Paleo Solution - 369

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Robb: Hey, folks, Robb Wolf here, another edition of the Paleo Solution Podcast. I am sure all of you know today's guest, Christopher Kelly. He's the co-founder of Nourish Balance Thrive along with Dr. Tommy Woods. These guys are turning the functional medicine and athletic training world on its head, lighting it on fire, and helping everybody in the process. Chris, how are you doing, man?

Christopher: I'm great. Wow, what an introduction. How can I possibly live up to that?

Robb: I'm setting you up for either massive success or a very lukewarm podcast. But I'm incredibly excited about this. Chris, you have a background in computer science. You had a plethora of health issues which forced you to basically take your health investigation by the reins and figure out what was going on. Can you talk to folks a little about that?

Christopher: Sure. I'm British, as people can probably tell from my accent. I came to the US in 2001. I had the opportunity to come here with Yahoo, the big tech company that moved me out to Sunnyvale and I instantly fell in love with the West Coast lifestyle which is road biking and mountain biking and kiteboarding and surfing and snowboarding, all of this really cool stuff. And so I was having a really good time with that.

               Eventually, somebody said to me, "Hey, you're pretty strong with the mountain bike. You should do some bike races." And so I did. And they were right. I got quite good results. And I got really excited about it and hired a coach and started doing lots more cycling. Eventually, I got to maybe 20 or even 30 hours a week of exercise, which is probably too much for even a pro mountain biker.

               I mean, I started eating more of the food that I was eating before I started, which is probably the foods which I was exquisitely sensitive too, so more pasta, more bread, more cereal, all that stuff. And, of course, the wheels started coming off the wagon. I experienced a lot of bloating, brain fog, diarrhea, gas. Erectile dysfunction was the thing that finally got me to go to the doctor.

Robb: That will perk you up. That will definitely perk you up, yeah.

Christopher: It was either you or maybe Kirk Parsley that said that men only go to the doctor for two reasons. One is a pain the chest and the other is the dick doesn't work, right? And so, for me, it was the latter. And the medical doctor who is -- He was pretty useless, actually. He prescribed me Viagra and he said, "Go see the gastroenterologist. They'll be able to sort out your gut."

The gastroenterologist was actually worse than useless, I'm just going to say. Totally useless. And they said, "Okay, it's nothing to do with what you're eating. Here's a prescription for steroid anti-inflammatory drugs. When those start working, we can do some surgery, and that's really all we've got for you." And that didn't sound like very good to me.

Robb: And you were like the ripe old age of…?

Christopher: Early 30s.

Robb: Early 30s. So, clearly the wheels were primed to fall off the wagon and you were just ready to die because of age and decrepitude.

Christopher: I know. And do you know what? I even booked a follow-up appointment with a gastroenterologist but I was really lucky because I just met the woman who is now my wife. Julie had just finished her master's degree in food science and she'd been looking at food sensitivities in the lab specifically dairy allergies. And she said, "You should really try an elimination diet before you go under the knife."

I thought, well, okay, let's do it. And I found the Paleo Diet for Athletes, which was a book by Loren Cordain and Joe Friel. I only worked this out recently. It was like I was looking through my Amazon buying history. How the hell did I find Robb Wolf? And so, Loren Cordain was how I found you and your Paleo Solution podcast. I listened to that. That led me to some other podcasts, realized it wasn't just about the diet, figured a whole bunch of stuff out, had an amazing transformation.

And then I started wondering what else is possible? If I feel this much better just by changing my diet, what else is out there for me? And so that led me to the world of advanced testing, blood chemistry and urinary organic acids and hormones and stool testing and all that. I did a whole bunch of tests and found a bunch more problems that were very fixable with nutritional supplements, had another amazing transformation. It was almost as big as the first one.

And then I partnered with a medical doctor. Her name is Jamie, Jamie Kendall-Weed, and she's a UCI pro mountain biker, just finished her residency, not really enjoying her work, $250,000 worth of student debt. Day one in the practice, "You've got seven minutes to fix this person, go." She's like, "How can I do that? That's impossible. I just cannot do that." And so she was in the right mindset, shall we say, to start the business.

