

Paleo Solution - 151

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Rob Wolf: Hey, folks, Rob Wolf here, episode 151 in the Paleo Solution Podcast. In my house sitting next to me, I have the infamous, Chris Kresser bringing up property values on this podcast. So to bring them down, Chris, what's going on?

Chris Kresser: Not much. Good to be here in the Wolf den. Beautiful day outside, and I'm happy to be here again with you, Rob.

Rob Wolf: Thanks man. So Greg is on vacation one more week and then we'll have a great back. We had opportunity to hang out with Chris and -- when is the last we had you in the podcast?

Chris Kresser: That's been several months.

Rob Wolf: Almost year.

Chris Kresser: Yeah, maybe a year.

Rob Wolf: So what's new? What's cooking?

Chris Kresser: Well, you know, always something cooking.

Rob Wolf: Oh, I forgot. One minute. I keep forgetting our sponsor. Evolve Foods, sponsor of the Paleo Solution Podcast. Obviously, slap-dick as always on this thing. Evolvefoods.com putting in Wolf Pack, I think with the capital W. I'm not a hundred percent sure on that. Wolf Pack 12 and you'll get a 15% discount on your order if you choose to buy something. If not, that's good too. Okay. Chris, you were saying.

Chris Kresser: That was pretty smooth, Rob.

Rob Wolf: Thank you.

Chris Kresser: I want to hire you for my promos.

Rob Wolf: Yeah, probably a bad idea.

Chris Kresser: Yeah. Well, you know, let's see. Sophie is 14 months and walking around terrorizing, as you can see.

Rob Wolf: Yeah, yeah.

Chris Kresser: So that's been fun and a little bit challenging at times too. Just trying to take care of myself and stay healthy and keep putting stuff out there.

Rob Wolf: Thanks. So you released the personal Paleo code about six months ago?

Chris Kresser: Yeah, that was -- actually, that was in November of last year.

Rob Wolf: Okay. So, about a year older.

Chris Kresser: Almost a year. And then just now, the high class role action plan. I made this.

Rob Wolf: And you talked to me maybe five months ago about this idea for the high class role action plan. What was kind of the scene for that? Like, I get questions frequently about folks who have gone on Paleo. They feel better, they have some blood -- their parameters improve. But then sometimes things don't look as good, so.

Chris Kresser: That's right. Yeah. I mean, I get the same thing. I probably get more questions about cholesterol than anything else. And I think we have, you know, readership and an audience that's way more educated about cholesterol than the mainstream, and yet it's still a really confusing issue even as much as people know, as much as we've learned about it. There are still a lot of misunderstanding and misconceptions out there.

And even in my own family and friends, you know, people go to the doctor and they get diagnosed with high cholesterol and they don't really -- and they get prescribed with that and they don't know what to do, you know. Should they take it, is it really something to be concerned with? They've probably heard some idea, you know, in the Paleo and prime community that high cholesterol maybe isn't as much of a concern as people as we once thought it was.

But there are so much, you know, there are some pretty powerful conditioning around that that we've all had for years and years. I think it's pretty hard to just set to decide and ignore it.

Rob Wolf: Yeah. And so, like you were talking yesterday and, like, we kind of have two camps kind of the mainstream and we have Dean Ornish on the front page.

Chris Kresser: Right, right.

Rob Wolf: Was it at New York Times?

Chris Kresser: Right, New York Times. Yeah.

Rob Wolf: And, you know, still eat red meat and recommending high carb, super low fat, you know, intervention is like the way to go. And then the other side of this, we have this kind of Paleo primal community where folks have said blood cholesterol has absolutely new bearing on cardiovascular disease, the higher the better...

Chris Kresser: Right.

Rob Wolf: Is almost the sentiment. And where's -- where do you feel like the truth is in that whole story?

Chris Kresser: Yeah. That's a great question. I mean, the way I think about it is there's -- if we took the -- if we talk about two ends of that spectrum, on the one hand, we have what you might call the cholesterol believers.

