Transcript of the June 13, 2022 AMA

Chris Masterjohn (00:00:06):
All right. I will wait for some people to come in. Looks like people are starting to come in now. One thing before we get going is, could you let me know in the chat, which is not to be used for questions, but just let me know how bad is the sound, because the AC I have, the only one that I can use right now is very loud. The good thing is, this microphone is very directional. So apparently it's saving me from how loud the AC is. I do remember one time, when using the same microphone, I was recording a podcast way back in the day when I lived in Brooklyn. And I apologized in the podcast for the extremely loud fire truck sirens that were going by. And then I listened to the podcast, and I couldn't hear the fire truck at all. I just heard myself apologize for it. So apparently the mic is saving me.

Chris Masterjohn (00:01:22):
All right. A couple ground rules before we get started. If you've been here before, you know the drill. But real quickly, there are two or three ways to ask a question. One is to raise your hand and you can come on live on the webcam. If you raise your hand, I will pick you first.

Chris Masterjohn (00:02:09):
Okay. So if you want to jump on the webcam, you can raise your hand. And then, if you want to ask a question by text, please do not use the chat. Do use the Q&A box. Oh, let me change the setting so that everyone can see everyone's question and everyone can comment on everyone's question. Okay. In the Q&A box, you can ask a question anonymously or with whatever name you're using. Just keep in mind that eventually some of these may be turned into clips that are distributed publicly. So ask your question whatever way you're comfortable being possibly shared publicly. And then, second, you can ask anonymously. It won't hurt you. But if there are a lot of anonymous questions, I'm going to treat them all as if they come from one person, because I do try to go through everyone and make sure that I answer each person's first question before I answer anyone's second question.

Chris Masterjohn (00:03:18):
And then, if you have a bunch of questions, please ask them one at a time, and ask your most important one first, because if time is stretched... I will go over two hours if it's needed, but if we're at the two-hour point and there's a bunch of questions left, I'm going to start answering them more quickly. So if there's something that you really want to make sure gets a very good answer, ask it at the beginning.

Chris Masterjohn (00:03:41):
All right. Anonymous asks, "What would you recommend for someone who has persistent, recurring SIBO, small intestinal bacterial overgrowth, bloating and gas, that comes back after dietary changes, such as, for example, gluten free, Paleo, GAPS diet, dairy free, et cetera, and herbal antimicrobial treatments? What are possible root causes of recurring SIBO?" First of all, you might want to comment... Oh, and I forgot to mention before that, feel free to jump in on

anyone's question by commenting on it in the Q&A box. And if someone's on the live cam, you can add something in a chat if you want to add to the discussion. Okay. First of all, you might want to comment on your own question and just clarify what you mean by coming back after dietary changes. So are you saying that when the person goes gluten free, it goes away? But then if they go Paleo after that, it comes back? Or are you saying, if they go gluten free, it goes away, but then if they go off gluten free, it comes back? I'm not sure what you mean by that. So I'll answer your last... And then herbal antimicrobial treatments, I assume you mean it goes away when they get the antimicrobial treatment. Are you then saying that just after the treatment is done, it comes back regardless? Or are you saying the antimicrobial treatment makes it go away, but then they change their diet from gluten free to Paleo, and now it comes back on the new diet? I'm not sure what you mean by that.

Chris Masterjohn (00:05:21):
So what are the possible root causes of recurring SIBO? I mean, first of all, if you didn't address the root cause, which antimicrobial treatments obviously are not doing, because you can kill the bacteria, but it's not like you got it in the first place because you weren't chronically taking antimicrobial treatments, obviously. And so, if you haven't addressed the root cause... And a diet might kind of address the root cause. Although, it's not like GAPS should be the default diet for everyone. So GAPS helps. It's not like you got it in the first place because you weren't on the GAPS diet because most people aren't on the GAPS diet. Not everyone has SIBO.

Chris Masterjohn (00:06:07):
And also, I think it's pretty obvious that highly-restrictive diets, even Paleo, are not some kind of obvious default template for humanity. On the other hand, I think it is an obvious default for humanity that you shouldn't have access to modern junk food that didn't exist until a hundred years ago, or fewer years ago than that. So I do think you could say that, if you're constantly eating chips and pizza and ice cream, and you get SIBO, and it comes back when those foods return, I do think it's legit to blame it on the diet itself.

Chris Masterjohn (00:06:53):
I know that not everyone who eats chips, pizza, and ice cream has SIBO. But I think it's incredibly obvious that the natural human diet is not one that has any pizza, chips, and ice cream. And I'm not hating on pizza, chips, and ice cream. I like all of those things from time to time. But I guess what I'm saying is, out of the full dietary spectrum of foods that existed a hundred years ago or more, I think shifting around to more restrictive diets than that is not really addressing a root cause. Whereas, getting rid of modern junk food, or at least moderating it so that it's not an overall preponderance of the diet, might actually be a root cause. So I think you don't have any... If it's every time I go back to 70% pizza and ice cream and chips, then I think the answer is just stop going back to pizza and ice cream and chips, and it's your fault for doing that.

Chris Masterjohn (00:07:51):
I assume you don't mean that. And I'm not trying to sound like I'm blaming people, but I'm just saying, you shouldn't expect to be able to eat mostly modern junk food. But you should expect

to be able to eat anything in the Weston A. Price diet without having to go on GAPS, is what I'm saying. Eva, I see your hand up. I'll get you next. So beyond that, I would say the main causes for persistent SIBO are going to be either... Well, the most common cause, I think, is just slow gut motility that is causing food to incubate in the small intestine for too long a period of time and not get cleaned out when the digestive process there is done. And that's generally a deficiency of the migrating motor complex.

Chris Masterjohn (00:08:59):
I think there are a number of things to consider. First of all, I would look at thyroid health. And thyroid is a key regulator of gut motility, a positive regulator. So better thyroid status means faster gut motility and generally should protect against SIBO. Another factor is bile acids. I mean, one of the ways that thyroid regulates gut motility is by making you make more bile acids from cholesterol. And bile acids themselves speed up gut motility. So you could have a deficiency of bile acids, which could be due to a slow thyroid or could be due to some other cause. For example, maybe your cholesterol levels run too low. Obviously, if you have high cholesterol and low bile acids... You're not going to really know if you have low bile acids. I guess you could... I mean, there's probably some stool tests that can make an inference about it, but you're not going to know directly. But you could infer it based on fat digestion being particularly bad among your fat digestion absorption, among your digestive capacity. That could be one sign.

Chris Masterjohn (00:10:22):
And if your cholesterol is high, then you probably have slow thyroid, and I would... If your cholesterol is high and your fat digestion is bad and your gut motility is slow, then you probably have low thyroid. And if TSH doesn't indicate that, you should get a full thyroid panel and look for something like low T3, because that's a pattern that's almost certainly a low thyroid activity. You should also consider whether maybe you're on too restrictive, too low carbohydrate, of a diet. Because if all your thyroid labs look normal, you might have elevated free fatty acids that are interfering with thyroid function. And so you might be getting slow function of the thyroid hormone, even though the lab tests are normal.

Chris Masterjohn (00:11:20):
But if your cholesterol is low and your signs of bile acids are low and your gut motility is low, you might just have low cholesterol as a starting point. And so you might want to raise your cholesterol. You could try eating more eggs, more cream, more coconut oil, more liver, eggs with the yolks because of the cholesterol content. You could try those things to raise the cholesterol and thereby get better bile acid production. You might want to consider whether you need more taurine or more glycine because those form salts with bile acids to bring forth their activity.

Chris Masterjohn (00:12:07):
I've seen in one animal study that suggested that too high of a fat soluble vitamin intake might slow bile acid production by acting as a signal that you've made enough bile acids if you are indeed absorbing your fat soluble vitamins adequately. So you might want to consider whether

like megadosing fat soluble vitamins might play a role if you've ruled all those other things out. But all this applies... And then there are some things that stimulate the migrating motor complex, like lactobacillus and ginger. So you might want to try ginger supplementation. I think fresh ginger is best. Although, it can be a tax on your convenience to be peeling it and cutting it up all the time. And fresh ginger goes moldy in the fridge easily. So there are ginger supplements you could use. And then lactobacillus supplements might help. Those apply to SIBO that is really late in the digestive process. So if your symptoms are coming three hours after your eating, then you probably have distal SIBO, which means it's at the end of the small intestine. If they're starting 45 minutes after you eat, you probably have proximal SIBO, meaning it's at the upper part of the small intestine, towards the stomach, rather than towards the colon. Similarly, if you get a SIBO test, and the breath test shows that gas is being produced 45 minutes after the sugar you take, then it's proximal. And if it's three hours after the sugar you take, then it's distal. And then, of course, proximal can go deeper, and then distal can go higher. But if it's starting distal and moving up from the colon, then as it gets worse, you're going to see an expansion from the three-hour time point to the two-hour time point and on.

Chris Masterjohn (00:14:04):
Whereas, if it's proximal and it's getting worse, you're going to see an expansion from the 30, 40, 45-minute mark to the one-hour mark, and then on in that direction. If the SIBO's still bad at the two-hour mark, but it's worse at the 45-minute mark, and then it dissipates as it goes to two hours, that's proximal. And if it's the reverse, it's strongest towards the colon and it dissipates as it gets higher, excuse me, dissipates in terms of how much gas is being produced on the test. So if you're seeing it start at an hour and a half, and then it keeps increasing as it goes on, that's obviously distal, even though the gas is showing up in the middle.