So, we started Nourish Balance Thrive. And then Tommy, who's been on the podcast before, he heard me speak on this podcast and we got together, and

he's now an equal partner in Nourish Balance Thrive. We work together all the time. We've been on a bunch of podcasts and I told this story that I've just told now and a whole bunch of athletes came forward and said, "Hey, that happened to me too. What have you got for me? Just give me whatever it is that you did." And that was how Nourish Balance Thrive was formed.

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We now run labs on a thousand athletes over the last three years. I quit my job at the hedge fund three years ago to start NBT. And we're just having tons and tons of fun. I can't believe how much fun I'm having.

Robb: That's awesome. At some point, I need to have you do your best Darth Vader imitation and say something to the effect "were once I was the student now I am the master." Maybe that's how we'll wrap this thing up. Can you talk a little bit about specifically about what you unpacked with the health? I mean, for a lot of people, even in this Paleo scene, thinking about gut problems, gut dysbiosis and potential like erectile issues or kind of like, okay, yeah, the knee bone is connected to the thigh bone, but I don't really see the connection there. What the heck was going on here?

Christopher: Sure. So, there's a very clear connection even in the literature, if you look at the data, between erectile dysfunction and inflammation. So, look on your blood chemistry. To me, I saw high sensitivity C-reactive protein of eight. At that point, something's not right. You don't know what it is but something is not right. And for me, at that time, I was still eating lots of nuts and seeds and eggs. Those were the things I had to eliminate from my diet in order to heal my gut and then my high sensitivity C-reactive protein came down.

So, erectile dysfunction is really, really complex because there's, obviously, a lot of stuff going on in your brain as well as in the vasculature. So it gets complex. And then if you get prescribed a drug you sort of get hooked on the drug because you start having performance anxiety if you haven't got the drug. And so, it's obviously very complicated. But definitely I had a whole bunch of stuff going on in my gut.

I had a pinworm infection. That was quite easy to find with a stool test and I went back to the doctor and he prescribed me a drug to get rid of that pin worm infection. And then I also had a massive overgrowth of candida. And I found that using a urinary organic acids test. And so I took some supplements. I think it's oregano oil, actually, a bunch of some other herbs. I've forgotten exactly what I did. I have to dig back through some files to see what herbs I took. But we used herbs like that in our practice all the time and it worked really well. We know they work really well because we redo the test that found the problem and we see that they work really well.

Robb: Amazing, amazing. So, you guys had been doing some really just phenomenal, basically, bench level analysis with your athletes using things like the DUTCH test, urinary organic acid testing. And then oftentimes what you're faced within is this massive chunk of data that you need to sort. You guys have more than a thousand athletes that you work with now. The human brain only has so much capacity to find signal versus noise.

But because of your computer science background and just incredible curiosity and interest in this stuff, you've been looking at some machine learning algorithms for kind of trying to get the signal out of the noise. Could you talk a little bit about what machine learning algorithms are, how they're being applied to medicine currently both maybe appropriately or stupidly? Because you've talked a little bit about that. And then kind of how you've woven that into the Nourish Balance Thrive process.

Christopher: Sure. Yeah, this started as a joke. I mean, we went on your podcast and a whole bunch of amazing people came forward to work with us. If you're listening to this podcast, thank you, you're amazing. I love you completely. So, absolutely incredible to work with all these people. And we started to joke that we were seeing the same person over and over again. Like literally the same person. This person even -- I've done a lot of work with Jordan Reasoner and Steven Wright who do this Practitioner Liberation Project thing.

Robb: Really great guys.

Christopher: Yeah, great guys. So, the first thing they get every practitioner to do is who's your avatar like? Who are you talking to with your messaging? And so we did that and we got specific. And then, guess what? That avatar comes forward to work with you. So, you'd literally see the same person over and over again. And so that got the wheels turning. So, could we really predict like some of the test results just based on some health assessment questionnaires that we ask people to do as they come in to the clinic?

And as it turned out, the answer was yes. But it took me a kind -- It's a long story. It really took me a long time to get into machine learning. Although I'm a computer scientist, my undergraduate degree is in computer science, I've worked for several companies that have used machine learning techniques. So, machine learning techniques are different from what a computer programmer would normally do.