These are the folks like Ornish that you mentioned, and probably represented by the dominant paradigm and mainstream doctors and organizations like the American Heart Association, American Diabetes Association, et cetera, who think that cholesterol is basically an evil nutrient and we should do everything we can to get as low as we possibly can. If we could get it down to zero, that would be ideal, you know. And they complete don't understand the important physiological roles of cholesterol and that we would basically die without it. And that's one of the main things that separates animal life from plant life, is cholesterol.

Rob Wolf: Is cholesterol.

Chris Kresser: Yeah. So -- and then on the other hand, as you mentioned, we have -- what we might call the cholesterol skeptics. And these folks are represented by, you know, like the international network of cholesterol skeptics. Dr. Raffe...

Rob Wolf: Uffe Ravnskov.

Chris Kresser: Uffe Ravnskov and a few other pretty prominent folks. And in their argument -- I mean, it was actually kind of a diversity of opinion in that group, but the most extreme version of that argument is the one you just articulated, which is we shouldn't even bother measuring cholesterol.

It's got nothing to do with heart disease. And let's just forget about it and move on.

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So, there are a lot of problems with that, Rob. And one of the -- I think one of the main problems is one of the terminology because when a lot of people say cholesterol, what they're actually referring to are the lack of proteins that carry the cholesterol around.

And I think we need to just, like, step back and cover this basic point before we go on because it's going to be pretty important to the rest of the discussion. So, the easiest way to explain it is that if you imagine that your bloodstream is like a river, then the -- and then you have boats on the river, the boats are lipid proteins. And these are like LDL, low density lipid protein; HDL, high density lipid protein; VLDL, very low density lipid protein.

And these lipid proteins travel around the bloodstream. They transport cholesterol but also triglycerides and fat soluble vitamins and antioxidants. So they're basically like shadows that carry nutrients all around the body. It places them to get to. So if the lipid proteins are the boats, then the cholesterol would be the cargo in the boat. So, a lot of the misunderstanding that we have about this debate comes from just a problem with nomenclature or terminology.

And people, when they say cholesterol, they're not actually referring to the cargo in the boat, they're talking about the boats themselves. So, what we know now is that both ends of that spectrum are wrong and that the evidence really is more in the middle.

And you can have high cholesterol, you can have -- which means a large amount of cargo and those boats and be it very low risk for heart disease. And you can have low cholesterol, which means not very much cargo in those boats and be at high risk for heart disease.

Rob Wolf: So when people are doing a standard blood panel, what is it that they are typically getting and how does that relate back to, like, the, you know, cargo over this boat.

Chris Kresser: Right.

Rob Wolf: Like, what is it that, you know, you go to your doctor, get a basic blood panel, what is it that that blood panelist typically tell you?

Chris Kresser: Right.

Rob Wolf: And what is it not telling you?

Chris Kresser: Sure. And this is the problem with the standard lipid panel is that the standard lipid panelist is only measuring the cargo and the boats, not the number of boats. And it's actually the number of boats or the numbers of the proteins, that's the main driving factor in heart disease. So, LDL cholesterol or LDL-C, that's on the standard lipid panel. That measures how much cholesterol is within the LDL particles. And then HDL-C measures how much cholesterol is in high density lipid protein boats, total cholesterol kind of combines the LDL, VLDL and a bunch of other lipid protein remnants into one score.

But that's also just measuring the total amount of cholesterol the boats are carrying around. So that turns out to be not very relevant in the process of heart disease. And as I just said, it's the number of the proteins, the number of boats that's really the driving factor. And that is not measured on a standard lipid panel.

Rob Wolf: Okay. So what do -- and so, we need to find out how many of these boats, how many particles there are floating around, and maybe we'll talk about that test here in just a second. But as an example, like, somebody - - or no, let's talk about the boats like the LDLP, how many of them and then let's talk about how you could have in LDL cholesterol, the hundred and have relatively few particles. I mean, you could have LDL cholesterol of 100 and then have a ton of it.

