how to get the meat to grow. The tech problem is really a lot deeper than that because meat animals grow in an ecology.

When you're asking the question where are the nutrients going to come from, where do they come from in the ecology? Well, it starts with minerals in the soil and soil organisms and the organic matter that's produced and the PH balance and all these many, many biological beings that are just getting nutrients into plants in ways that are ideal for the animal that ultimately undergo many metabolic conversions in the animal to get to the place where it's good for us.

I think what you have to do is not simply do the work of getting the animal to grow. You have to do the work of every single layer of that ecology. I don't know the thermodynamics of this. I don't know the energy distribution. It seems to me that there's a lot more work to go through all those steps than might be worth it because if you need to come up with a new way of getting each of those steps

done, that's a lot of work that we have to do that's already being done by the ecology as it's evolved over millions of years.

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Robb: Right. And basically leveraging sunlight.

Chris: That's my first question.

Robb: No, no, no. Again, trying not to ask a leading question on that but it's just one of these fascinating topics that I really am pretty passionate about. Diana Rodgers has really been spearheading this topic with a lot of her work and her passion in this topic. But, man, we definitely have our work cut out for us because at least in talking to people about nutrition we can play this some kind of narcissistic tendencies, I guess.

There's a hope of abs and dating and looking better and everything. You can kind of get an acre there. Whereas when it's interesting, again, within that kind of vegan-vegetarian paradigm, they're able to kind of dovetail this whole thing together. You're going to look good, you're going to feel good, you're going to save the planet. It's a very consistent message that they have.

Whereas in this kind of ethical omnivore kind of story, as what I call it, man, there's so much nuance and it seems counterintuitive because, I mean, meat gives you cancer and fat has all these problems. It's just like quagmire and bear traps layered with snake pitch.

Chris: It's certainly counterintuitive to argue that you're going to kill more animals on a vegan diet. That might be true but you don't have to take any intuitive points when you argue that.

Robb: Yeah, man. Had I had this position during college, my dating would have been more sparse than what it was. It's interesting. Again, I always love confirmation bias when somebody smarter than myself seems to be seeing the world in a similar way. I definitely appreciate that. You spend a lot of time producing just really top tier content both with your podcasting, video blogging. You still do some writing. How did those things -- Which do you enjoy the most and what do you feel like ends up having the greatest impact on folks?

Chris: Well, I'm kind of trying to do everything, audio, video, writing, pictures with captions because I think it just hits different people in different ways. It really depends. I personally would never watch my videos because I don't have time to watch videos. What I might do now that I subscribe to YouTube Red is play them in the background.

The videos that I make are -- There's the Masterclass with Masterjohn videos that are very deep into the science. I make those videos because the slide content, the visual content on the slide is tremendously helpful to being able to understand what I'm talking about. And so I don't usually run those as podcasts. What I started doing was I started running audio cliff notes on the podcast because it didn't make any sense to just take, strip the audio from that because there's just too many details that if you can't visualize them most people aren't going to get them.

And then my audio stuff just goes in a different direction that doesn't require, just less mechanistic stuff. I mean, probably more mechanistic than the majority of people want to hear but a lot less than the videos go into. I also think that -- Now, by contrast, I do these short little videos called Chris Masterjohn Lite where it's like two to five minutes of a quick practical tip.

I just take the whole audio and just duplicate it right on the podcast feed because there the point of doing video is that you get a more like emotional connection with the audience. People who only know me from my videos feel like they know me a little bit more when I do videos than they would if they were just listening to the audio. I think it has a lot of value from feeling like a community connection.

I know that in doing all these other things I've really frustrated the people who just like to read because I don't blog as much anymore. I know there's a ton of people out there who just wish that I would just write more. Anyway, my ultimate goal is to get a work flow going where I can actually just hit all these different types of content and get it going all the time. I like to think--

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One of my influences in making all these different types of content is Gary Vaynerchuk, the business guy whose answer to everyone who asks him, "Should I be on Instagram or Facebook or make a podcast," is, "You should be on all of that, and Snapchat." He said one time that you don't want to be a show, you want to be a network. That kind of stuck with me and I envisioned over the next year just being like a network with multiple channels with multiple shows where I'm just hitting all of it.

Robb: That's amazing. Again, you're doing a phenomenal job with all that material. I definitely feel your pain on the writing. Every once in a while there's something that just seems to really lend itself to a blog post format and it's tough because I've noticed just in brass tacks reach, I could spend literally a solid two weeks writing something that I spent two weeks researching.

It gets a little bit of social play and whatnot but then I'll pop on and I'll do a video from my backyard sitting in the sun and talk about a given topic and the reach is just orders of magnitude larger. I'm conflicted by that because it's kind of like, okay, sometimes you really need to do that deep dive but in the process of doing that deep dive how many of these other smaller forays could I have done in the same amount of time and potentially had more impact and reach although, like you said, the folks that really read, I think, oftentimes are the typically little better steeped in the material and so you're kind of catering to the long time die hard audience with some of the blog post stuff. I'm definitely conflicted on how to allocate that.