So, normally, a computer programmer, they would hand code an algorithm. If this, then that. If this, then that. So, it's very difficult to code complex algorithms in this way. A machine learning is different because rather than you handcrafting, you have the machine learn how to classify or predict things by

showing it many, many examples of data. So, this is fundamentally different way of coding, I suppose.

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And so that's what we did. We took all these thousands, a hundred thousand total features that we had collected over three-year period and then I created a machine learning algorithm and fed all this data in and then out the other end comes this model that can make predictions about what we're going to see on your urinary organic acids test or your blood test or your stool test just using health assessment questionnaire data. So, super duper exciting.

Robb:　　　If people are kind of scratching their heads about this, if you've read Wired to Eat or checked out a couple of my podcasts, I also talked about this in one of my Paleo f(x) talks, the work out of the Weizmann Institute that looked at the variabilities in blood glucose response between people and different types of food, particularly the carbohydrate content of the food. It didn't really follow the classic like glycemic index response. There was huge variation.

Hummus was about 50-50. Some people did well with it. Some people did terribly. One person would eat a banana and look good, another person ate a cookie and they looked good. And it was only when they use some machine learning algorithms that they were able to really get a handle on this. But what's interesting, again, is they use those outputs with one group of people with a really complex screening process on the front end.

But the screening process is more kind of like how do you feel and some blood work and different things like that. And then they were able to take other groups do that pre-screen and then predict. They would say, "Okay, based off this, we think you would do well with these foods under these amounts and ratios. And conversely, you'll do poorly with these other foods." And then they actually tested that. A 0.7 correlation, I think, was basically, like it was perfect. Like irrefutable, yeah, this is 100%. I think they were getting 0.68, 0.67 on the correlation. It's really powerful stuff if people can construct the whole process in an effective way.

Christopher:　Right. And so, many people listening to this podcast that have never heard this term machine learning before, but you are using it. So, every time you use Facebook, the algorithm that decides which post you're going to see first, that's machine learning. If you go on to Amazon and you buy a book, it's going to recommend Wired to Eat. Of course, that is machine learning algorithm. My wife was chosen for me by a machine learning algorithm. I met her on OkCupid and it emailed me and said, "You really must meet this woman." It was absolutely right. Even if people have never heard that term before, machine learning, you are using it every day.

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Robb: Interesting, interesting. Now, machine learning is being used in, let's say, the more mainstream circles like you had mentioned some applications of this with regards to vision. But again, it's kind of this like the train is about to go off the tracks reactive health model. Can you talk a little bit about what? What is Google and some of the people that are working on this stuff? They're still using this allopathic reactionary model. And so how are they rolling this stuff out?

Christopher: Sure. So, I got started with this -- Imagine. I'm on the internet. I'm trying to figure out how I can solve this problem that we have with predicting the test results. And I stumble into this Ted Talk which is called The Wonderful and Terrifying Implications of Machines that can Learn. That's a Ted Talk by Jeremy Howard. I got incredibly lucky because I Google-searched his name and it turned out that Jeremy was teaching data science at a university institute in San Francisco and I was able to be there in his classroom three days later, which is absolutely extraordinary to be, being taught by a world class practitioner.

And Jeremy's story is that he has no background in medicine, no background in pharmacology or anything to do with the natural sciences. And he started a company that was able to create a computer vision learner that would identify a malignant tumor on an x-ray or CT scan of the lung. And it was able to do this as well as the panel of the four world's leading radiologist, which is absolutely extraordinary when you think about it.

These computer scientists with no background in medicine are able to do this so quickly. So, it does make you wonder what's going to happen to radiology. It's probably going to go away. If you're doing a radiology qualification right now, I'd probably stop and find a different line of work because that's going away. That led me to go to a conference, the AIMed Conference down at Dana Point in Southern California.

And so I got to see what everybody's doing in this space, what other cool things that are going on there. And the DeepMind group, which I believe are out of London but are now part of Google, they presented a paper on a very similar model that Jeremy had developed.

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They would identify diabetic retinopathy using the same sort of vision recognition algorithm. And so your first thought is like, wow, that's cool. So now, I can have a robot doctor diagnose my retinopathy in no time whatsoever and this technology could be available to people all over the world without having access to that very expensive and maybe not available doctor.