Chris Masterjohn (00:14:58):
So if it's distal, meaning towards a colon, meaning showing up late in the test, then everything I said before about clearing out the gut I think is most important. Whereas, if it's proximal, which is less common, then it's probably from low stomach acid. And if it's low stomach acid, you want to look at things like your salt intake, you might need more, your energy status, thyroid's going to regulate this as well, but diabetes, adrenal dysfunction, excessive fasting, excessive caloric restriction, a corollary with fatigue. You could have a rare inborn error of metabolism. You might not have enough B vitamins, you might not have enough magnesium, basically anything that could slow your ATP production, and salt, not enough salt. Either of those things could be contributing to that, to low stomach acid.

Chris Masterjohn (00:16:05):
If you're over-methylating, you could be reducing your histamine production. And I don't think that should happen just because you're taking methylfolate or something like that, but I think it's possible that could be a side effect of taking SAM-e. If you're the type of person that swings back and forth on methylated supplements, that could be relevant. And then you could also always test it by supplementing with betaine hydrochloride as a source of hydrochloric acid, or taking acidic things with your meals.

Chris Masterjohn (00:16:42):
And then, just as a general thing about digestive dysfunction, you want to eat when you are upright. And you want to be upright after you eat for at least a half hour, if not three hours. And I know that sounds terrible for someone who likes to lay back and eat while watching TV and then lay down on the couch. I don't know if that's going to cause SIBO, but it's certainly going to make it worse and harder to heal.

Chris Masterjohn (00:17:21):
I'm not saying you want to be standing up when you eat, unless it's Passover or whatever, but you want to eat sitting upright and then go for a walk, is probably the best thing that you could do. And then stay active for a couple hours. I'm not saying go exercise. Don't go swimming. But I just mean moderate activity like walking around and getting up and doing this and that, rather than being ready to go to bed.

Chris Masterjohn (00:17:59):
And in the off chance that you need to eat before you go to bed, you should probably fix that. But, if you must, then the more elevated you can sleep the better. So if you could just sleep with a couple pillows behind your head, at a minimum, or even elevate your bed at an angle. That's kind of a last resort, but out of desperation you might need to do something like that. But it's better to just not eat at least three hours before bed.

Chris Masterjohn (00:18:37):
All right. Hope that helps. RB adds this question, "What do you mean by elevated free fatty acids interfering with thyroid function? Does that have to do with dietary intake of fat? I have high cholesterol, poor fat digestion, varying gut motility, but normal thyroid numbers." I mean that high free fatty acids will prevent thyroid from entering cells and binding to their nuclear receptor, and therefore, functioning. And dietary intake of fat could do that in the postprandial period, but low carbohydrate intake, low calorie intake, excessive fasting, would do that in general, particularly in the fasting period. So it would be a combination of those things.

Chris Masterjohn (00:19:22):
If you're eating a lot of fat but also eating a lot of carbohydrate, you're probably not going to have elevated free fatty acids, except in the post postprandial period. And you will even suppress those because you're going to promote fat storage of those fatty acids with the carbohydrate. All right. Thank you, Anonymous, for your question. Eva, I'm going to promote you to a panelist so that you can ask your question. Eva, how are you today? Looks like you're muted. There we go.

Eva (00:20:03):
Hello.

Chris Masterjohn (00:20:04):
Hi.

Eva (00:20:05):
Hi. How are you?

Chris Masterjohn (00:20:06):
Good. How are you?

Eva (00:20:07):
Good. Thank you so much to taking our calls and spending time with us.

Chris Masterjohn (00:20:11):
My pleasure.

Eva (00:20:13):
I do have a very simple question.

Chris Masterjohn (00:20:16):
All right.

Eva (00:20:17):
Hemoglobin A1c So I'm playing with a continuous glucose monitor since like 17 months, and my glucose is around the average glucose. It's under 100. It could be 90 for three months, and then I try to figure something out, I can go up to 95, 97. If I'm spiking, I'm spiking maybe 152, but for only five minutes or 10, let's say 10 maximum. And then goes back right how it's supposed to be. But my hemoglobin A1c it's always coming back high, so between 5.5 and 5.6 every time.

Chris Masterjohn (00:21:09):
The continuous glucose monitor trumps the HbA1c, hands down, and makes it irrelevant because the point of HbA1c is that it is a useful but imperfect marker of cumulative past glucose exposure. And you are actually completely tracking all of your glucose exposure. It's completely pointless to measure HbA1c if you have a continuous glucose monitor because you're using something that is an imperfect marker to try to make an inference about something where you have the exact data of. It's like calculated LDL cholesterol and exact LDL cholesterol. If you had them measured in the same test and the calculated one looked bad and the exact one looked good, you would ignore the calculated one because the calculation isn't perfect, and obviously it's wrong. But the reason is that HbA1c is subject to two other determinants besides cumulative past glucose exposure. One is red blood cell turnover.

Chris Masterjohn (00:22:29):
Well, first of all, probably wearing a continuous glucose monitor actually increases your red blood cell turnover because you're taking little dips of blood all the time, right?

Eva (00:22:38):
Mm-hmm.

Chris Masterjohn (00:22:41):
I don't know what the volume of that is, but if you... Wait. Is it taking blood?

Eva (00:22:46):
No, it's just a sensor.

Chris Masterjohn (00:22:50):
Oh, it's just infrared or something like that, right?

Eva (00:22:52):
It's not a needle.

Chris Masterjohn (00:22:54):
So I take that back. Things that we know can increase your red blood cell turnover include exercise, include any kind of blood loss, right? So if you have a heavier period or you're running a lot of lab tests or you donate blood, all of these things can increase your red blood cell turnover. And then there's also just other determinants of red blood cell turnover that are unknown. So just probably for genetic reasons or hormonal reasons or whatever it is, some people just have higher red blood cell turnover than other people, and it's a confounder.

Chris Masterjohn (00:23:35):
Then the second thing is that you actually have an enzyme called fructosamine-3-kinase that deglycates hemoglobin. And there are some things that might impact that, but there's also a strong genetic component. I don't know if you can get that measured with a test, but in research, they can test it. And there's a very significant correlation, inverse correlation, between fructosamine-3-kinase activity and HbA1c, where HbA1c goes down if that enzyme is high. And if that enzyme is low, HbA1c goes up.

Chris Masterjohn (00:24:10):
So you're taking this HbA1c measurement, which in you is a little bit high, and there are three possible interpretations. One is that your cumulative blood glucose exposure over the last 48 weeks is high, in the prediabetic range. Another is that your red blood cell turnover is a little bit lower than average. And a third is that your fructosamine-3-kinase activity is a little bit lower than average. And you've ruled out the first one because your continuous monitor shows that that's not true. And therefore, you know it's one or two of these other confounding factors that makes HbA1c borderline useless in some cases, such as yours.

Eva (00:24:55):
And is this good to explore why it's happening? Or I would just not?

Chris Masterjohn (00:25:01):
I'm sorry. What'd you say? Is it going to explode? Is that what you said?

Eva (00:25:04):

No. Is this good to explore the other two options that we know?

Chris Masterjohn (00:25:09):
Oh, to exclude them.

Eva (00:25:12):
Or you would not get a-

Chris Masterjohn (00:25:15):
Is there a way to rule in or out those other two options? Is that what you're asking?

Eva (00:25:19):
Yes.

Chris Masterjohn (00:25:20):
Okay. I don't think so. I mean, there's no direct test for red blood cell turnover, as far as I know. I mean, I don't know if some obscure lab offers one, but it's not a usual test that you would get. I'm trying to think if you could infer it from... I don't really think you could get a good inference, even from anything on a complete blood count, actually. So I think it would make sense to consider that if you have... Let's say you become menopausal or have amenorrhea or have a lighter period than average, then that would be one thing that would raise HbA1c. And then if you, I don't know, haven't been exercising... Let's say you go from a more active period to a less active period, and then it goes up a little bit, that would probably be a contributor to that.

Chris Masterjohn (00:26:38):
I don't know. I don't think anyone offers a commercial test for fructosamine-3-kinase activity. Maybe there are some snips that are in 23andMe or something like that, but I don't know that's the case. I doubt it is. No one's diagnosing it for any reason. But if I have time at some point, and I find that there are any ways to look at either of these things, I'll post about it, but I don't think so.

Eva (00:27:13):
Thank you.

Chris Masterjohn (00:27:14):
Yeah.

Eva (00:27:14):
Thank you so much.

Chris Masterjohn (00:27:16):
Thank you for your question. Appreciate it.

Eva (00:27:17):

Thank you.

Chris Masterjohn (00:27:30):
All right. Thank you, Eva, for that question. Going back to the Q&A box, we have Iris, Ulrick asking a question for Iris from Denmark. And Iris's question is, "I would like to ask you about copper and histamine and toxicity. I've heard that histamine binds to copper and vitamin C in the gut." I'm now interjecting. I have no idea if that's true. It might be, but I haven't come across it. But copper... I mean, particularly copper is needed for diamine oxidase, which gets rid of histamine in the gut. And I'm not sure if that's what you're thinking of. Going back to your question. "If this is true, does that mean that copper and vitamin C works as an antihistamine in the gut and can be used as such?"