Chris: Yeah. Well, I think one way to do that is to make it a package. So, you did this deep dive. You can probably break that up into a lot of five-minute musings on video that can kind of link back to the big deep dive for the people who really want that. And then you can have someone go through it and take out the most salient points and turn them into pictures that go up on Instagram.

You can get this whole package and content that ultimately leads back to the deep dive for the people who really want the deep dive. And a lot of that extra stuff that's getting more reach, some of it is a -- There's a ton of people who just want that point and it's great that they're familiar with you now. But also some percentage of those people who wouldn't have otherwise seen your big deep dive get funneled into the deep dive and now they love you even more.

I guess that's the way to do that. But ultimately, going back to that economic concept, your time and attention is the most scarce resource that you have and some you've allocated. The only answer to that, I mean, the way that I think about the answer to that really is you hire a team and you batch things. Right now, I'm kind of on a hiatus because I've had so many things going on and I'm coming back to my content production more from a system building perspective.

I think in the next couple of months I'll be able to come up with a lot more content because I'll just save my production of short little videos for a day when I can really do nothing but that then I can build like months -- If you just sat down and made five-minute videos all day long for one day you're going to have like months of five-minute videos. I think that's the key thing to it.

Robb: That's genius. That's genius. I'm taking notes right now. In that thought around just kind of time efficiency and whatnot, clearly your work life is really important to you. But there is some time spent outside of hunching over a keyboard on the interwebs. I know you've got a couple of different passions, some of them in the gym, some of them newly in this Brazilian jiu-jitsu space. You want to talk to folks a little bit about that and why you like that and what it provides you?

Chris: Sure. First, I never hunch over a keyboard. I have an uplift standing desk that goes up and down at different heights and I distribute my computer time between various positions and include walking on a treadmill and sitting in various different yoga positions like half lotus, cross-legged -- I don't know the names of the yoga positions, sitting on my heels, et cetera, et cetera, stuff like that. Yoga is not really a passion of mine but I do like going to yoga classes because I learn new positions that I should be able to work on the computer.

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Anyway, right now, for fitness, I had done cross fit for about a year and a half and I learned from cross fit a few things that I really, really liked. I really liked Olympic lifting and I really liked gymnastics. Those two things were -- Part of the reason that I love them was that they're a real challenge to my mobility and they're a real challenge to muscles that I didn't even know I had. Getting up on rings, you get sore in these places deep inside your chest and you're like, "There's muscles in there? I can't remember that."

I think what I didn't like about cross fit was the things that are most defining of cross fit. So, a lot of the randomness that -- I do think it makes some sense with the randomness in your training. Certainly in Brazilian jiu-jitsu, if you're doing any kind of sparring or anything like that, there's a lot of randomness because you don't know what your partner's necessarily going to do and so on.

Life is like that but I think in cross fit there is too much randomness for me and not enough structure to the training for the mix that I wanted and also some of the just sort of like balls to the wall heavy intensity was just like too much for me. I just didn't get a lot of value out of some really high intensity wads relative to the recovery capacity.

I kind of left cross fit thinking like, "Well, I've really learned that I love some of this mobility challenging stuff, some of this skill challenging stuff. How do I put that together in a way that I like that mix?" I ran into some health problems last year related to being in an apartment with toxic mold and barium toxicity. I lost a lot of muscle mass because I couldn't workout during that period.

The last year was kind of recovering my health enough to workout and then I was just totally focused on bodybuilding this past year because I had lost a bunch of muscle mass and I wanted to get it back. And now that I'm comfortable with my body composition I am trying to branch out into something that was skill and mobility challenging.

I thought about Olympic lifting and I thought about gymnastics and I thought about Brazilian jiu-jitsu as things that would be skill and mobility challenging. I ultimately decided on BJJ because I thought it would do a lot more to build my character than the other opportunities would. And in particular, I feel like I give fear too much of a priority in my life and so I wanted to do something that would make me face things that are fearful. It just seemed like BJJ would do more for that, more for me in that regard.

I also, just from a self-defense perspective, I don't actually feel like I would ever be competent in a situation where I would have to defend myself or someone else so I'd like to do some things that could change that. That's kind of the path that brought me there. I've been doing that once a week for the last couple of months and then I had to take a month or two off because of some family stuff but I'm up to just now getting into that twice a week routine. I'm a baby. I'm a baby white belt so let's see what happens.

Robb: Well, Nikki, my wife, she's been pretty consistent since December. We do a little bit on our own at the house, we have some mats there, and she goes to women class and usually a drilling class. Just this last week she went to one of the open mat sessions and in eight seven-minute rounds. It's interesting because, I mean, again, she's a white belt but it's shocking how much she has learned in that time and really has become pretty formidable in a couple of the positions like her open guard is really, really good.

She actually is a legit athlete. She played collegiate level volleyball and then way back I in the day she was the 17th place finisher at the cross fit games and stuff like that, used to be able to clean and jerk like 205 pounds at like 130-pound body weight and stuff. She's actually a legit athlete. I'm a complete hack by comparison.