But then you realize that it's just the same nonsense that we've seen before. So now, you've got an allopathic robot doctor that diagnosis you and gives you the wrong answer in a record amount of time. That's what I was thinking as I sat there in this conference hearing about this paper was, my god, if they got these people, the one million scans they label, so hand labeled a million images of people's retina, if they got those people to do an oral glucose tolerance test 20 years before they went into that scan, their eyesight might have been saved.

So, I think, there's some really interesting things coming up here. Google don't know this. Google are not thinking about this. They're just going to the traditional medical establishment and say, "Hey, how do you do medicine? Can we help?" They're not really thinking, they're not going to Mark Hyman to ask that question, right? So, some interesting stuff going on.

Robb: Right. Let's get out in the weeds a little bit, highly conjecture based, but I've been thrown this idea around that somewhere along the line somebody with some deep pockets, big breeches, will say, "Hey, this evolutionary template, there might be something going on from that." When or how do you think that's going to crack? I mean, the tech scene is arguably the smartest cross-section of people in the world at this point, like the best and brightest people go into technology at this point.

But it's kind of miraculous to me that they're so almost allergic to this idea of this evolutionary medicine template or ancestral health, that the solutions are going to come out of the test tube or vertical farming and stuff like that. But it seems like if you just had one entity, maybe like Nourish Balance Thrive, connected to some different institutes that just had an operating system, basically, that was so much more effective, is that all we need for a tipping point? And then everybody else is going to have to follow suit with what's going on with this? What are your thoughts around that for kind of a future development?

Christopher: It's only a matter of time, isn't it?

Robb: It seems like it.

Christopher: It has to be. I mean, the smartest people on the planet working on these very difficult problems, I think medicine is going to be found. Well, it's not going to be -- So, I saw this really interesting presentation at a conference, another conference called Mastermind Talks. The president of Viom, this new tech company, I've forgotten his name. I apologize for that. He said something which I thought was really interesting, which was that medicine is not broken. Medicine is doing exactly what we designed it to do which is to treat acute episodic trauma and infection.

The thing that it's not good at is all these progressive chronic stuff that you've talked about many times on the podcast. And so, I think, the tech people, they're finding this out. They're realizing that -- The cat's out of the bag here. It's only a matter of time, I think, before they do something horrible like hire Tommy Wood, my chief medical officer. I might be looking for another MD-PhD somehow. Yeah, I think it's only a matter of time.

Robb: Right. And it's fascinating because so many people have made so much money off of this system and you can get jaded and you can make it into conspiracy theory stuff but it's really kind of a path to hell paved on good intentions in my opinion. But it's also become so expensive to deal with these things. I mean, there's some projections that like 2030 all of US GDP could be allocated to dealing with just diabesity-related issues, not a single student gets educated, pothole gets filled, every single nickel, dime and penny could get allocated to that.

And so even though there's huge money and huge interest in this whole process, it's basically a house of cards. It's going to crumble and it really is just going to come down to -- What's fascinating and it's a little scary for the future work and stuff like that but there's been quite a number of documented instances in which this machine learning process works much better than a human practitioner. So, that's one thing. So then you have the potential for huge scale in really very low cost point to the see lots and lots of people.

I mean, maybe you could do scans with your smart phone or something like that or there will be these little biosensor packages that get delivered in the mail and you slap those on and that plugs into your smart phone or communicates through what have you.

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And then if you have this operating system, this kind of ancestral health evolutionary medicine kind of template, that seems like a pretty powerful winner. But it will be interesting to see how it all rolls out.

Christopher: I think there's still a big part to play for the diagnosis. So, for me, personally, I know everyone's different but for me personally, seeing, doing a blood test and seeing that my hs-CRP was very, very high was a powerful motivation for me to change. I'm like, okay, there's definitely something wrong. I don't quite know what it is yet. And then you make some changes and you go do that blood test again and you see the change. I mean, you've really got it then.

And so, okay, the blood test is kind of difficult to do. If I'm in a third world country maybe I can't do the blood test at all. What else could we do? That's what we've developed at NBT is health assessment questionnaire. Okay, I'm

going to get you to click on some radio buttons and then I'm going to try and predict your fasting glucose and insulin, your hemoglobin A1C, and it turns out that I can do that with astonishing accuracy.