Chris Masterjohn (00:28:46):
I wouldn't do that, but improving your copper status will certainly improve your ability to handle histamine in the gut if you're copper efficient. Let's see, just quickly to make sure I have a complete view of this. Diamine oxidase has shown to be copper dependent in humans. It's manganese dependent in humans. It is zinc dependent in humans. And it's been shown to be B6 dependent in pigs, and so that might apply to humans as well. I don't know if it's been shown not to be B6 dependent in humans. So it may be dependent on vitamin B6. And it's been shown to be riboflavin dependent in a plant. But I would not generalize that from humans. I don't think that would be very reliable. So copper, zinc, manganese, and probably vitamin B6 would be important for diamine oxidase activity in the gut. I mean, vitamin C is important to stabilize mass cells and prevent them from releasing histamine, but I don't know if it binds to histamine. But in any case, I wouldn't use them as a direct antihistamine. Vitamin C would-

Chris Masterjohn (00:31:03):
Vitamin C would be safer to do that with. Although, vitamin C at high doses is not completely without risk. But copper at high doses would be at serious risk of toxicity, which I think is where your question's going.

Chris Masterjohn (00:31:19):
All right so back to your question.

Chris Masterjohn (00:31:24):
Oh, so part of your question was if copper and vitamin C works as an antihistamine, could this increase the need for copper and vitamin C because they may be used against histamines instead of getting absorbed? No, I would not count on that at all. I think that would be extremely unsafe to high dose copper, assuming it's not gonna get absorbed. That's not safe at all.

Chris Masterjohn (00:31:49):
Back to your question, "Is it correctly understood that mast cell activation syndrome leads to more histamine being produced in the gut? And if histamine binds to copper and vitamin C in

the gut, could mast cell activation lead to deficiencies in copper and vitamin C?" So I don't know about this binding to histamine in the gut.

Chris Masterjohn (00:32:06):
If you have a source for that information and you post a link to it, I'll take a look at it during this AMA. But I'm not familiar with that so I'm going to assume that the vitamin C is helping stabilize mast cells and prevent them from releasing histamine, and that the copper is supporting diamine oxidase activity. Under neither case is the copper and vitamin C going to be bound to anything that prevents them from being absorbed.

Chris Masterjohn (00:32:41):
Mast cell activation syndrome is probably going to raise the need for copper and vitamin C at a minimum to prevent the syndrome from being as bad as it could be in its worst case. But whether it's gonna take copper and vitamin C away from other functions, such that you would get scurvy, or any kind of classical copper deficiency syndrome, like neutropenia, or something like that. I don't know if that would happen. It might, but I don't know that would happen.

Chris Masterjohn (00:33:21):
Going on to the last part of your question, "And when supplementing with high doses of copper, is it then possible to prevent copper toxicity by testing, in that case, with which markers?" Yeah, you want to measure serum copper and serum ceruloplasmin. And the top priority goes to serum copper, and you want to be in the middle of the range, not in the top, not in the bottom. Thank you Elrich and Iris for your question. Hope that helps.

Chris Masterjohn (00:33:55):
Cindy M. says, "Hi, Chris. Thanks for hosting these. I always learn a lot." You're welcome, Cindy. Thank you for your appreciation. Cindy goes on, "To your knowledge is there any upper limit on B complex by IV versus oral intake? We'll be getting ALA infusions soon to treat nerve pain after some Pub Med studies and the protocol recommends daily B complex supplementation.

Chris Masterjohn (00:34:20):
The B IV would contain the following amounts, thiamine hydrochloride 100 milligrams per milliliter, riboflavin two milligrams per milliliter, dexpanthenol, USP, two milligrams per milliliter, niacinamide, 100 milligrams per milliliter. Can you think of any downside to getting this amount five days a week for three weeks by IV?

Chris Masterjohn (00:34:37):
Well, the first thing that I'll say is I can't make any heads or tails out of those doses because you didn't tell me how many milliliters you're going to take in each infusion.

Chris Masterjohn (00:34:49):
But what I can say is that thiamine might cause problems in rare circumstances where people have some sort of sulfur intolerance, but there's no thiamine toxicity to be concerned with as a general rule. Riboflavin, the ratio of riboflavin here is very small. If you just look at the DRI's for

these, you have an obvious low amount of riboflavin relative to the amount of thiamine no matter how many milliliters you're getting infused just on a ratio basis. So it's hard to imagine that you could possibly wind up with too much riboflavin, but there's also no toxicity from riboflavin. Granted any B vitamin in megadose might cause imbalances with other B vitamins, but there's no general toxicity syndrome that would, by rule of thumb, tend to cause problems with thiamine or riboflavin. Dexpanthenol is a form of B5 and that's also a very low amount. But extremely high amounts of pantothenic acid have been used orally or by IV. They seem to be very efficiently used and also have no toxicity.

Chris Masterjohn (00:36:19):
The niacinamide is something that could have toxicity. So niacinamide, first of all, it shouldn't cause flushing, although it might in some exceedingly sensitive, oh, Cindy clarifies that one milliliter is used in each infusion. So that's one milliliter of the infusion five days a week for three weeks so you're basically getting these exact doses five days a week for three weeks. So that's 100 milligrams a day of thiamine five days a week for three weeks, two milligrams of riboflavin, two milligrams of dexpanthenol, 100 milligrams of niacinamide, each of those five days a week for three weeks.

Chris Masterjohn (00:37:17):
The niacinamides the only thing that has some potential toxicity concerns, the concerns would be sapping methylation and inhibiting NAD dependent enzymes, meaning inhibiting enzymes that do things that depend on the hydrolysis of NADS. So PARPs and sirtuins, but 100 milligrams five days a week for three weeks is pretty low dose. So I wouldn't be too worried about it, but that would be the... And it's probably not going to cause flushing either. Although I've seen anecdotes of very sensitive people, getting flushing from niacinamide. It's pretty rare. I think.

Chris Masterjohn (00:38:14):
So that would be the only concern and it's not a big one at those doses. Thank you, Cindy, for your question.

Chris Masterjohn (00:38:23):
Heather Chandler has the next question. Heather says, "I begin my day with oral re-hydration salts, 1300 milligrams of sodium chloride, 750 milligrams of potassium chloride, 1,450 milligrams of trisodium citrate dehydrate, and glucose. I do this one hour prior to eating breakfast. Could I take 15 milligrams of zinc along with this? Or would you expect the rehydration salt to out compete the zinc?"

Chris Masterjohn (00:38:56):
I think that it would be fine to take zinc with that. Yeah, I don't see anything that would be obviously a problem. So that was quick. Hopefully it was helpful. Thank you, Heather, for your question.

Chris Masterjohn (00:39:11):

RJ Douglas says, "Hi, Chris, thank you very much for doing these AMAs." You're welcome RJ, "They're very educational. I have heard that reishi, as discussed in this study and turmeric as discussed in this study, can both decrease testosterone production. I enjoy having these items on occasion. So my question is assuming a standard dose for how long with these impact testosterone production? For example, would the impact on testosterone be cleared from my system in 24 hours? I ask this question in part, because I usually weight train in the morning. So I want my testosterone to peak around that time. And I'm considering adding turmeric, reishi, et cetera, in the afternoon or evening in order to get the restorative and the anti- inflammatory benefits from these substances without them impacting my workouts. Thank you very much for taking my question."

Chris Masterjohn (00:40:07):
So let me share my screen here. So we're looking up at a study in the International Journal of Endocrine Chronological Metabolism from 2012 called An Update on Plant-Derived Anti-Androgens from Paul Grant and Shamin Ramasamy.

Chris Masterjohn (00:40:49):
And this says, "Anti-androgens are an assorted group of drugs and compounds that reduce the levels or activity of androgen hormones within the human body disease states in which this is relevant, include polycystic ovarian syndrome, hirsutism, acne, benign prosthetic hyperplasia, and endocrine related cancer, such as carcinoma of the prostate.

Chris Masterjohn (00:41:12):
We provide an overview and discussion with the use of anti-androgen medications in clinical practice and explore the increasing recognition of the benefits of plant derived anti-androgens. For example, spearmint tea in the management of PCOS, for which some evidence about efficacy is beginning to emerge.

Chris Masterjohn (00:41:26):
Other agents covered included red reishi, which has been shown to reduce levels of five alpha reductase, the enzyme that facilitates conversion of testosterone to dihydrotestosterone, licorice, which has phytoestrogen effects and reduces testosterone levels, Chinese peony, which promotes the aromatization of testosterone into estrogen; green tea, which contains epigallocatechins and also inhibits 5-alpha reductase, thereby reducing the conversion normal testosterone into more potent DHT; black cohosh, which has been shown to kill both androgen responsive and non-responsive human prostate cancer cells; chaste tree, which has a reduces prolactin from the anterior pituitary; and saw palmetto extract, which is used as an antigen through it, although it showed no difference in comparison placebo in clinical trials."

Chris Masterjohn (00:42:17):
Well, I'll stay off the bat that I'm not familiar with this data, but we are going to have to know most probably what the active component is, and then have a pharmacokinetic study on how long it lasts in the body to even begin to answer your question.

Chris Masterjohn (00:42:34):
And I would be surprised if they have detailed data on that, unless there's actually a sort of... What you would ideally want is a half life of the effect in humans. So a study where they dose a certain dose on a regular schedule in humans, and then look at how long does the decrease in testosterone take to recover. And then that's going to be very complicated by the fact that they even indicated in the abstract, some of these are having inhibiting testosterone metabolizing enzymes, like 5-alpha reductase, which isn't even going to... You'd have to be measuring DHT and other testosterone metabolites together to be looking at the activity of that. And I would be very surprised if they have detailed data on that in humans.