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But it's been remarkable the amount of progress that she's made and some similar stuff where it's like, "Hey, I've got little butterflies in my stomach in the class today." That's normal. I found it to be different than the butterflies I would get from cross fit because every day at cross fit was like white buffalo in the sky, am I going to die today?

Whereas Brazilian jiu-jitsu, you can kind of, "Hey, I'm not feeling great. I'm not going to roll with you. You're a 19-year old college wrestler and I just can't do it today." You can kind of pick your poison a little bit more with that. That's awesome. I'm really excited to see what you take from all that over the course of time.

What else do you have cooking? I know that you've got a new project and a new offering recently that we're going to talk a little bit about here. What else? You're going to be at Paleo f(x)? I think this is going to run after Paleo f(x). What are some other big speaking gigs that you might be at here soon?

Chris: I am probably not going to be at Paleo f(x) this year. My grandfather died earlier in the year and I took a lot of time out to kind of process a lot of things in my life and support my family and stuff like that and that kind of shook me up at the beginning of the year. Right now, my really overwhelming goal right now, like I had been talking about it a little bit before, is really to get a system of content production up and running where the people that I have working for me behind the scenes are fully trained to take over all of the logistics aspects to allow me to focus on content production.

One of the things that was difficult for me over the last year is that I was trying to keep up the pace with my content production. I was doing so many -- Even though I had offloaded a lot of responsibilities to people that I had hired, there were still so many things that I was doing that I should train someone else to do. To really train someone to do something properly who doesn't know how to do that thing is time consuming.

There was always this barrier. I know that I'm wasting an enormous amount of time doing this stuff but I know also that I'll get my video out tomorrow if I do. And if I try to train someone else to do it I'm just going to -- I'm not going to make that video and it's going to take two weeks before something comes out. Right now, I'm at a point where my content schedule is kind of suffering anyway and there's a lot of people out there who's like, "Where did Chris Masterjohn go?"

I really want to focus on coming back to it the right way. I love going to conferences but every single time I go to a conference I get two or three weeks behind where I wanted to be on something else. So, right now, what I'm doing is I'm -- I will almost be certainly at the Ancestral Health Symposium but because it's later in the year. But I probably won't be speaking there though. Next year, I'll submit talks to all these conferences.

My hope is that in the next maybe two months I'm really getting into a consistent daily content production where I have my podcast Mastering Nutrition coming out once a week. For most of this year, that's going to be a deep dive into managing nutritional status for a particular nutrient. You alluded to the Testing Nutritional Status cheat sheet that I just published that we'll talk about in a bit.

That gets like the practical cliff notes of everything you could need for all those nutrients into one place. On my podcast, I really want to -- and that's the tension between the stuff, the two principles of doing a deep dive into something for the core audience and getting something that has wide reach that's easier to digest. I want to do all of that.

Everything's that in that cheat sheet that covers all the different nutrients, I just want to take each nutrient and then do a one or two-hour podcast where I go deep into the science for the people who are the real hard core geeks who love that aspect of my work. And then on the video front, I'll be continuing with my energy metabolism class and Masterclass with Masterjohn. Right now, actually -- And actually, this is something that you and I would probably have fun talking about.

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Right now, I got stuck in the ketogenic diet unit. What I'm actually doing right now is I wanted to do an episode on why the -- The last few episodes I did in that section were on the ketogenic diet as it was developed for epilepsy. And I wanted as a bridge to do an episode on the mechanisms of what do we do now about why the ketogenic diet is effective for epilepsy and use that as a bridge to if we generalize to other things how does what we learn about its effect in that state carry over to what we might think the other uses of it might be especially in a neurological context?

What I realized was I really needed to study a lot of neuroscience to understand why seizures take place or why seizures occur. The stuff that I'm learning is just so fascinating but it's gotten me to the point where I'm reading this textbook on epilepsy and then I'm like, okay, I actually really need to go back to the neuroscience, the intro to neuroscience textbook to really understand this paragraph.

I think when this comes out they're going to be pretty amazing but it's -- I'm stuck on that for the next week or two. I'm very immersed in that right now. But anyway, that energy metabolism class is basically just into all aspects of why we, how we break food down for energy and then how we use that energy and how we store it. I think that's probably going to take the rest of the year to really complete that course.

And then I'm hoping to have ultimately like those come out twice a week when I'm back up on schedule and then my Chris Masterjohn Lite videos which are just short, quick practical tips, I'm hoping to get those twice a week too. If I do that podcast once a week and then those, the class and the Chris Masterjohn Lite

videos twice a week, maybe I can plan something fun for what can be released on that weekend but I haven't settled that yet. That's my overall--

Robb: That is an ambitious schedule. That's awesome.

Chris: I'll be a network.

Robb: You will be a network, absolutely. That is incredibly ambitious. That's awesome. Clearly, I'm a fan of the ketogenic diet although I also recognize that it has some serious limitations. But even in that epilepsy story, I was just reading a pretty interesting paper on the MCT ketogenic diet with some suggestion that the brain cells can actually metabolize directly some of these medium chain triglycerides and those may have some anti convulsing effects outside of the ketone body concentration.