So, we've looked at -- So, when I trained these models that we produced at NBT, I held out 20% of our data. So, 200 of these athletes that we tested, I set their data to one side. I trained my models so they're learning how to identify the glucose intolerance by example and then once I finished doing the training I then let the models loose on the 20% of the data that I had never seen before and then I can test to see how accurate my models are.

And with Tommy's help, obviously, I can tell you that they're astonishingly accurate. So, we may get to the point where you can do a health assessment questionnaire, click on some radio buttons, and then I can tell you whether you've got a glucose problem. And then once you know you've got a glucose problem then maybe you can make some changes to your diet and then redo the test later on and it's going to cost you not very much money at all.

Robb: Right. I actually went through the process. We haven't been able to dig into my results yet but it was super slick. Just with my knowledge of this kind of functional medicine scene, even the types of questions that you guys were asking were incredibly well-informed. I was kind of like, okay, I see where this thing is going, I see what you're going to learn from this whole thing. It's really, really exciting.

Christopher: That's interesting you should say that because those questions -- I designed the health assessment questionnaire three years ago. I've been collecting this data for a long time. And so what I did was I went to -- There's a data bank of questions called PROMIS and that's an NIH funded project. And you're supposed to use these questions in modules. But when I looked at them I thought, "That's not really relevant."

I'm an athlete. There's lots of questions like, "I don't have enough strength to lift myself out of the bath tub." And so, as an athlete, you're not feeling good, maybe you're bloated, you've got diarrhea or constipation or maybe all of those things, but you still have enough strength to lift yourself out of bath. So, not all of the questions were relevant.

I picked them and said, "Yeah, that would--" If you would ask me that two years ago, I would have been like, "Oh my god, it's like you're reading my mind." And so I wondered were there any other athletes that would also be thinking, "Yeah, that's a really good question." And so that's how the 51 questions that form our health assessment questionnaire that I use to predict the results of the advanced testing that we do, that's how I chose them.

Robb: Brilliant. I want to shift a little bit. We'll circle back more and talk about this process that you guys are doing. But historically you have been a largely keto fueled athlete and motored along pretty well with that. Like that seem to be a pretty good solution for a lot of the issues that you have initially. But then started having some problems, and you guys did a deeper dive on that.

                And you're not doing by any means what most people would consider a high carb diet, but you've definitely added a significant amount of carbs back into your day to day training. Can you talk about that whole process? Part of this is because I am very much living a parallel life to you. I'm very curious about your process because I think there are things I can learn from this.

Christopher: Sure. Yes, in the beginning, back in the Viagra days, I was also slamming the maltodextrin gel like it was going out of fashion. One gel every 45 minutes on the bike, which is a lot of gels if you do long rides. And I literally couldn't go without them. I couldn't go for more than 40 minutes. I'd start having severe hypoglycemic episodes. I couldn't get through the night without eating. I'd wake up at 2 o'clock in the morning in a poof of cortisol, and then I'd have to make my way into the kitchen and eat a huge bowl of oatmeal in order to make it through the rest of the night. It was just the most awful thing. I thought I was the only person on the planet that's afflicted by just such a horrible thing.

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                It turns out that there are other people that do this apparently. So, obviously, severely metabolically inflexible towards the glucose end of things. I can only use glucose, very little ability to use stored body fat. And so, Julie, my wife, she was really the first person to persuade me that the fat was not going to make me fat and it wouldn't give me a heart attack. So, I started eating more fat. And that was definitely a big part of my transition towards a high fat diet.

                And then, like you, I'm sure you've heard lots of very interesting clever people like Ken Ford and Dominic D'Agostino talk about the benefits of a high fat ketogenic diet. And so I thought why not, let's just try this? And like you, I felt amazing. Productivity wise, during the day, I felt absolutely incredible. And so I continued with it. I wasn't really sure. It was kind of didn't really make a lot of difference to my mountain bike performance and training. But in racing, I definitely noticed the gun would go off and I would feel great, my legs felt great, I was going, but all the other riders were disappearing off into the distance.