Chris Masterjohn (00:43:35):
Maybe just keyword search through here. So you were concerned about reishi and turmeric, right? So reishi, they say, "Red reishi, commonly known as LingZhi in Chinese, is a mushroom thought to have many help benefits and research exploring the antigenic effects of 20 mushroom species, reishi mushrooms are the strongest action inhibiting testosterone. That study found that reishi mushrooms significantly reduced the 5-alpha reductase preventing conversion of testosterone in the more potent DHT. High levels of DHT are a risk factor for conditions such as benign prosthetic hypertrophy and baldness."

Chris Masterjohn (00:44:13):
I'll tell you right away that it sounds like this is a cell study where you're not going to have any information on half life in the human. Oh, so they're looking at inhibiting testosterone induced growth of the ventral prostate in castrated rats. This is a terrible abstract in that it's not clear whether they did a cell study to screen these compounds and then took one and tested it against prostate growth in castrated rats or prostate growth in castrated rats was the main test.

Chris Masterjohn (00:45:10):
Shoot. I think I'm not sharing this study. Let's see. Let me stop share and then share again and go to, is this Fujita 2005? Yeah, it is. All right. So share Fujita 2005. All right. So here they are making methanol extracts of edible mushrooms and then, all right, it's basically a cell study. So they're taking rat liver and prostate microsomes, which are endoplasmic reticulum, which is a subcellular organelle, and then they're looking at the effect of the enzymatic activity in those extracts.

Chris Masterjohn (00:46:05):
So this is giving you nothing that could answer your question at all, because this is just a basic screening of the potential activity. And we don't even know if feeding this to a rat makes the rat absorb it and how long it takes to go away, let alone a human. So in the rat study, they took the testes out of the rats. After four days, testosterone was injected into them once daily for seven days. Some animals got a 0.3% of the mild fruiting body of ganoderma lucidum with their food. And so that was, is that reishi? Gano, that must be reishi, right? So I don't... Let's see if there's anything on time course here. I don't think so. So they got it at the same time as the testosterone. They got them once daily for seven days. Then they killed them and they looked at the growth of the prostate. So, okay. Let me stop sharing and go back to this one.

Chris Masterjohn (00:48:24):
So there's nothing about the time course there. And also they don't have, the anti-androgen effect was just shown in the screening of the... It's not even a cell study, they isolated a subcellular component and then screened it. And so you, presumably you have, an effect in the rats, given that you inhibited the testosterone induction of prostate growth, but the anti-androgenic effect on the enzyme is looking at it in a way you're sort of just dumping the extract right on the subcellular organelle.

Chris Masterjohn (00:49:15):
And so you have to keep in mind that when you, generally these cell studies aren't accurate because phytochemicals are treated as xenobiotics, and so besides the fact that you're absorbing probably 1% on average of phytochemicals, and then you are methylating them and glucuronidating them, et cetera, et cetera, generally cells are exposed to the phase II conjugates, meaning once you've detoxified it to make it easier to excrete their by methylating, glucuronidating, et cetera, that's what cells are exposed to. So dumping these things on a subcellular organelle is... It's an interesting proof of principle as a screening thing, but I wouldn't conclude anything at all from it, except that that might happen.

Chris Masterjohn (00:50:05):
And there's you can't draw any time course from this in vivo study there, and they don't list any other relevant studies in this paper. And so that might be all there is on that. And then do they cover curcumin or turmeric in this one? I know you gave the other one, it looks like not.

Chris Masterjohn (00:50:29):
So then on the other one you have is, Modulation of AKR1C2 by Curcumin Decreases Testosterone Production in Prostate Cancer from Cancer Science, 2018 by Ide Etal. And they say here that, "Intratumoral androgen biosynthesis has been recognized as an essential factor of castration resistant prostate cancer. The present study investigated the effects of curcumin on the inhibition of intracrine androgen synthesis in prostate cancer."

Chris Masterjohn (00:51:06):
So we're looking at the cancer making its own androgens. "Human prostate cancer cell lines, LNCaP and 22Rv1 cells, were incubating with or without curcumin. Afterwards, cell proliferation was measured at 0, 24, 48, and 72 hours respectively. Prostate tissues from the transgenic adenocarcinoma of the mouse prostate (TRAMP) model were obtained after one month oral administration of 200 milligrams per kilogram per day, curcumin."

Chris Masterjohn (00:51:38):
200 mgs per kg is a lot of curcumin, but anyway, let's see prostate tissues from that mouse model... Okay. So they fed the mice 200 mgs per kg per day of curcumin for a month, and then looked at prostate tissues from this mouse model of adenocarcinoma.

Chris Masterjohn (00:52:05):

"Testosterone and DHT concentrations in the prostate cancer cells were determined through mass spectrometry. Curcumin inhibited cell proliferation induced apoptosis of prostate cancer cells in a dose dependent manner. Curcumin decreased the expression of steroidogenic acute regulatory proteins, CYP11A1 and HSD3B2 in prostate cancer cell lines, supporting the decrease of testosterone production in prostate cancer cells.

Chris Masterjohn (00:52:34):
After one month oral administration of curcumin, aldo-keto reductase expression was elevated. Simultaneously decreased testosterone levels in the prostate tissues were observing the TRAMP mice. Meanwhile, curcumin treatments considerably increased the expression of aldo-keto reductase in prostate cancer cell lines supporting the decrease of DHT. Taking together these results suggest that curcumin's natural bioactive compounds could have potent anti-cancer properties due to suppression of androgen production. And this could have therapeutic effects on prostate cancer."

Chris Masterjohn (00:53:11):
I guess the first thing I would want to know, and I'm not too familiar with this topic, is do these prostate cancer cells have alterations to testosterone production that make the effective curcumin different in them? I don't know if I'm going to be able to find that easily, unless it's mentioned in the intro.

Chris Masterjohn (00:53:40):
So let's take a quick look, "Cultured cell analysis curcumin has been shown to cause apoptosis in cell cycle arrest with prostate cancer cells." They did a double blind trial on prostate specific antigen in male patients with negative prostate cancer biopsies. PSA levels decreased in the patients among the group, which PSA was over 10 and were treated with the supplement containing isoflavones and curcumin.

Chris Masterjohn (00:54:18):
Furthermore, treatment strongly inhibited PSA production and expression, antigen receptor. So this study, the way they're talking about this study, kind of sounds like a BS to me. So I want to take a look at that. It sounds like they are... So the relevant thing right in this study is did the... All right, I got to change my sharing to Ide 2020 in Fujita one second. Oh, I didn't open it, that's why.

Chris Masterjohn (00:55:20):
So the relevant thing in this study is going to be were the... First of all, they're combining soy with curcumin. And so we don't know which is doing which, but the relevant thing is not whether the PSA went down. That's a complete BS way to look at this because if something is high, it will go down as a result of regression of the mean on average no matter what, was PSA lower in the supplement group versus the placebo group?

Chris Masterjohn (00:55:57):

So this study is complete BS. So look at this, the PSA at baseline is, first of all, it's higher in the supplement group than in the placebo group, which there's not a lot you can do about that. If you're randomizing it, if it's a small study whatever. But the point is that it's 2.5 points higher in the supplement group than the placebo group. And the amount that it's going down is, look its PSA lower in the placebo group. End of story. But of course that doesn't tell you anything really, because, it's very consistent with this thing doing nothing to PSA.

Chris Masterjohn (00:56:56):
So the principle of regression to the mean is, and I have a post on this where I went into great detail, just search my website for regression to the mean I got an article called, When a Study Shows Something is True, But It's Completely False and There's Regression of the Mean or something like that. But the principle, I won't go through the mechanics of why this is true, but the principle is that if something is high, it will go down on its own. And the reason is that if you get a collection of people with high PSA some of those people always have high PSA, but some of those people, usually have lower PSA, but they just had a bad PSA day.

Chris Masterjohn (00:57:44):
And so, because their PSA was higher, they got into that group, which means that on average, you're going to have more of those people that usually have normal PSA, but it was high on that day that you measure the next time. And it's just the overwhelming probability is that the PSA is going to be lower for them, and they're going to drive down the group average. And so that's why the overwhelming rule that you would get from any statistics class is that what you want to look at is the ending value in the supplement versus the placebo group.

Chris Masterjohn (00:58:16):
But if you have a well conducted study that shows nothing and you want to, and you want to BS your results, you'll look at something like the decline over the course of the study in ythe supplement group. Why would you even have a placebo at all if that was the metric area? It's total BS. And so this study shows that this thing does nothing to PSA because the PSA is literally lower in the placebo group than the supplement group. And that's not statistically significant.

Chris Masterjohn (00:58:49):
But the point is, if you wanted to show that this supplement did anything, you would need to show that this was statistically significantly lower in the supplement group than the placebo group. So the conclusion from this paper is that there is no inhibitory effect of soy isoflavones or curcumin on the production of PSA. And therefore all the mechanistic BS to explain why that effect exists is useless because it doesn't exist.

Chris Masterjohn (00:59:22):
So, all right, going back to that paper. All right. So they have shown that curcumin... All right, so this is the same authors who showed this study, who are misrepresenting it in this paper. Therefore, I question this whole paper, because these people are trying to propagate this extremely weak effect in this paper and build on it by showing more and more reasons why in effect what didn't happen happened.