It's a really, really big topic. It is cool that we -- I don't know if we have more research underway right now than what has been done in history but, man, there's a ton of research in different areas. We're definitely learning a lot more about that topic.

Chris: Yeah. Well, what's really fascinating though is -- One thing I didn't really appreciate until I started researching this is that despite all the research and the century of rigorous scientific treatment of epilepsy, we don't really know that much about what causes it. And what's fascinating is -- I mean, one thing we definitely know is that the cause of epilepsy, probably 1% of the population has epilepsy and the cause of epilepsy is dozens of different causes.

You could probably treat everyone optimally if you could break down every one into which category they fit into in terms of what causes their epilepsy. But we don't know enough science to be able to categorize that. The international categorization of different types of epilepsy was revised last year. In the papers, both on the categorization of seizures and on the categorization of epilepsy, so you can think of seizure as a symptom of epilepsy which is the underlying disease process, in both of those statements they basically say we wish that we could make the classification based on the etiology, meaning based on what causes this. But we don't have enough science to do that.

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The epilepsy textbook that I'm into right now, there's a chapter on categorization and they talk about -- They make an analogy to the classification of plants. You could classify plants like you were a gardener where you're just looking at what does this plant look like, what is the use of this plant?

And when you do that, you have this very utilitarian breakdown of what appears on the surface. Then you could also classify plants like a biologist would. The

biologist is out there studying not only what do the plants look like but studying the molecular aspects, the genetics to try to construct this thing where did the plants evolve from?

So, in epilepsy categorization right now, we have a gardener's classification of epilepsy and not a biologist classification of it. In other words, we have a classification where the clinician is the gardener in this aspect and they're looking at what is the pattern that I'm seeing, how might I group that together, what might I do about it? But we're not grouping it yet at the level of what is the fundamental molecular cause of this epilepsy?

We're starting to try to do that but it will probably be years before we have enough science to actually fully make the classification that way. And this is super important for the ketogenic diet because the ketogenic diet is not going -- I mean, first of all, about maybe half of people with refractory epilepsy get really serious benefit from the ketogenic diet.

But the ketogenic diet is 100% effective for some of those people and it's 90% effective for others, 50% effective for others, and less than that for others. And the people that it's 100% effective for are primarily people with Glut1 deficiency which is a genetic defect in the ability to get glucose into the brain. Well, of course, those people should be eating a lot of fat because if the glucose cannot get into the brain, how is the brain supposed to run on glucose?

So, like it's super straightforward there and you don't even have to invoke the anti-convulsing effects of ketone bodies like the brain just needs energy. It doesn't get any if they're not on a ketogenic diet. But then there are other cases where the ketones are probably having an effect that's very similar to the drugs that are used because they're impacting the excitatory inhibitory processes based on glutamate and GABA in a very similar way to what's some of the drugs are doing.

And then you mentioned other cases where in the MCT oil diet maybe the brain cells are running on the MCTs directly or maybe those are having anti-convulsing effects. But then there are other cases where they've shown that a low glycemic index diet that is, its low glycemic load and low glycemic index, and there's no randomized controlled trials on this diet yet but there are case series at John Hopkins where they've taken people who either couldn't tolerate the full on classic ketogenic diet or they were waiting to get put on that diet and so they just put them on this one because it was easier.

But this limits the carbohydrate content in the absolute terms but not -- It's not that low. I don't remember what the gram is but nowhere near as restrictive as the classic ketogenic diet. And it also limits the glycemic index. So, they're not

getting as the type of glucose spikes. In this case, at least from the case series, it is about -- It's similarly as effective in the patients that they've tried it in as the classic ketogenic diet. In those people, that diet only gets their ketones up to like one millimolar. It's not that ketogenic. It's a little ketogenic but it's not--

Robb: You mean 0.1, right?

[0:45:00]

Chris: No. It gets up to like -- It can get up to about one. Actually, there's a lot of variability. So, there's some people that are on -- I think one millimolar is like the sort of high end of what it can get to.

Robb: Even in that low glycemic state. Interesting, okay.

Chris: Yeah. It is carbohydrate restricted. I think it's restricted to like 60 grams or something like that. It's not 20 grams and it's not pushing ketones up to four or five millimolars which you can get to on the other diets. But my point is, if there are anti-convulsing effects of the ketone bodies then you have to be getting way less of those anti-convulsing effects at one millimolar or half a millimolar than you're getting at three, four or five millimolar, clearly.

Because of the uptake of ketone bodies into the brain is going to be directly proportional to the amount in the blood. And so you're clearly getting way more into the brain at three, four, five millimolar than you are at one millimolar or half millimolar.

And so in a certain subset of people, and we have no idea how to identify that subset. We just know through trial and error when they put people on that diet there are fairly similar amounts of people who will get fairly similar reductions in seizures as on these other diets and really hard to invoke ketone bodies as the causal thing just because they're getting some but they're not getting as much.

And then maybe it's just that they can't tolerate the glucose spikes from the meals and so when you flatten out the glucose spike maybe that's where they're getting the primary benefit from. Who knows? Maybe it's like 20% benefit or 50% benefit from the ketone bodies. But the fact that there are so many different mechanisms of these different diets and the fact that there are so many different causes of epilepsy means that it has to be the case that if you could know what's causing the epilepsy you could design a diet for that person that much more effectively targets the cause of their epilepsy.