So, tell folks even about what the LDL particle, you know, like, what that test is, who offers that.

Chris Kresser: Okay.

Rob Wolf: And then when did the testing for this get on your radar? Like, how did this newer information kind of get on your side?

Chris Kresser: Yeah. Really, in the past couple of years, it's come out more. Earlier on, I wrote, you know, I was guilty of this. There was a lot of focus on LDL particle size, right, or lipid protein particle size, so.

Rob Wolf: And remind folks with that means.

Chris Kresser: Right.

Rob Wolf: It does tell us something.

Chris Kresser: It does tell us something. So, the size -- the lipid proteins aren't uniformed in size. You can have some that are very small and very dense and then you can have some that are intermediate density and volume and then you can have others that are larger and lower density. And for those of you who have heard of the VAP test, or the vertical auto profile, or other, you know, technologies for measuring particle size, there's pattern A and pattern B.

And pattern A means you have a whole bunch of large fluffy LDL particles.

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Rob Wolf: Theoretically low reaction?

Chris Kresser: Theoretically not as big of a risk factor for heart disease. And then pattern B would be that you have a bunch of small dense, LDL particles and the idea was that these are -- were more harmful, more likely to damage the endothelium and initiate the whole process of atherosclerosis.

But more recent research has shown that there are a couple of problems with that theory. There's no doubt that smaller dense of LDL particles can be a sign of something gone wrong. But in studies that control for LDL particle number, they found that the association between small dense LDL and heart disease disappeared. So in other words, if they did a study and it only measured small dense LDL protocol number and heart disease, they found a correlation. But if they also measured just a number of all LDL particles, then the predicted value of small dense LDL particles disappeared.

So what that suggest, of course, is that it's the total number of LDL particles regardless of whether they're large and fluffy or small and dense. That's the most important factor. And getting back to your earlier question, how do we measure that? The gold standard for measuring that is a test called the NMR, nuclear magnetic resonance test. And it's offered by a lab called Lipid Science. It's the only lab that's FDA approved for determining LDL particle number, which is often referred to as LDL particle concentration.

So you take that test and the result comes back and it tells you the number of LDL particles that you have. And that turns out to be the main

driving factor in atherosclerosis because it's a gradient-driven process, which means that the more particles that you have floating around in your bloodstream, the more likely it is that some of them are going to migrate into the endothelium, damage it and start this process of platforming.

Rob Wolf: So it's just kind of a statistical gig, like, even though small dense LDL maybe more reactive even large puffy LDL particles, at some point, if we have enough of them, just statistically, we're going to call some damage in the endothelium, get some inflammatory response and then...

Chris Kresser: Right. And that's one of the -- actually, one of the -- actually, was one of big holes in the theory of -- that large buoyant LDL was not a problem, is that people with the condition called familial hypercholesterolemia, which is a genetic problem that we'll probably talk about in a few minutes here where people produce -- they have a much higher number of LDL particles than someone without that condition.

Well, people with this condition have a whole bunch of particles and then mostly large buoyant LDL particles. But they have a three times greater risk of heart disease than someone without that. So even though all of their LDL particles are large and fluffy, they're still having, you know, they have 300 percent higher risk of heart disease?

Rob Wolf: Right. So -- but interestingly, lower rates of infectious disease, lower rates of cancer, which is, again, this tradeoff about cholesterol having some benefit with the immune system and stuff like that and why we don't want to drive cholesterol to zero or 70 or something.

Chris Kresser: That's right.

Rob Wolf: Or some interventions.

Chris Kresser: I'm going to bust your chops here and make you say lipid proteins instead of cholesterol.

Rob Wolf: Okay, okay, I need to think of that.