Chris Masterjohn (01:00:14):
So that really calls into question the whole thrust of this paper. But anyway, so what I really want to know is does this have any information on why a prostate cancer cell might be different in its testosterone production than a human test testicle, for example? Actually real quickly, I wonder did this paper, they did a human study, right? So did the human study show any effect on testosterone in the humans? No, they did not. They didn't look at that. I don't know why they wouldn't look at that in the human study, if that was their hypothesis. Although they might have looked at it and there was no effect and so they didn't show it. I guess let's check real quick in the discussion.

Chris Masterjohn (01:01:59):
Many studies have shown that intratumoral steroidogeneses of testosterone prostate cancer cells active...

Chris Masterjohn (01:02:03):
Intratumoral steroidogenesis of testosterone, prostate cancer cells is active, including these... The case of castration resistant prostate cancer. To date a series of steroidogenic enzymes necessary for antigen biosynthesis from cholesterol were observed in prostate cancer. Over circulating cholesterol levels were directly correlated with tumor expression 17-A1, which is the critical enzyme for de novo synthesis of androgens. So, it looks like they're making normal enzymes, but that doesn't mean that the expression is regulated the same way as in normal testes cells. I guess one thing I'll look at real quick is whether curcumin in examines Human Effect Matrix has anything on testosterone. And I'm not seeing it so far.

Chris Masterjohn (01:03:18):
I'm starting to... I feel like I should redo all of examines work because I don't know why they take this PSA study seriously. But anyway. Holy smokes, there are a lot of things listed in the Human Effect Matrix. All right, testosterone. Oh, great, great. A human study showing no effect.

Chris Masterjohn (01:03:51):
A randomized double-blind, placebo-controlled trial to evaluate the role of curcumin and prostate cancer patients with intermittent androgen deprivation, prostate 2019 by Choy et al total of 97 participants were randomized one-to-one to curcumin and placebo. Among them 82 patients were /valuable for the analysis. I don't care about the off treatment. The change of PSA testosterone levels during six months were not different between curcumin and placebo groups. So, no effect on testosterone in humans. Let's see. And then let's see if they have RACI. Human Effect Matrix for RACI. Do we have testosterone? Going once?

Chris Masterjohn (01:04:57):
Testosterone C-Study randomized clinical trial of an ethanol extract of Ganoderma lucidum, and then with lower urinary tract syndromes and no changes were observed with respect to testosterone levels, among many other things. All right. Well, that's it. There's no effect on testosterone of either of these things in humans. These screening studies are interesting, but

there's no human effects, and these people are over interpreting their results and promoting a bigger effect than there is.

Chris Masterjohn (01:05:36):
So, I wouldn't worry about it at all. But to give you an alternative answer, generally, most of these phytochemicals, I mean, if you don't know the specific one and you can't really say much about the dose over time and how long it takes to go away, but as a general rule of thumb, your body's trying to get rid of this stuff, and usually it doesn't stay much in the system for more than 24 hours. So, I'm most familiar with green tea and I know green tea catechins, they're gone in 24 hours, maybe a little bit stays around, but if a certain dose is going to be required to do something with testosterone, in which case it's going to have to be way bigger than any of the doses in these studies finding no effect.

Chris Masterjohn (01:06:32):
Even if there's some left after 24 hours, there's not going to be much left. Not enough to do anything that first initial dose was required to do. So, thank you, RJ, for your question. I hope that helped. Hope that helped everyone, who's interested in reading research. I know it was a little long winded, but we got to look at how to look at science studies.

Chris Masterjohn (01:06:55):
Peggy Loughlin says, "Does baking glycine and recipes negate part or all of its benefits?" I doubt it. I mean, generally proteins are... The protein itself isn't heat stable, but the amino acids are pretty heat stable. So, I've never seen a study on baking with glycine, but I wouldn't be surprised if that... I would be surprised if that negated its benefits. Thank you, Peggy, for your question. Peggy says, "I'm eating prone while watching screens. You are fired. Smiley face." Well, you're still here aren't you.

Chris Masterjohn (01:07:44):
Taube Becker says, "Bad reactions to magnesium, erratic heartbeat, bad dreams, loud tinnitus. What do you think this is due to, low aldosterone? I read magnesium inhibits aldosterone release. Is that part of the problem? How to improve, increase aldosterone levels naturally? Thank you." I think that's far out as an explanation, because you could just be having hypermagnesemia. And so, of course, if you have hypermagnesemia, you're going to have an erratic, you're going to have heartbeat issues. I mean, generally too much magnesium's going to slow the heart rate, but it could do the opposite, and it could also cause secondary hypermagnesemia. It can also cause secondary hypocalcemia. I mean, overwhelmingly the top... Like maybe these other things you mentioned are true, but overwhelmingly the top issue is, is it altering your serum magnesium, and or calcium levels?

Chris Masterjohn (01:09:05):
So, you really should look at serum magnesium, not red blood cell magnesium. Serum magnesium in the fasting state and then also after you take a magnesium supplement, because it might be that you're fasting, serum magnesium is in the normal range, but that maybe it's on

the higher end and as a result, or maybe it's not and as a result of something else, when you take a magnesium supplement, you're spiking into the hypermagnesemia range.

Chris Masterjohn (01:09:38):
If it's over the top of the range at all, I would consider that possible. And if it's double the top of the range, I would consider that just directly the problem. And so, you are bringing up, perhaps there are other secondary effects on other electrolytes or something like that I guess you're saying through aldosterone, which is going to be... Especially relevant to salt and potassium. And maybe, but really any electrolyte abnormality is going to be very overlapping with any other electrolyte abnormality, because these are all collectively driving neuronal excitation, and neurotransmitter release, and action potentials in neurons and contraction of muscles. So, all of these things could be just anything that could be from a salt or potassium imbalances, is probably also going to be possibly related to a calcium or magnesium balance. And so, it's just overwhelmingly...

Chris Masterjohn (01:11:08):
Taube says, calcium is 9.1 around that time, too. I think you want to look at... I don't think you said your magnesium at that time, but your calcium... You want to look at ionized as well to rule out a calcium issue, but I would be much more interested in your serum magnesium at that point. Particularly post supplement, rather than fasting.

Chris Masterjohn (01:11:50):
Taube says, "Serum mag. Okay." I'm not sure what you mean. I don't remember the mag, serum mag. Okay. Do you mean, it was okay, but you don't remember the exact number? Or do you mean, "Okay. I'll go look at it, because I don't remember." Oh, I mean, I'll order it.

Chris Masterjohn (01:12:08):
Yeah. So, I would get serum magnesium fasting, and then take your usual dose of magnesium, and test your serum magnesium like an hour later or something like that. And see... Or, well, actually I would take the distance based on the distance of symptoms. So, if you get these problems four hours after taking magnesium, then you might want to... And if that maybe that's usually at night, but then I would take it in the daytime or whenever you can test reasonably and do a four-hour post magnesium, if that's the usual timeframe for the symptoms. I guess your heart rate might be more sensitive in the sense that you don't have to wait for... Obviously, you can't test your serum magnesium while you're asleep and dreaming, but you could use whatever the nearest symptom is.

Chris Masterjohn (01:13:05):
So, it takes X number of hours to develop an erratic heartbeat. And that's the first thing. And then, when you notice the erratic heartbeat, if you fall asleep, you notice the dreams, et cetera, then take the minimal distance for the erratic heartbeat or the... Not really the minimal, but the modal. So, like what is the most common distance of symptoms from taking magnesium? Most commonly around two-hour mark, for example, then use two hour mark as your... take the magnesium at a point where you could go in two hours later and get it tested, and otherwise

keep the conditions of taking it as similar as you can. Obviously, you can't control for time of day, but if you usually take it on empty stomach versus you usually take it with a meal, do that so, that it's similar and look at the serum magnesium post supplement.

Chris Masterjohn (01:14:02):
Although I would say try to control for time of day, as much as you can. So, like if Labcorp closed at 5:00, and you get a 4:30 appointment, then that would be better just in case there's any kind of diurnal effect of anything that's interacting with it. That's what I would do. And there's no reason to say like, don't look at aldosterone, but I just wonder maybe you're taking too much magnesium or it's not getting into cells and your serum magnesium has an outsized response to it. Thank you, Taube, for your question.

Chris Masterjohn (01:14:51):
RB says, "For someone with gut problems, how would they know if they have low stomach acid? Is there a noninvasive accurate way to test that? I thought I might have low stomach acid. And took betaine HCl, but afterwards I felt a strong burning sensation in my stomach. What are other things I could try? And how would I know they're working? For example, apple cider vinegar."

Chris Masterjohn (01:15:11):
There are no accurate noninvasive ways to know. So, the conventional way to do it is... I forgot what it's called. It's a swallowable monitor, trying to see if I can find the name of it. Let's see. Yeah, I don't know. I forget the name of it, but anyway, it's a monitor that you swallow that gives a pH reading.

Chris Masterjohn (01:16:15):
There are various tests that are probably useful, but not necessarily anywhere near as accurate or precise, such as the baking soda test. You can just Google these like HCl baking soda test, and you take a little bit of baking soda, if you burp really quickly, you have high stomach acid. If it takes you forever to burp, you have low stomach acid, then there's the HCl test, you did that, I don't know how many you took. If you took one capsule, then you probably don't have a deficient stomach acid, but if you took six then maybe you do and you just need a lower dose.