And so I think that's the real fascinating thing is that we -- And the same thing is true of drugs. If they could design the drug to actually affect the root cause of

the epilepsy and target it to that person that would also be useful. And they're not doing that right now either.

I think it's fascinating from the perspective of epilepsy but I think it also carries over into what you would do with the ketogenic diet in the broader population that you might use it for. The same principles are true. Not everyone who struggles with weight loss struggles with weight loss for the same reason. Not everyone who has hormonal problems has them for the same reason.

I think that's where -- There's always this tension in medicine between medicine and health and nutrition, between you just need to know what to tell people to do versus you need to understand why it works. This is something that I'm always harping on, is you really do need to understand why it works because that's what dictates who should be doing what practical thing. That's what dictates how you can generalize a practical utility from one person to another.

Robb: I love that. That degree of nuance is, like you said, really hard because so many of these situations are still in a taxonomic stage, like we're still naming things and we really aren't even digging into root cause mechanism and then looking at the variation. Okay, does this person have similar mechanism of causation versus that person?

Have you ever done any digging around on the comparative evolutionary advantage of epilepsy? I know that that's going to be tough too because, like you said, there's a bunch of different causations here. But can you posit any reason why those adaptations would have occurred in the past?

Chris: I haven't but I'll -- If you have, I love to hear it. But I would question whether that even exists because a lot of -- I think the epilepsies that are known to be genetic are the best way to start addressing this question because ultimately evolution is acting on genes, right? If there's an adaptational value to that, to epilepsy, what we really mean is there's an adaptive value to the genes that are underlying the epilepsy.

[0:50:00]

In the cases where -- You'd be surprised. There's a tremendous amount of epilepsy that is ascribed to presumably genetic causes where we don't know what the genetic cause is and there's a tiny portion of epilepsy where we do know what the genetic cause is. In those cases, most of the mutations are not polymorphisms. They're inborn errors of metabolism that are often de novo mutations.

Most of the time, in these inborn errors of metabolism, even outside of epilepsy, there are numerous inborn errors of metabolism that cause profound disease states that are due to fundamental defects in energy metabolism. It's usually the case that each time you find a new patient you find a new mutation. What that means is that we call them -- That's called private mutations which means that it's all in one person or in one family.

You might have a de novo mutation in someone that causes the first thing of epilepsy and then it becomes heritable after that. If you treat the epilepsy well enough that that person is able to have children then they may pass on that mutation to their children. But you can imagine that in the past, if the only treatment for epilepsy was exorcism and it didn't work that well -- I mean, granted, fasting has been used for thousands of years.

But still, those mutations are generally not being passed on to a big family that grows and grows in the population because regardless of whether you can treat the person well enough to get by, it's not a really survival advantage to have epilepsy in most conducts. Now, on the other hand, there are almost certainly cases of epilepsy where the outcome is due to a polygenic context that sort of activates a single mutation to become harmful.

For example, you may have a defect in the sodium transporter that totally screws up how easily excited the neurons are because sodium transport is one of the things that activates neurons. But there are cases where it seems like if you have that defect it doesn't make you get epilepsy. It just profoundly increases the risk of it. And so in the background there's probably some other dozens of genes that modify -- It could be modifying it based on where in the brain is that defect most manifest, on which cells, and things like that?

Or are there other compensatory mechanisms? For example, neurons are excited not really by sodium transport. They're excited because of the balance of positive and negative charges along their membrane. So, if you have a defect in sodium transport, which is positively charged, you might have other ways to compensate for that with other positive or negatively charged ions to try to maintain that balance.

There could be like a dozen other genes that impact that ability to compensate that are important in the epilepsy but we don't really understand them. And probably in those cases what you're dealing with is polymorphisms that are popular that do have some survival advantage and that is why they're more common in the population but we don't really know what they are yet. And so to ask why is it beneficial is a whole -- It's something that we have to start asking once we understand what they are better.

Robb: Right. I love that answer. This has just been one of these things that I'll do when I'm researching a topic. I was kind of on a tear with a Huntington's disease for a while and it was interesting. One day I just threw into Dr. Google Huntington's disease evolutionary advantage and there were quite a few interesting papers and it's very macro level. There wasn't much mechanism there.

They noted that folks with the Huntington's genotypes, and there's huge variation in that as to how many base pair repeats you have and whatnot. There did tend to be a higher fecundity, greater reproductive status, younger life, better immune function, decreased cancer rates. There does seem to be something going on there in some circumstances where maybe there's a genetic predilection that has some advantages or potentially advantages in the past and then maybe some changes in epigenetic signaling. I know you've done some stuff on like familial hypercholesterolemia and that maybe that has not always been quite as problematic as what it is today.

[0:55:02]

It's just an interesting thing that I will take a given topic like epilepsy or Parkinson's or something like that and just see if anybody has nosed around potential evolutionary advantages.