Chris Kresser: No, I mean, it's -- I'm half joking. But it actually -- I'm trying to be more precise in my terminology because what you are just referring to is that LDL, low density lipid protein, as you've talked about before, has antimicrobial property. So, it's very important in the immune system, which is why people with familial hypercholesterolemia have lower rates of infection. We also see on the other side of that spectrum that infection

can raise -- yeah, both lipid protein number and the amount of cargo in the boats because the immune system will ramp up LDL production when there's an infection, or even when there's leaky gut and endotoxins scape from the gut where they should stay into the bloodstream. So, it's an important point.

Rob Wolf: I think at various points we've talked in the podcast about that that the lipid proteins actually sup up or attach to the lipopolysaccharide. And in all vertebrates there's this potent inflammatory response to LPS, lipopolysaccharide at some of these glycosylated proteins around the outside of, like, E.coli and various bacteria. And our systems have a wicked response to that, and it can turn into systemic sepsis. But it also tends to look a whole lot like type 2 diabetes. You get this elevated blood glucose level, elevated triglycerides, the speed forward mechanism with the delivery still producing glycogenesis despite the high blood glucose levels.

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And that might be something that's going in the low grade level with chronic infection.

Chris Kresser: Yeah, I think so. And, you know, I didn't put this into the action -- the high cholesterol action plan as a potential cause of high cholesterol because there's not quite enough research on it yet. I wanted this to be absolutely bullet proof, you know. So, any mainstream position could go through it and check all of the references? And it would be absolutely rock solid. But I think that's actually a really exciting frontier of research, this connection between leaky gut and high cholesterol.

Rob Wolf: Right.

Chris Kresser: And leaky gut being the cause of high cholesterol or in certain people. So let's get back to your earlier question, kind of tie this all together. So it's kind of crude to extend the analogy this way. But if we go back to the rivers and boats analogy, if you've got a river and it's absolutely full of boats and it's so crowded in the river that the boats can't even navigate, some of them might try to go in and dock in the shore. And that's basically what's happening in the artery.

If there are so many LDL particles, just because of the gradient driven process, some of them are going to penetrate the initial lining, which is extremely thin and fragile, you know. It's one cell thick on the exterior. So it can be easily damaged by these LDL particles. So, that's how the number of LDL particles is the most significant risk factor.

Getting back to the standard lipid -- here's the big problem, and I really feel like if your listeners only take away one thing from this show, this should be it. It's possible to have a high number of LDL particles and a normal or even low LDL in total cholesterol. And that person would be at high risk for heart disease, and they would be missed by the conventional standard testing.

So this is someone, they go in to the doctor, the doctor runs the standard lipid panel and maybe just total cholesterol and LDL and HDL. And they look at total cholesterol, maybe it's 180. They look at LDL and maybe it's 90 and - or 100 or something. And that person, they say, "Oh great, you're under the limit of 199 for total cholesterol and you're under the limit for LDL. You've got to clean your health. Come back next year."

But that person could have an LDLP or LDL particle concentration of 1500 or even 2,000 and they'd be, like, in the highest risk category for heart disease and they wouldn't even know it.

Rob Wolf:

And these are the people that, you know, like, maybe looking back, like, Jim Fix and some of this people that were young, thick -- maybe eating for anti-inflammatory -- probably had some other elements to this where their conventional testing, they look pretty solid. But then, you know, some of this people we don't have the LDLP to look back at, but we're definitely seeing that, just for folks also for reference this LDLP test and the LipoScience test. This is what renal risk assessment program uses after people have been flagged as discordance, like they have something going, either metabolic arrangement or some other type of problem that kind of raises a flag and then we send some advance testing down and then we're going to -- hopefully, at some point, we'll talk a little bit about Chris' involvement with the risk assessment program and some CEU stuff with this material.

Chris Kresser:

Yeah. Let's talk about discordance. I'm glad you brought that up because I think this is a really important concept and all this. So, what Rob is just referring to when he said discordance was exactly what I just explained where you have someone with normal or even low total and LDL cholesterol, but high LDL particle number. So, of course, discordance is when you have two variables that aren't tracking each other concurrently.