Chris Masterjohn (01:16:56):
But you can't rule out that you just have a sphincter problem. And so, you take a little bit of HCl and it's coming back up rather than doing anything. RB clarifies, just one capsule. Yeah, I mean, you can't rule it out. You can say it's less probable. Try the baking soda test. If you burp fairly quickly with the baking soda, then you can probably rule it out.

Chris Masterjohn (01:17:25):
It's not a precise test at all, and I don't know that you can rule in low stomach acid with a long time to burp, but you can at least... You take it and then you burp, you can at least rule out that you don't have much stomach acid. And then, if you really want to know, you got to swallow that capsule. So, thank you, RB for your question.

Chris Masterjohn (01:17:59):
Garry Krieger says, "Hi, Dr. Masterjohn." Hi Gary. "I know you're not a fan of SpectraCell, but if you could humor me. I've had three SpectraCell tests, 2014, 2015, 2019. 2015 results followed changes in my diet and supplements versus '14 results, giving me confidence in the test. My lipoic acid and CoQ10 were at healthy levels in both tests. With that said from '16 to '19, I adopted a Peat-like diet, meaning Ray Peat, Peatarian. Mostly increasing milk, sugar, gelatin, and cooked veggies and decreasing grains and raw veggies."

Chris Masterjohn (01:18:42):
"A '19 test showed a dramatic drop in lipoic acid, and CoQ10. No other significant changes were seen. Since '19, my diet has returned to including all foods. Could a higher sugar intake cause a drop in lipoic acid, and CoQ10? Also, a key nutrients are needed to boost lipoic acid and now regularly consume raw spinach, broccoli, and supplement with ancestor supplements, beef organs. Thank you."

Chris Masterjohn (01:19:20):
I mean, if lipoic acid, CoQ10 went down when you increased milk, sugar, gelatin, and cooked veggies, I think it's not from anything you increased. I think it's from what you decreased. You obviously decreased something besides raw veggies, and grains. Or maybe you didn't. I mean, maybe the grains were really high then. I don't know. I just find it very unlikely that either of those things are going to go down because of something you had in your diet, instead of something you didn't have in your diet that had a CoQ10.

Chris Masterjohn (01:20:08):
So, I don't know. I mean, off the top of my head, I just know that potatoes have some lipoic acid and organ meats are generally high in lipoic acid and CoQ10 is overwhelmingly high in heart meat, but also soybean oil is quite high in CoQ10 compared to all other oils, and that's definitely a no-no on a Peatarian diet.

Chris Masterjohn (01:20:46):
But other than that, I would look up in a database, the foods you were eating for lipoic acid CoQ10 to try to figure out what went missing in your diet. I really doubt high sugar intake caused a drop in those. I doubt it. But as you said, I don't read much into the SpectraCell. And I know you saw changes that reflected your supplements, but I think you must be extrapolating, obviously you don't mean that you were supplementing with LA and CoQ10 when it was high, in which case that's why it was high.

Chris Masterjohn (01:21:37):
It sounds like you're saying you made changes to other supplements. And so, therefore you have confidence in SpectraCell in general, and now you have confidence in LA and CoQ10. I think that's completely wrong. I mean, if you weren't changing your LA and CoQ10, the way that it explains the SpectraCell results on it, you have no basis to assume that it accurately

reflects your LA and CoQ10 status, unless you're just saying it was so consistent across those years until you changed your diet.

Chris Masterjohn (01:22:16):
But I don't know. I think that's weak. So, I don't know, I don't have a good answer to your question. Your LA will probably go up, if you eat more potatoes, and organ meats, and your CoQ10 will probably go up if you eat more beef heart. Or if you take those supplements. But off the top of my head, I can't tell you every step of LA synthesis or anything like that. And I would look at blood concentrations of those and not the SpectraCell. So, I think SpectraCell's good for brainstorming, but not for confirming. Yeah, but anyway, that's all I can give you off the top of my head. Thanks Gary, for your question.

Chris Masterjohn (01:23:10):
Joan Hutchinson says, "Normally if I need a sweetener and a recipe, I use medjool dates. Looking for a substitute for the odd time. Need a product that acts similar to granulated sugar. Came across lucuma powder made from lucuma fruit. Wondering what your thoughts on lucuma powder? I have no thoughts on lucuma powder." I don't know anything about it, but if you want a sweetener that acts similarly to granulated sugar, and you're not against eating sugar, which you're obviously not against if you eat dates, then I would get rapadura, which is granulated sugar that hasn't been refined. I think that would be overwhelmingly most likely to act like granulated sugar, because it is granulated sugar. It's just not refined, because it sounds like what you want is just non- refined sweeteners that do have sugar, because that's what dates would be. So, I would use rapadura and I don't know anything about lucuma powder, so sorry I'm not directly answering your question, but I don't know if I helped, but I hope I helped. Thank you, Joan, for your question.

Chris Masterjohn (01:24:19):
Pamela Peak says, "Any thoughts on treatment for chronic tinnitus and people older than 55, or 60 that has no obvious acute causes just getting worse over the years." Well, you want to look at the causes 30-years ago. So, unfortunately tinnitus never has an acute cause. Tinnitus is a 30-year delayed response to the loud music you listen to when you're a kid, or to working in occupational exposure to high noise without adequate ear protection.

Chris Masterjohn (01:24:52):
So, rarely do you want to look for an acute cause that's happening at the moment rather than 30-years ago. But magnesium has been shown to help with tinnitus. Although Taube, gets tinnitus from taking magnesium so, there's an exception to every rule, but magnesium's the first thing that I would look at. Thank you, Pamela, for your question.

Chris Masterjohn (01:25:17):
Anonymous says, "If I think I have fat malabsorption, for example, low triglycerides, Steatorrhea, and floating stools, the digestive enzymes don't seem to solve it. What are interpretations you would recommend to potentially address it?" How does someone know if they have a problem with bile, or insufficient enzymes, or some other root cause. I mean, you

definitely have fat malabsorption. If you have low triglycerides, Steatorrhea, and floating stools, you might want to look at whether there's a new phenomenon or it has been always with you, because if you have always had low triglyceride, Steatorrhea, and floating stools, then you might have a genetic hypo-beta-lipoproteinemia or Abetalipoproteinemia, which would cause genetic fat malabsorption. If that's not the case, then I would look at thyroid levels first, I would try bitters to promote the fat digestion machinery. So, urban moonshine makes a good bitters tincture that you can get on Amazon. Take recommended dose. You could experiment with a meal, or half hour before the meal, see which helps better. I mean, kind of hard to tell between enzymes versus bile, but if enzymes don't help, it's more likely bile, although the dose might be relevant. And if bile helps and the enzymes don't, then it's probably bile or if taurine, and glycine help, it's probably bile.

Chris Masterjohn (01:26:58):
But bitters will promote the whole digestion machinery. And if nothing helps, then you should definitely look at whether you might have a genetic hypo or Abetalipoproteinemia. Thank you, anonymous, for your question.

Chris Masterjohn (01:27:17):
Eva Klein says, "Is vitamin C a histamine liberator?" No, vitamin C prevents histamine release. Although, there's always exceptions to the rule, but the rule is vitamin C as an antioxidant prevents Mast cell degranulation, and therefore prevents histamine liberation.

Chris Masterjohn (01:27:38):
Peggy Loughlin says, "The Cunningham Panel, by Moleculera test, CIM kinase-11. Not sure if this is anything remotely related to the kinase discussed earlier, if not, excuse helpful info." I don't know, but thank you, Peggy.

Chris Masterjohn (01:28:12):
RB says, "Thank you for hosting these very helpful AMAs, Chris." You're welcome. "Do I need to eat foods with calcium every day? Or is it okay to have large amounts of calcium containing foods, for example, dairy once or twice a week, but not have it on other days of the week?"

Chris Masterjohn (01:28:27):
You definitely want your calcium smoothed out over the day. Definitely. If I can't get enough calcium from foods due to food intolerances, and need to take calcium supplements, do you recommend taking calcium supplements at the same time as magnesium supplements? Doesn't matter. What about other supplements? I recall reading for instance, that zinc supplements should be taken at a separate time from calcium supplements because they compete for absorption sites.

Chris Masterjohn (01:28:55):
Generally, calcium at high levels will inhibit the absorption of everything. And that's not really any kind of specific thing. It's just calcium across the board, inhibits the absorption of all the other positively charged minerals. But that's high doses, and if you just keep your calcium

levels... Your calcium intake or doses, similar to what you get from a glass of milk. So, like 300 milligrams and no more than that at one time, I wouldn't worry about it at all.

Chris Masterjohn (01:29:23):
I mean, you can start to micromanage that cell stuff. If you have like, your plasma zinc is low, you have symptoms, and you can't figure out why, then you could try moving your zinc away from your milk or calcium supplement. But generally speaking, you can ignore that if you're not mega dosing. Thank you, RB, for your question.

Chris Masterjohn (01:29:52):
Garry Krieger says, "Would grains help with LA, being lipoic acid?" I don't know of the top of my head. I would look up a food database for LA and see if there's specific grains that you might have been eating when your LA levels were high and see if those match. If those are found in a food source database for LA. Off the top of my head, I would see if the Linus Pauling Institute page for lipoic acid might have a link to such a database.

Chris Masterjohn (01:30:24):
Pamela Peak says, "How do you feel about vibrant nutritional testing? Same as Spectracell, or Vibrant is a good lab." I don't know anything about them. I could look them up now. I feel like I have seen them, and I don't think they do have... I don't think their panel is like SpectraCells. So, tests we offer. So, I think this selling point of testing intracellular and extracellular is sort of dubious.