Chris: Yeah. Well, I think that's -- So, familial hypercholesterolemia is a case where you could trace the lineage back many generations of where those genes came from. That's very different from de novo mutations where it occurred in one person. That's a place where you can look for the evolutionary advantage. I think probably there might be research out there that I just don't know about because I certainly don't know everything about epilepsy by any stretch of the imagination.

I think the vast majority of cases where there are genetic roles we actually don't really have a good grasp on what the genes are. I think it's just a matter of time before we're bound to discover genetic factors that maybe don't cause epilepsy absolutely but do increase your likelihood of it that are in the population for reasons, advantages that we could postulate. We probably will have explanations like that at some point.

Robb: Right. It's fantastic. Even on a clinical level, I've always imagined that if there was something about that, say, the genetics of a particular condition that was advantageous in the past, even on the clinical level when talking to someone, instead of just like that far side cartoon with the deer that has a bulls eye and the guy is like, "Dude, bummer of a birth mark."

Instead of couching it like that, it's like, "Well, in the past, this may have been advantageous and today we've got some differences in the environment." Even on just kind of a personal empowerment level, but clearly there's a lot of nuance and lot of detail with that stuff. I have to sing your praises again on a number of levels. Your piece that you did on iron overload, I started donating blood about eight weeks or so, definitely feel better from that, have dug into a number of your nutritional status recommendations ranging from copper to selenium.

Those things have just been game changers for me. I really listened to some of the problematic features of not getting enough of those particular nutrients and then kind of tackle them and the whole food recommendations that you made and have had great benefit from that. And you have developed a nutritional status cheat sheet. Tell folks about that.

Chris: Yeah. So, look, we want to eat a diet that is nutritionally robust that will maximize the chances that we don't need to worry about any of this stuff. That's part of the reason that we live a good lifestyle and we eat a good diet is because we don't really want to have to micromanage these things.

But if you have any unresolved health problems or you do care about your future, your health might be good now but you want to make sure you keep it that way, or you come from a background of not having eaten well all your life, which is probably most of us -- Most of us who come to Paleo or ancestral eating in some way come to it because we had problems that developed elsewhere.

Then you really need a good way to assess your nutritional status. This is way more complicated than macros, right, because there's only three macronutrients, protein, fat, carbohydrate. It's fairly easy to determine what a healthy range for protein is, carbohydrate-fat balance, we all play with. We find what works for us. That's kind of simple.

It becomes a lot harder when you're asking questions like, "Do I have enough zinc? Do I have enough selenium? Do I have enough copper? Do I have too much selenium? Do I have the wrong balance between vitamin A and vitamin D?" One of the things that we know from an evolutionary context, if you're thinking about the Paleo diet, you can think about it as I'm going to eat the diet that Paleo men ate.

But one of the basic principles of evolutionary theory that we're founding this on is the idea of variation. We have just been talking about that a lot now, same principle that a variation applies to nutritional status because we all are likely to have very different needs for nutrient. And so we can as a default that, yeah, I'm going to eat a diet that's rich in folate but rich in folate for one person is deficient in folate for another person.

[1:00:03]

For some nutrients, being deficient in one nutrient -- Iron is a great example. Take the woman who is menstruating with a heavy menstrual flow all her life and what's good for iron for her and then take the man whose never gotten a cut, maybe he's gotten a cut but he's never had a period and never gushed blood in a serious injury and he's got the genes for hemochromatosis. Well, what's good for iron for that woman is too much for that man and what's good for iron for that man or what that man should be doing, maybe that man should be giving blood every eight weeks, that woman might become seriously anemic if she gives blood at all. And so you can have a lot of variation on there.

Now, here's a real kicker. Let's take that woman and let's imagine that she has the same hemochromatosis genes as that man does. Imagine that in the first 20 or 30 years after she gets her period, she has heavy menstrual flow, she's constantly vulnerable to anemia. But then she hits menopause. Or maybe even earlier than that. She didn't need to hit menopause. She developed amenorrhea for other reasons relating to--

Robb: Exercise, yeah.

Chris: Energy intake and exercise and things like that. Or something just changes and makes her menstrual flow become very light instead of heavy as it had been. That woman can go from a state of heavy vulnerability to anemia to the complete opposite state of heavy vulnerability to iron overload. Why is that problematic? Well, because some of the symptoms of iron deficiency anemia and iron overload actually overlap.

You could be fatigued, for example, because you're anemic. You could be fatigued because you have iron overload that's contributing to oxidative stress and is destroying your energy metabolism. Imagine that that woman doesn't really know about nutrition and she doesn't -- She didn't have the cheat sheet. She never took any classes about nutrition but she kind of is in tune with her body and she knows by instinct when she starts to feel anemic.

Maybe she calls it anemic, maybe she doesn't but she knows when she feels like that she should eat a lot of red meat and she feels a lot better. Well, imagine that that person then not really knowing about this process starts to undergo this transition where now her periods are lighter or they've stopped. Now, she's transitioning to a period of being vulnerable to iron overload. Maybe it takes years to actually get there.