There are a couple of people that this tends to be -- well, there's one main group of people that this is more common. And those are people with some kind of metabolic arrangement. So they might have high triglycerides or low HDL or both. And the reason for this is that the LDL

particles can only carry a given amount of cholesterol, right, and so, any given amount of triglycerides.

So if you have very high number of triglycerides, then your liver is going to have to make more LDL particles in order to carry that amount of triglyceride. And so, your LDL particle number will increase and the amount of cholesterol in each of the particles will decrease because that cholesterol is spread out over a greater number of LDL particle.

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Rob Wolf: It's like diluted by the triglyceride.

Chris Kresser: That's right. So they're triglyceride rich but cholesterol poor. And that's why when you measure the LDL cholesterol, the total cholesterol, it's low, which appears to be a good thing.

Rob Wolf: Right.

Chris Kresser: But if you know how this works, that could actually be a very bad thing. So my greatest concern in all of this is that people are going into the doctor and they're getting tested and they're coming away thinking they're not at risk but they actually are at risk.

Now, there's the other side of this coin, which are people who go in and they get tested and they have high total and LDL cholesterol but low LDL particle number. And they're not really at significant risk, but they're going to be over-treated by the doctor because there's this, you know, this old notion that it's all about the amount of cholesterol and the particle that matters.

Rob Wolf: So if you're that person, I mean, is this something where just in general you would recommend this NMR testing to kind of fair out what's going on? I mean, if the person permits with high total cholesterol, high LDL cholesterol but low triglycerides, like they're really not showing signs and symptoms of metabolic arrangement, their triglyceride HDL ratio doesn't look bad, like, you know, they're not carrying, you know, abdominal adiposity, they don't have high blood pressure, then should that person seek out NMR test to maybe keep their doctor from throwing some more stats or, you know, just maybe have a little more negotiating one.

Chris Kresser: Yeah, that's a good point. I mean, I certainly don't think there's any harm in doing it. I mean, especially if your doctor will order it. And even if they won't, you can now get them through places like [directlabs.com](https://www.directlabs.com) or

privatemdlabs.com. These are LabCore affiliates that the general public can order test through.

But there's a couple of ways to answer that question. So in the high cholesterol action plan, I kind of break down what the four major red flags would be if you went in to get test. And we've been here talking about all the deficiencies of the standard lipid panel. But there actually are a few -- there are ways that you can use the numbers on that panel to predict whether you're likely to have elevated LDLP.

So, there are four criteria here; one would be if you're total cholesterol is above 290 milligrams per deciliter, I do recommend that someone goes ahead and gets the NMR because what that could indicate is familial hypercholesterolemia, which we can come back to. So even though total cholesterol itself isn't necessarily a problem if the total cholesterol is very high like that, it suggests that familial hypercholesterolemia might be present. And the problem there isn't the cholesterol, per se, but it's the increased particle number. So that's number one.

And number two would be the ratio of total cholesterol to HDL. Now, this turns out to be a fairly accurate predictor of LDL particle number in some people. It is an accurate predictor and people with -- well, let me backup. It's an accurate predictor of LDL particle number and it's a fairly accurate predictor of metabolic arrangement because if the total cholesterol is high and the HDL is very low, it's likely that that person also has elevated triglycerides, you know, which would be another sign of metabolic arrangement and a sign that the liver is having to work hard and produce extra LDL particles.

Rob Wolf: Right.

Chris Kresser: So if your total cholesterol to HDL ratio and you just get that by dividing total cholesterol by HDL is above 4.0, then it's likely that there are some discordance going on there and that you might have elevated LDLP. So that's a way that you can use numbers that are on the standard lipid panel to predict that -- the LDL particle number. The third would be triglycerides themselves. And that would be if you're above 125, milligrams per deciliter, that is basically where discordance starts.