                So like, what the heck is going on here? Like I'm pedaling and nothing's happening. This is not right. And so, clearly, there'd been some change in my power output even though I felt so good in the day. And I kind of persisted on with it for a long time if I'm honest. I probably went on for about two years kind

of sucking as a mountain biker. And then, eventually, it was doing the Keto Summit -- So, I hosted the Keto Summit last summer and there were interviews--

Robb: It was amazing, by the way. If people haven't checked that out, it's absolutely amazing. You guys let me speak on it which don't discount the fact that I made it in there. There's amazing people.

Christopher: It was so much fun to do. I absolutely had a blast and just learned so much stuff. The people that I think were most influential in the reintroducing carbohydrates were Bryan Walsh -- he's been on this podcast -- Chris Masterjohn and then, most of all, Mike T. Nelson, who is a PhD exercise physiologist. Mike, he's been at Paleo f(x) every time. You probably know him. He had presented several times. I can link, or maybe you could link to some of Mike's presentations on metabolic flexibility.

Mike talks about how, what you really mean by metabolic flexibility is you want to maximize your ability to burn fat without compromising your ability to use glucose. And I'm not sure you can do that on a very high fat ketogenic diet. Eventually, you'd lose the ability to use glucose. And so you'd end up with the situation where the gun's gone off and you're pedaling and everyone else is disappearing into the distance.

And so reintroducing some carbohydrates, I feel like, has brought back my exercise performance. And I don't really notice anything during the day when I'm working. I still feel really good. But having said that, I've continued to do a bunch of work on my gut. So, I keep doing urinary organic acids test. I keep doing stool tests. I keep finding problems. The last stool test I did, I found cyclospora on the GI-MAP test, which is not -- some of the bugs -- I've got also blastocystis hominis, which is controversial. There are researchers looking at its role in health as well as disease.

But cyclospora is not like that. You go into the CDC website, this is a parasite, you should probably see your doctor. I've continued to find problems like that and treat them with herbs, not have to go and get any antibiotics or anything like that yet. And I feel that may have been part of why I've been successful in reintroducing carbohydrates because, certainly, I was very, very bloated in the beginning. And when I ate carbs that bloated me up even more. And so, I think fixing the gut dysbiosis is an important factor in reintroducing the carbs.

Robb: And then about how much of a ratio or how many carbs are you typically doing like rest days versus training days and stuff like that?

Christopher: Oh, yes, still really quite low carb. So, I would guess it's somewhere between 100 and 150 grams of carbs on a day where I'm riding. I don't do massive volume anymore. So, a two-hour bike ride is kind of average for me. I'll do that most

days, and then apart from a couple of days where I do strength training. And so I'd been working with Mike as a coaching client, full paying coaching client. He encourages me to try and do some of the cardio in a fasted state.

Maybe on a Saturday morning, I've not got anything else going on that day, I'll go out with my buddies and do a ride in a fasted state, no breakfast, and that helps push the fat burning side of things. And then the strength training workout that he has me do. He likes me to do those in a fed state. So maybe I'd have some sweet potatoes, something for lunch before doing the workout in the afternoon. Yeah, generally, it's around 100, 150 grams of carbs at the most. If I'm not doing anything then I could probably be just fine on 50 or maybe even less.

Robb: Fantastic, fantastic. So, Chris, even though you guys are working or let's say the avatar has kind of drawn in athletes, for somebody doesn't necessarily consider themselves an athlete, are they going to benefit from going through your seven-minute analysis and kind of checking that out?

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Christopher: That I don't know. I honestly don't know the answer to this. We will see. So, certainly not all of the people in our training data set are athletes. So, last week -- We use this internet chat thing called Slack. We just post in -- I'm sure you get this -- emails and then maybe somebody's on a client call and somebody says something. And on the call, they just transpose it and put it into Slack. So, we get referrals.

People come in, they're an athlete, and then they say, "Oh, can you fix my mom?" And so we end up working with mom. And, obviously, mom has very different goals from the Olympic athlete. And we get by the testimonial two months later, "Now, I'm able to mow the lawn and play with my kids in the same day. I'm so happy." And that makes me like beyond happy. I'm just so delighted with that type of story. It's absolutely amazing.