But she starts feeling fatigued. And she knows that when she feels like that she should eat more red meat. But this time it doesn't work. Now, she's starting to feel worse. What's her gut instinct going to be? Probably to double down on the red meat because she always feels better when she eats red meat. She has decades of experience telling her this and it's not working. So, she must need to eat more red meat.

It could be a long time before she realizes that she actually did a lot of damage from eating the red meat. It's cases like this where it becomes essential to have a basic understanding of what are the things that you should look out for that might tell you if your nutrients are out of balance and what should you do about it. And so what I did with this cheat sheet is -- This cheat sheet came on the heels of trying to do this--

This gets back to the content production stuff we were talking about before. What I was trying to do the year before last year was help everybody get a handle on this by making a two-hour podcast geeking out on each nutrient going into the depths of all the science leading into, okay, what do you do about this, how do you look for the deficiency, how do you look for the toxicity, if you find it what do you do about it?

And what happened was, number one, it would take me forever to come out with these episodes. It takes me two weeks of doing nothing else to prepare for it then I record it then there's all the production stuff. There are some people who really love these episodes but they're like, "Chris, you told me what to do about selenium. Am I going to have to wait until October of 2018 to find out what to do about magnesium?" And so, there's that.

And then there's like maybe you love to geek out for two hours on folate but if you're trying to convince your grandmother that she needs to eat more greens you're not going to do that by saying, "You really should listen to Chris Masterjohn's podcast on folate."

[1:05:01]

So, there's a reach problem because not everyone has the time for that. But then the big problem that really made me do this was I had people who work as practitioners with other people who are sending me emails saying, "Could you just take all your recommendations and put them into a one-page PDF because I'm going back through all your podcast notes and even with the transcripts and keyword searching makes it easier, but I'm going through all the podcasts and it takes me forever to find was selenium supposedly measured in plasma or serum? What was the range supposed to be?"

I'm like, "Okay, I'll do that." So, I get someone on my team to start pulling out my recommendations from the podcast and she comes to me and she's like, "I can't find in your zinc podcast like what you said what should be." I'm like, "Come on." I go to visit and -- So, I go to the podcast and I'm like, "I can't find it either." I really need a simple place to put all of this stuff in one place.

As I'm doing this, I originally was toying with this idea of just having a one page table. That's where the idea of calling it the cheat sheet came into being. But then as I'm realizing it, I'm like, I cannot make a one page table without forcing people into the completely incorrect belief that you can treat this the way modern medicine treats the numbers.

You cannot simplify it down to you should just measure plasma selenium. Plasma selenium should be between this and this and if not take a supplement. The reason is that just as you and I might have differences in our needs for a nutrient, we also might have differences in what the optimal range in our plasma is. We derive where we have the best research is still based on statistics. It should be.

But what do you get when you base something on statistics? You get a conglomeration, a synthesis of a bunch of people that vary as individuals. And so if you get -- We have very elegant studies taking people in China who grew up with severe selenium deficiency on selenium deficient soil. We have very elegant studies taking these people and putting them on different doses of selenium, watching their plasma selenium go up, watching their other functional markers of selenium status like the enzymes that depend on selenium, watch where they plateau and looking at their signs and symptoms and saying what plasma selenium is all of this normalized.

But that's still taking an average plasma selenium from a group of people that almost certainly vary. You can't say serum vitamin A should be between X and Y and that's the end of it. Because if you have, honestly, if you have someone whose serum vitamin A is at the bottom of the range but it's in the range but they don't eat any liver, they don't take cod liver oil, they don't take a multivitamin, they don't take vitamin A supplements, they don't eat red, orange, yellow or green vegetables -- these are all the sources that you'd get vitamin A from -- and they have night blindness and they have this crusty skin in their hair that kind of flakes off and they have these little bumps on their skin that they keep mistaking for goosebumps but they don't go away and they don't come when they're nervous. They're just there all the time.

Well, those things are all signs of vitamin A deficiency. If you start working in vitamin A into that person's diet and they go away, did serum vitamin A have to be out of the range to conclude that that person had vitamin A deficiency? Of

course not. But at the same time you may have a problem with the skin that looks like vitamin A deficiency but maybe it's something else.

Or maybe night blindness. Night blindness is the most sensitive sign of vitamin A deficiency that is well-established. I actually think there could be some other problems that would come first but out of what we really know as definitely vitamin A deficiency symptoms night blindness is usually the first thing. But night blindness can be caused by zinc deficiency. You can't just say, "Well, the person has night blindness. That's vitamin A deficiency. We got to put vitamin A into their diet." You have to be able to look at -- The only thing that would tell you that is if their serum vitamin A is fine and their plasma zinc is low, that's probably a zinc deficiency.

So, the blood measurements are still valuable. What I've done with this cheat sheet is I've said, "Okay, how can I preserve the cheat sheet nature and yet actually explain everything that you would need to be able to use the cheat sheet on a practical level do something about these things and know whether what you're doing is working?"

[1:10:16]

And so it's a cheat sheet because I try to condense -- If you wanted to do a comprehensive lab testing, you can find everything that you need to order on one page. If you want to do everything that I recommend to assess nutritional status, you can get the full instructions in the first five pages then everything else is -- If you want to know everything or you're a practitioner caring for many people, you probably should read the whole thing. But if you just want to follow the instructions, everything else is just on a need to know basis.