So if you look at these charts that show LDL particle number and LDL cholesterol, you see that they travel together up until about when triglycerides get to 125 and then LDL particle number will continue to go up and LDL cholesterol starts to go down. That's where that phenomena starts where...

Rob Wolf: You've saturated enough with triglycerides that it starts displacing the cholesterol and the liver needs up regularly production of lipid proteins. Okay.

Chris Kresser: Right. So if you have triglycerides above 125, that's another sign that discordance maybe present. And then finally, if your HDL is below 40, that's another sign of discordance. So if any of those four markers are present, then I suggest that someone goes ahead and does the NMR.

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Rob Wolf: So, you know, for me, for ages, I kind of felt like if you were eating paleo, it's get out of jail free card for cardiovascular disease. So, you know, I think it's obviously an improvement off of the standard American diet, but we're seeing some people pop up with some profiles that, you know, I can't credibly say that anymore.

Chris Kresser: Yeah.

Rob Wolf: So, you know, what do you feel like is going on, you know? What are -- we've talked a little about iron overload, you know, there are potential that leaky gut is -- an issue in this typically when people starting paleo, we see improvements in their health. Like, what exactly is the mechanism do you think that's going on with some of this?

Chris Kresser: Yeah. Well, I think it's really important to answer that question. There are -- it's -- one of the things that I'd like to say is that high cholesterol is a symptom not a disease. And that means that when cholesterol is high, there's almost always some underlying process that's driving in. And there are essentially four -- I mean, there are more than four possibilities, but there are four primary reasons that this can happen. One is genetics and this particularly this genetic condition called familial hypercholesterolemia, and also FOE genotype, which we can come back to again.

And number two would for thyroid function because thyroid hormone, T3 is required to activate the LDL receptor, which takes the LDL particles out of the circulation. So imagine someone that has, you know, poor thyroid functions. It doesn't even have to be frank clinical hypothyroidism. It can be subclinical. There are a lot of studies that show that this subclinical hypothyroidism can cause this problem.

And the third would be infection. So, we know that H.pylori, the bacterium that causes ulcers, can raise cholesterol. We know that viral infections like cytomegalovirus or Epstein-Barr virus, which are very common. Herpes can raise cholesterol. And we know gut infections can raise cholesterol as well.

And in the fourth are -- the fourth causes metabolic derangement, which we've already discussed that triglyceride low HDL insulin resistant kind of pattern. And it's important to point out here that this, you know, it's more prominent in people who are overweight or obese. But I have plenty of patients who are quite lean and still have this pattern. You know, they still have insulin resistance and elevated LDL particle number.

So, in terms of how this all relates to the Paleo diet, there are few possible scenarios. So let's say someone is eating a kind of standard so-called healthy diet according to the, you know, Dean Ornish types, like, fairly low fat, grain, lots of grains, stuff like that. and then they switched to Paleo and they're eating, like, a pretty low carb, higher fat diet. And let's say this person had FH, familial hypercholesterolemia, well, on that previous diet, even with FH, their cholesterol -- their LDL particle number and their LDL cholesterol would have remained pretty low because they just weren't eating anything that was going to elevate their cholesterol.

And then they switch to diet where they're eating foods that could potentially increase their cholesterol. And for someone who doesn't have FH, it's not going to have a significant effect. But for someone who does, then their cholesterol shoots through the roof. So, that's one possible scenario.

Another possible scenario is let's say someone switches to a really low carb paleo diet, like, under 50 grams a day and they already had some preexisting susceptibility of thyroid dysfunction. And so that kind of gets exacerbated by this long-term, really low carbohydrate diet, which can impair your thyroid function with certain people, not everybody. And so, then because their thyroid function is declining, their cholesterol goes up. Those are, you know, two possible scenarios.

Rob Wolf:

And then if we throw -- particularly on the thyroid side of that, if we throw a lowest carb, lots of training, lots of stretch, like cross fit type of deal, then this is really exacerbating the problem because we are seeing an elevated course and kind of tapping into that like an athlete with inadequate carbohydrate.