So, not all of the people in our training data set are athletes. But I don't know. So, here's the thing. if people want to do this analysis, I'll give Robb a custom link that he can put in the show notes, and then I would encourage people to find that custom link and use it because I don't know that the Robb Wolf people are very different from Ben Greenfield's people, are very different Michael Ruscio people, are very different from Chris Kresser people, do you see what I'm saying?

So, maybe my models are over fit on Robb Wolf listeners. Over fit means that the model is too complex and it's too specific to this particular type of person and it doesn't adapt well, it doesn't generalize well to other types of listener. So, I think, it's important that we use the custom link so I can keep all these people separate.

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Robb:	Right, right. Fantastic. And we will definitely get that linked in the show notes. Chris, do you want to cover some more stuff? But what I was thinking is that we can kind of wrap things up here, get folks exposed to this link, have them go through this system, and then maybe we can circle back. And I would love for you to go through what my experience was taking the seven-minute analysis and then we're working on getting some follow-up blood work and some stool testing for me so we can do kind of a deep dive on what the fit was for me. I'm just an old guy trying to do Brazilian jujitsu as much as possible but I still kind of consider myself an athlete. But then also maybe we can unpack some of the experience of folks that have gone through the process.

Christopher:	Yeah, absolutely. It is very nuanced. Here's the thing, and this is frequently the case in machine learning. People will say to me, "So, how does it work? How did you make it work? How does it work?" And the answer is I don't know. The machine learned how to do this. This is going to be the same with driverless cars. People are going to start traveling in driverless cars. And the engineer that put that thing together doesn't know how the computer learned how to do it. It's exactly the same with my stuff.

	Maybe most people would consider gas bloating, diarrhea, constipation, that means you have gut dysbiosis. So maybe we'll see an elevation of C-diff or candida or H. pylori on a stool test or urinary organic acids test. That's what people like me, a practitioner, would normally think. But the computer, it might have learned something completely different.

	Like if you have anxiety or you can't go more than a few hours without eating or you wake up in the morning feeling unrefreshed, it might have learned that those are the most important features for diagnosing gut dysbiosis. This makes it really, really complicated for me. It's a real head scratcher. There's 53 questions, each has five different answers. So now we've got one times ten to the power 37 different permutations. I don't know about you but I can't keep that many things in my head at once.

Robb:	I can't keep two things straight in my head at once, so, yeah.

Christopher:	So, this might be one of the reasons that computers are going to get better at diagnosing these types of problems just because they just don't get bored of things and they're really good at holding lots of things in working memory at once. So, yeah, it will be really, really interesting if we push this thing live to actually get people on to the program, get the real test results, and then say, okay, we know how well this works in training and in testing but how well is it working in the wild?

Robb: Fantastic. I love it. I love it. Again, such huge respect for what you guys have done. I learned so much from you guys every day. We're supposed to get, at least Tommy, I think, both Tommy and you on to talk about some stories around the metabolic winter hypothesis and then Tommy's response to what metabolic summer hypothesis and whatnot. So, definitely looking forward to getting you guys back on. You want to say maybe two months, three months and then we'll circle back and do some deep dive on what we learned from all this after cracking the link open?

Christopher: Yeah, absolutely, sounds good. I must give credit to Tommy because I'm terrible at turning out and taking credit for other people's work. And, of course, without Tommy, I would never have been able to produce this analysis. So, the analysis, it identifies the things, the five things that we think are the most common performance killers in athletes.

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And I didn't invent those things. Tommy selected them by reviewing the literature. So, I could have never done that by myself. So, Dr. Tommy Wood. I should give him a lot of credit for what I've been able to do with the computer.

Robb: Awesome, awesome. Well, Chris, it was great having you back on the show and looking forward to doing some work with you and seeing what folks discover out of this whole process.

Christopher: Sounds great. Thank you, Robb.

Robb: And then just to remind, folks, we will have a custom link to the seven-minute analysis via Nourish Balance Thrive. So, head to robbwolf.com/podcast and then you will find that link in the show notes with this particular show. And, Chris, take care, man. I'm looking forward to talking to you more.

Christopher: Sounds good. Thank you.

Robb: Okay, bye.

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