There's an algorithmic process that says if this blood measurement is low, read this section on vitamin A. There's an index of signs and symptoms where there's, I think, 178 entries in alphabetical order. You just go through it and you look and say, "Oh, do I have dry skin around my mouth? Do I have dry skin in my perineum, which is between the anus and the genitals? Do I have patches of dry skin elsewhere? Do I have mood problems? Do I have energy problems?"

You go down through these symptoms. Are my hands tingling? You go through that and it just links directly. You just click on the link and it puts you right to the part where you want to read. But the whole thing in its entirety is 78 pages long and that's why it's the ultimate cheat sheet. Because once you figure out that you need to do something to look into your thiamin status, which is vitamin B1, you have everything you would need condensed into several sections that say what are the things that make it plausible that you might have this deficiency?

What would you be suffering from? How do you test to verify it? What do you do about it? And how do you make sure that's working?

Now, one thing I should point out is that some of the things that I recommend are expensive. For example, the comprehensive lab testing. A lot of people would be paying out of pocket for a lot of these tests and to get all of them could run a couple thousand dollars. Some people don't have time to do some of this stuff. I recommend in here as part of the comprehensive screening that you should track your diet in an app like Cronometer for a few days and see how you're matching up with the RDA.

The RDA doesn't tell you everything. But if there's one nutrient where your 10% of the RDA and everything else is fine that definitely points you in a direction. But that's time consuming. Some people have money and they don't have time. Some people have time and they don't have money. But everyone has one of those things that they can fit into their priority somewhere to make sure that they get healthy if they're not and that they stay healthy if they are.

I basically give three options to use this. The comprehensive approach says do the comprehensive lab testing, do the dietary analysis and look through the index of your signs and symptoms, pick those three legs of evidence, use the algorithm to point you in the right direction and then solve the problem when you find one.

But then for people who don't have money I say skip the comprehensive lab testing, start with the dietary analysis, start with the signs and symptoms. Only get lab tests when the cheat sheet is telling you that you need it to figure something out. We're talking before about is the night blindness really vitamin A or zinc? That's when you need to test plasma zinc and serum vitamin A. We're talking about the woman who could have anemia at one point in her life and iron overload in another. That's when you need to test your iron status. That's the cost saving approach.

The time saving approach says skip the dietary analysis, do the comprehensive lab testing and just do the dietary analysis when you would really need to figure out a problem that you can't figure out otherwise. In that way, I try to make it possible for anyone with whatever resources they have at their disposal can take the simplest and most effective approach to quickly determining where their weak spots are, where their imbalances are and what they need to do to fix them.

Robb: That is amazing. I've been so impressed with this thing. I know you reached out to me a while back about this and I've been super excited to let folks know about it and just really appreciate the practical element to this. It's funny or interesting.

[1:15:01]

You diverted away from medical school but yet you are providing materials that most physicians and clinicians would find indispensable to say you're ending up probably doing a much, much more good work and getting much more reach out of this stuff. Chris, where can people track down this cheat sheet?

Chris: Well, they can go to a special page for your audience at chrismasterjohnphd.com/robbwolf and that will go to a page where if you order it before midnight on May 14th Eastern time for you folks out on the West Coast, if you order it before May 14th, you use the code Robb Wolf to get a \$5 discount. You put it in the box provided. You hit the little arrow button or the apply button and you watch the price fall from \$30 to \$25. You will always be able to use that link. I'm sure Robb will put it in the show notes for you. That's where you get it.

Robb: Awesome. Chris, it's been such a treat having you on the show and really, again, just super appreciate your work. You are mentioned three separate times in the Metabolic Flexibility talk which I am doing at Paleo f(x), Low Carb USA and I have already done at Low Carb Breckenridge. Your work dramatically inspires and forms my work. I cannot thank you enough for what you do.

Chris: Awesome. I appreciate the honor.

Robb: Oh, and before we wrap up, and I will get all of that in the show notes, but where else on the interwebs can people track you down?

Chris: Well, I have my content going out on all your favorite channels, Facebook, YouTube, Snapchat, Instagram and Twitter but you can find the home for everything at chrismasterjohnphd.com. Everything that I put out anywhere winds up finding its way to somewhere on chrismasterjohnphd.com on chronological order too. If you go there, you can always see the most recent.

Robb: Chris, thank you again and looking forward to seeing you and doing some jiu-jitsu with you in the future. That's going to be a ton of fun.

Chris: Yeah, for sure. I better practice.

Robb: I'm fat, old and lazy. So, rolling with me is usually pretty fun. I am not a headhunter so it will be a ton of fun.

Chris: And now that you're a purple belt you have the discipline--

Robb: I kind of always had that discipline but I'd definitely taken the -- I want my good training partners to come back and not hate me. I try not to be a dick. Awesome, Chris. Thank you again and looking forward to seeing you and thank you again for all the hard work you're doing. Okay, take care.

Chris: You're welcome and thank you.

[1:17:48] End of Audio