Chris Kresser: That's right. Right. So insulin is required for T4 to convert and to T3. So if you have really chronically low insulin levels because you're not eating any carbohydrate, your conversion is going to be impaired, number one. And then if you're over training, your cortisol levels might go up at first, but eventually they go down, and cortisol is an anti-inflammatory hormone. So if cortisol levels are low, you can't turn off the inflammatory process. So you go and you do a really intense workout. That's a catabolic process and inflammatory state that's induced on purpose.

Rob Wolf: Right.

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Chris Kresser: Because normally, and someone who doesn't have low cortisol, you know, you'll get back into an anabolic state and the muscles will build back bigger. That's the whole point, right? But if you have low cortisol, you don't come back to baseline. You stay in that catabolic state and those inflammatory side kinds suppress the conversion of T4 to T3, so.

Rob Wolf: So you have dual mechanisms that could be suppressing the thyroid?

Chris Kresser: Dual mechanism. Yeah. So those are a couple of issues there. And let's talk a little bit about the relationship between cholesterol and the diet and saturated fat in the diet and blood cholesterol and blood lipids because this kind of gets at the main question you're asking about the paleo and how does paleo affects cholesterol. Well, for 75 percent of people, the amount of -- the cholesterol to eat in a diet has absolutely no effect on blood cholesterol level. So, they could eat six eggs a day and their cholesterol wouldn't go up.

And this is where the cholesterol skeptics have been -- are correct, you know. It really doesn't matter how much cholesterol you eat in a diet for the vast majority of people. But there are 25 percent of people who are -- what are known as hyper-responders, which means that they have a mild increase in their cholesterol from eating cholesterol in the diet.

But here's the thing, generally, you see an increase in both LDL and HDL, which means that the ratio that we're talking about before, the total HDL cholesterol ratio doesn't change.

Rob Wolf: So it's kind of a wash.

Chris Kresser: It's kind of wash. I don't think it's clinically significant. And then we have saturated fat, and it's a similar phenomenon. I don't have exact numbers

because I've never seen a study with the exact numbers, but we know that short-term studies show that eating saturated fat does raise cholesterol in the blood. And that was where the confusion started is all the early studies were short-term.

So this whole idea that saturated fat raises cholesterol came from those short-term studies. But longer-term studies have shown that for the majority of people, eating saturated fat does not affect your blood cholesterol levels. Again though, there's a group of hyper-responders who -- when they eat saturated fat, their blood cholesterol levels go up. And it's not completely clear now whether there are LDL particle numbers going up or whether just their LDL cholesterol, you know, on the amount of cargo in the boat. But I can tell you just anecdotally from treating -- from my practice that some patients do experience an increase in particle number from eating...

Rob Wolf: Coconut, oil and...

Chris Kresser: Yeah.

Rob Wolf: Yeah.

Chris Kresser: Yeah. And this is where it gets a little tricky because for someone -- the normal treatment for metabolic problems would be a high fat low carb diet.

Rob Wolf: Right.

Chris Kresser: And people who have that pattern of metabolic derangement, the low carb high fat diet might actually bring their particle number down. But -- and someone was familiar with hypercholesterolemia, it might have the opposite effect. A low carb diet in that case might actually increase their particle number, and I've seen that happen a few times.

Rob Wolf: So somebody has FH, familial hypercholesterolemia, and the metabolic derangement, what do we do to fix this people? I mean, this is, you know, we were talking earlier this morning, like, people are sleeping on average like six and a half hours a night. And so I'm starting to think more and more. And obviously we've talked tons about sleeping in the past, but I'm just thinking more and more if people were to sleep nine to ten hours at night, would they respond to glutinous badly, will they respond to...

Chris Kresser: Right.

Rob Wolf: Like, with 90% of the problem, if we see this bad -- if we have a giant power outage for a year and floods, you know. So -- but so -- you know, what do you do for that FH person who also has metabolic derangement? Like, what's the operation from that?