Chris Masterjohn (01:31:18):
All right, so three tubes will be drawn. One trace element serum tube, and two whole blood potassium EDTA tubes. The trace element tube will be spun down, followed by pipetting blended, blah, blah, blah. Yeah, they're just looking at the nutrient levels in the different fractions. Spectracell is not doing that. They are taking white blood cells and seeing if the white blood cells grow faster when they add the nutrient. And Vibrant's not doing that.

Chris Masterjohn (01:32:05):
And my problem with SpectraCell isn't that it's a big panel. There's all kinds of good, big panels that I like. If you look in the cheat sheet, which you all have access to for free. So, that's in the new Chrismasterjohnphd@substack.com, which is where master pass now is. There's a section of the menu that says eBooks, and just go there to get the cheat sheet, if you don't already have it.

Chris Masterjohn (01:32:28):
So, you'll see panels in there, like the ION plus 40 from Genova. I don't have a problem with panels and the Vibrant panel, there's nothing wrong with it, but they seem to think that just like measuring all the different fractions of blood that they can for these nutrients gives you necessarily better information. Sometimes it does, sometimes it doesn't.

Chris Masterjohn (01:32:57):

Go to Chrismasterjohnphd.com/marker. I have a podcast. What Makes a Good Marker of Nutritional Status?

Chris Masterjohn (01:33:03):
I have a podcast, What Makes a Good Marker of Nutritional Status, which explains my views there, but it's ... A good marker is one that's been validated against depletion repletion studies, ideally with clinical symptoms. So that it's shown that it's a clinically relevant marker of nutritional status. Just because you measured it more places doesn't make it better. So I think Vibrant is over hyping their intercellular add-on, but I don't have a problem with what they're doing. Whereas Spectracell is measuring whether a lymphocyte from your blood grows better in a medium that has everything except the nutrient added versus that nutrient being added.

Chris Masterjohn (01:33:48):
And that's like, maybe it's reflecting that you're poor in that status, but maybe it's just reflected that your lymphocytes have been activated and are hungry for more nutrients. So it's just like sometimes it'll probably line up with the well validated test. Sometimes it won't. But they haven't validated their test against anything that is a good validation metric. They just sort of assume that because they're cutting edge and they're doing something different, it's better, but that's not how markers work. They're better when they're better validated. And in the validation shown to be valid. All right. Thank you, Pamela, for your question. Anonymous says, "Chris, in previous AMA you noted that you regularly consume toast. Could you state what bread you use and if you have any bread recommendations, also your thoughts on Ezekiel bread? Thanks."

Chris Masterjohn (01:34:41):
When I eat toast, I eat Bread Alone whole wheat sourdough bread. And the only reason I use that, which I think is very good, is because I can't get the toast that I really love, which is French Meadows 24 hour European style sourdough rye. That is my favorite bread of all time. I used to buy it at Whole Foods in Massachusetts when I lived in ... Or was it Connecticut? I forget when I started, it might have been when I lived in Connecticut or it might have been when I lived in Massachusetts. But when I lived in Illinois, I was able to special order from the local food co-op by the case, and then store it my chest freezer. When I moved to New York, I can't get it. I can't get them to mail order it. I can't find someone who will special order it. And so I use my second best option, which Bread Alone whole wheat sourdough bread.

Chris Masterjohn (01:35:38):
Ezekiel is okay. But I find that this sprouted beans of all sorts is not super great on my microbiome. I do much better with sourdough whole grain than I do with sprouted beans of all sorts. Ezekiel is much better than regular bread, which I wouldn't touch with a 10 foot pole. I wouldn't eat standard American bread. I'll eat it when I'm out with people who don't understand nutrition that much, but I wouldn't want it to be a major feature of my diet by any stretch. So Ezekiel bread is, it's decent by that metric, but I don't eat it much just because I don't feel like I digest it as well as sour dough whole grain breads, and long sourdough is what I would want.

Chris Masterjohn (01:36:57):
Heather Chandler says, "Just wanted to thank you for some of your advice over the years. I was unable to get my selenium down without your help. I guess it was a methylation problem since taking creatine riboflavin finally worked. You also advised me to try zinc to increase white blood cell counts. And that has worked also, so well that I finally graduated from hematology. I really appreciate the opportunities to pick your brain." Thank you, Heather. I appreciate that. Peggy Laughlin says, "How much milk thistle is okay to take on a regular basis? Any other thought on protecting liver if I need to take ongoing things, medications, including CBD that go through the liver?" I don't know anything about CBD so I don't want to answer that question specifically, and I'd have to do some research on CBD to understand how it's detoxified and stuff like that.

Chris Masterjohn (01:37:50):
I also don't know any safety problems with milk thistle but do be careful that anything that is promoting liver detox as a phytochemical is doing so because it up regulates liver detoxification enzymes, which it does because it has to be processed by those enzymes because it's otherwise toxic. So there are going to be some people that your regular dose gives them some problem with toxicity. And that's going to be rare. It's going to be few and far between, but there will be some dose where too much is bad for anyone. And so without knowing the data off the top of my head, I would stick to the dose on the label and would not ... I wouldn't use it more than the dose on the label. Now, unfortunately, I can't give you any tips on CBD detoxification, because I haven't looked into it, but maybe when I get a chance, I'll try to look into it and write something about it.

Chris Masterjohn (01:38:50):
Anonymous says, "Chris, a follow up question regarding your diet. In a previous AMA you noted that you regularly consume raw milk. Can you please describe the benefits of raw milk and whether consuming pasteurized grass fed milk would offer similar benefits." We're getting close on time and so I can't ... I'll have to be kind of succinct, this is a very open ended question. You know what, for the benefits of real milk go to realmilk.com and just read what you read there. So quite a bit of ... Not quite a bit, but if you find some really science-y stuff, it was probably written anonymously by me like 15 years ago. But yeah, I mean, better nutrient absorption and undestroyed whey proteins are the main benefits, better immune function as a result is probably one of the most often claimed benefits from people who use it. Better toleration. I feel like it's kind of invigorating, I feel like my energy is lifted from it.

Chris Masterjohn (01:40:15):
And I mean, this sounds a little woo-y, but it feels more alive. I just feel like it has life force that I don't get from most other foods that I eat. Can consuming pasteurized grassed milk offer similar benefits? No, I mean, that it's grass fed will improve the fat soluble vitamin content of it. But no, I would not say that pasteurized milk has the same benefits as raw milk. And I don't even think raw cheese and yogurt have the same benefits as raw milk. So you'll get some of, most of what's in milk. You'll get the calcium, you'll get the fat soluble vitamins. But I think there's a lot of sensitive whey proteins, immunoglobulin and other stuff that are not going to

be.... That you're not getting. Enzymes, maybe. And there's, I don't know what is responsible for this life force thing, but you're not going to get that from pasteurized milk. Thank you, Anonymous, for your question.

Chris Masterjohn (01:41:37):
Peggy Laughlin says, "Hi, Dr. Chris, can you discuss the ancestral supplements more specifically for mildly hypothyroid? How would one take, adjust, et cetera?" I'm sorry. You're going to have to be way more specific than that. I mean, I don't know what you mean by discuss and I don't know what you're taking for thyroid or why thyroid would adjust what you're taking and so on. Maybe if you could rephrase that in a more specific way. Pamela says, "Perhaps you were looking for Heidelberg test earlier for gastric acid test?" That's it. That's exactly what I was looking for. Thank you. Heidelberg test is the name of that sensor you swallow for stomach acid testing. Anonymous says, "What are reasons for an increase in the need to urinate in the middle of the night? Several years ago, I used to never need to get up in the middle of the night to urinate. Now I feel I need to, and I think I have similar water intake."

Chris Masterjohn (01:42:37):
Rather than answering that, I will direct you to my YouTube video, How to Stop Waking Up to Pee. That has everything I know about how to stop waking up in the middle of the night to pee. So go on YouTube and search Masterjohn, How to Stop Waking Up to Pee. Thank you, Anonymous, for your question. Anonymous says, "Any nutritional suggestions to combat Agent Orange ingredient in Weed B-gon, that I reread causes prostate cancer, and the glyphosate and any other chemicals in Roundup, if you happen to know? We do magnesium glyphosate." So can you, I mean, clarify whether you're using this stuff? Because in no way whatsoever would I suggest that you use this stuff and then try to compensate with nutrition rather than getting rid of it. I mean, don't use weed killer would be like my number one health tip, like stay the hell away from it. That would be my first tip. I don't know anything about Weed B-gon.

Chris Masterjohn (01:44:18):
So I don't know anything about the mechanism. I can't say anything about that. Anything I know about glyphosate comes from Stephanie Seneff. So I would defer to what she's written about that, she has a book, Toxic Legacy. I've interviewed her, she's written a bunch of stuff and given many interviews and talks. In theory, glycine could protect against it, but your ... But I wouldn't rely on that. I would reduce my exposure to it as much as possible. So I wouldn't eat anything that ... Peggy says, "Hell, no, I'm not using it. Having trouble avoiding it in Tennessee." Oh, I see. So, I mean, number one thing would just be like purge your food supply of anything that might have it. But if it's environmental and you can't avoid it, I don't know. I mean, glycine is probably the number one thing that could protect against it.

Chris Masterjohn (01:45:29):
But I don't know if glycine is ... It's not going to protect against it as well as avoiding it. I don't know. More glycine. But I would defer to Stephanie Seneff. I'm sure she has other tips. I know when I interviewed her, she had some interesting interactions that she was talking about with deuterium, but that's sort of the secondary effects of glyphosate. It might be poisoning these

enzymes and therefore you need ... You would be bad at de dueterating stuff and benefit more by getting deuterium depleted water, which is sort of expensive compared to not ... Compared to avoiding glyphosate. I don't know. I'm sorry that I don't have better answers than that, but you say you're using magnesium glycinate. I see you made a typo, magnesium glyphosate. I mean, you could use more glycine than that.

Chris Masterjohn (01:46:41):
Deuterium depleted water. That interview's now on my Rumble page, because YouTube took it down. But if you go to you just go to ChrisMasterjohnphd.com and search for Stephanie Seneff you'll find it. And she talks about it, she explains there. But briefly, glyphosate poisons a bunch of enzymes and they dedeuterate and deuterium is bad for your mitochondria. And so you can get deuterium depleted water, which filtering is not doing. But I'm not an expert in this so I don't want to keep going on about it. But check out Stephanie Seneff's work and follow up by reading more of her stuff. Thank you, Peggy, for your question. Anonymous says, "In your COVID 19 and vitamin D guide, you recommend low dosing with vitamin D. How do you ensure that you're not bringing yourself into hypercalcemia when you're low dosing if you're someone who has experienced hypercalcemia from high dose vitamin D supplementation in the past? If you look at biologically active sum of vitamin D and calcitriol levels, what would be the optimal sum of numbers that you would aim for, for example, a hundred? Or would you optimize just for PTH being maximumly suppressed, as you mentioned in your book?" First of all, if you have a history of hypercalcemia in response to vitamin D don't do the loading dose. Work on doing some more testing around what are the conditions that are required to raise the hypercalcemia in response to the vitamin D.

Chris Masterjohn (01:48:24):
And in the meantime, while you're figuring that out, stay within the range that is known to not cause hypercalcemia. And then second of all, I don't know what the optimal range for the sum of vitamin D and calcitriol would be, but it would probably be something like 60 to 100 or something like that. And I would want to see that tested. I think testing it against PTH suppression would be great, but PTH suppression is currently my gold standard for testing vitamin D status, because now you are looking at your body's decision. And parathyroid gland, they take measurements of your serum calcium, many times in a second, and you might test these things once every three months, you know? Your parathyroid glands have way more information than you do. And so I would listen to them by looking at whether PTH is maximally suppressed. Thank you, Anonymous, for your question.

Chris Masterjohn (01:49:39):
Anonymous says ... And I guess we can ... We might be able to take another question if you get it in quickly, but we'll cut off questions soon, because we have nine minutes left and there's three left in the cue. All from anonymous. Anonymous says, "Hi, Chris, about to give up nutrition and kill myself via McDonald's." That's morbid. I'm sorry to hear that. "Extreme CFS, depression, anxiety, brain fog. Been at this for 30 plus years, don't even have the brain capacity or energy to do any more testing. Do you have any magic bullet ideas or do you recommend a hospital retreat, place, doctor, wizard I could go to for help? Anything mainstream will result in

being drugged up again, as you know. I'm out of ideas and ability to help myself. Thank you." I mean, I don't know. I'm sorry to hear that you're suffering, but that is ... I don't really know that much about your situation from what you said.

Chris Masterjohn (01:50:48):
I mean, my first gut instinct is that if you feel ... It kind of sounds like you feel like anhedonic. You didn't say that. But if your first instinct is you want McDonald's, I don't know if that was sarcasm by just saying that nutrition has been so useless for you, that you might as well eat McDonald's or if it was, I hate my diet so much that I want McDonald's or otherwise I would want to kill myself more quickly than I would by eating McDonald's for 30 years. If that's what you meant, then I think maybe you should eat some McDonald's, honestly. Because I do actually think that I fall into the category of someone who needs a certain level of hyper palatable food to feel basic ... To feel energy.

Chris Masterjohn (01:52:00):
And I think I probably run low in dopamine and that sometimes I need the dopamine spike of hyper palatable food in order to have normal ... Not even just normal mental health, but normal energy levels. I noticed a couple years ago that if I was out walking and I just decided to eat a baked good from a cafe, which I normally would not eat because it's it ... They don't make baked goods very, very well. Then I would just have this amazing surge of energy that could not be explained on the carbohydrate content alone. And so, just reasoning through it, I think it was from the dopamine spike. And so I do think that, I realize I might be misinterpreting you, but if that is a feeling that you had that your diet sucks and you just, you envy someone who can eat McDonald's because it would make you happier than you are now, if that's what you're feeling, then I do think that you should take a break from any restrictive dieting ...

Chris Masterjohn (01:53:13):
And by the way, I don't want this to come across as managing your case because obviously, I'm not a doctor, you're not my patient. There's a lot that I don't know. And I don't to ... I mean, please take this not as direct treatment advice, but as some things to think about, but in a educational sort of suggesting possibilities way. But I do think that it's quite possible that if you are suffering from anhedonia as part of the depression and brain fog ... And I do think sometimes brain fog and fatigue can be direct results of low dopamine function that are driven by just sort of not seeing the value of ... It's like subconsciously your brain is not seeing the value of revving up your system. And that's because it doesn't have enough dopamine driving input.

Chris Masterjohn (01:54:32):
And so the short way to fix that is to eat some McDonald's and the longer or medium term way to do that is to go to Whole Foods and go to the bakery and eat some cake or just get some healthy junk food that is not the bottom of the barrel like McDonald's is, but is still ... Someone put effort into using organic ingredients and maybe unrefined sweeteners, but still made a baked good. So try to find a healthy version of those things, allow yourself to relax and gain a little weight or whatever, and just see if that boosts your mood up would be one thing. But

then, I don't know what you've done, and so I don't know what you've done for testing. I just don't know what might be reinventing the wheel versus helping. But the first thing I would be looking at would be a strategy and genetic panel, a Genova methylation, and Genova ion panel plus 40. And I would spend time with your family first. Or whoever most ... Whoever you have the best relationship with that cares for you. It sounds like you feel a little overburdened.

Chris Masterjohn (01:56:15):
And so I would find some people that don't mind sharing the burden a little bit just for now, so you can feel better and you probably need a vacation. But I don't know, I'm not connected to retreat centers for stuff like this. And so I don't have specific suggestions, but ... I don't know, hopefully as brainstorming that helps you think through some things. Thank you, Anonymous, for your question. All right. Last two questions from Anonymous. Anonymous says, "Can you talk about where to start nutritional supplements for brain health and cognitive issues? And do you know why taking fish oil or omega three supplements might cause nose bleeds? Is there another way to get the same benefits one gets from fish oil?" Yeah. Omega three fatty acids are going to cause nose bleeds because they thin the blood and they thin the blood by the EPA inhibiting arachadonic acid metabolism. It's possible if you use a lower dose and eat more eggs and liver, that will balance out.

Chris Masterjohn (01:57:29):
Nutritional supplements for brain health and cognitive issues. I mean, that's way too big of a topic. I would direct you to my nutrition and neuroscience four part podcast, which is basically five or six hours of me monologging on nutrition and neuroscience. But there's brainstorming from that podcast, then there's testing. And like I said before if you have cognitive issues that are hard to figure out, especially if they include depression, anxiety, brain fog, then I think strategy and genetic panel, genome methylation panel and genome ion panel plus 40 is where to start for testing. Thank you, Anonymous, for your question. Last question of the day. Anonymous says, "In your book, why is the recommendation to supplement with K2 when supplementing with vitamin E rather than supplementing with vitamin K?" K2 is K. I guess you mean K1?

Chris Masterjohn (01:58:35):
Anonymous goes on, "I'm assuming it's because vitamin K is more easily gotten through foods whereas K2 is not." I think you keep saying vitamin K, I think you mean vitamin K1 because vitamin K1 and K2 are both vitamin K. Anonymous goes on, "I'm also wondering, is there a daily requirement for vitamin K2 besides balancing recommendations you have with vitamin E?" Yeah. So you want one or 200 micrograms per day of vitamin K2, and I'm pretty sure that's in ... Not sure where you mean, the book, I'm not sure if you're talking about the cheat sheet or you're talking about the Cliff notes or you're talking about the vitamins and minerals one on one class. Pretty sure K2 recommendation is in the Cliff notes and the class. And it's definitely in the vitamin K2 resource @chrismasterjohnphd. com/K2. Yes, it is true that K1 is very easily gotten from foods. I mean, if you just eat vegetables, you're going to get so much K1.

Chris Masterjohn (01:59:45):

If you just eat like a moderate amount of green vegetables, you're going to be swimming in piles of K1. Whereas it's pretty hard to put together K2, if you don't tend to eat the narrow range of foods that are high in K2. But yeah, that's why. It also true that MK4 is turned over more easily than K1 or MK7. And that if you're increasing the turnover with other fat soluble vitamins, you are disproportionately going to turn over more MK4. And so it does kind of make sense to get some MK4 specifically. All right. Hope that helps. Thank you, Anonymous, for your question and that is it for the questions tonight. Thank you everyone for a wonderful Q&A. I'll get the recording out probably in the next day or so, the transcript out in the next few days, the video up in the next couple days and hopefully, maybe tonight I'll get the next Q&A session date out. Thank you very much, everyone for wonderful night and have a great night. See you later.