Chris Kresser: It's a good question, and the answer to that depends a lot also on what they're doing already. And, you know, for example, if that person is on a standard American diet, not training, you know, hasn't addressed gut issues, hasn't -- is not sleeping, is totally stressed out, I mean, I think obviously we address all those things first. We get them on a -- I would say a moderate carbohydrate diet in that case.

Rob Wolf: So carbo diet thing?

Chris Kresser: Yeah, something like, you know, maybe between 100 and 150 grams of carbs a day from starch, you know, starchy tubers and fruit, something like that. It will vary from person to person. But you don't want to go too high carb because that could increase, you know, triglycerides and that would, of course, increase particle number. You don't want to go too low carb because that could also drive that LDL particle number by a different mechanism if they're hyper-responders to saturated fat, for example.

Rob Wolf: And probably more mono and saturated fats, like, olive oils, coconut oil, avocados.

Chris Kresser: Yeah, I would say, you know, lowering the saturated fat content a little bit and increasing mono and saturated, like you're saying. It's -- you could almost think of it as like a Mediterranean paleo diet, or something like that.

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Rob Wolf: Right.

Chris Kresser: And then you'd want to rollout any thyroid problems because a lot of times those might be present in people like that.

Rob Wolf: So talk to folks about that, like, what is the -- you know, lots and lots of people go to the doctor. They even -- some of the people that we've seen in the risk assessment program that they have flagged as potential familial hypercholesterolemia. What I've done a little bit of digging, their thyroid, their TSH looks suspect.

Chris Kresser: Right.

Rob Wolf: And thyroid issues can look almost identical to FH because you still have large buoyant, LDL particles. But the company, you know, they...

Chris Kresser: That's right. Yeah. So, we might have to do another show on the thyroid. But I'll give you kind of basic rundown on some of the issues. So, one of the main things is that the lab range for TSH is too broad, you know.

Rob Wolf: Okay.

Chris Kresser: It varies from place to place. But usually it's about 0.45 to 4.5 or even as high as five. And so, if you go to a conventional doctor and your TSH is 4.3, they'll say, "Your thyroid is fine," you know, and hassle you out the door. But...

Rob Wolf: But in Chris Kresser land you're screwed right?

Chris Kresser: Not only my land, but actually the American Society of Clinical endocrinologist, you know, this is a fairly mainstream organization. Their range is 1.8 to 3.

Rob Wolf: Wow. Okay.

Chris Kresser: So much narrow range. And, you know, a lot of functional medicine clinicians like myself, we use that range because if someone has got a TSH at 4.2 or 4.3, that's not indicative of good thyroid function. So, that's number one. You need to use the narrow range of TSH with sensor thyroid stimulating hormone, for those of you that don't know.

And the way this work is that there's a pretty elaborate system for regulating hormone levels of any kind. But particularly, a thyroid hormone here, and it starts up in the brain.

And the pituitary measures to serve monitors the amount of thyroid hormone in the circulation and kind of the like the control tower. And if the level of thyroid hormone is low, it will bump up the production of thyroid stimulating hormone, which basically then travels down to the thyroid, knocks on the door and goes, "Hey, pick things up a little bit."

If thyroid hormone is too high, then the opposite thing happens, the pituitary will make less TSH. So it's a negative feedback cycle. And just so, you know, for everyone, for those who don't know this, high TSH actually indicates low thyroid function.

Rob Wolf: Because it's trying to goose this...

Chris Kresser: That's right.

Rob Wolf: And it can make the thyroid...

Chris Kresser: That's an inverse marker.

Rob Wolf: Okay.

Chris Kresser: And then we need to be concerned with T4 and T3. And this is another problem with standard testing is a lot of doctors will only measure TSH. They don't even measure T4, much less T3, but they'll just measure TSH. And if TSH is in the range, that's the end of the story.

But we need to look at T4, which is the main hormone produced by the thyroid gland about 93% of what the thyroid gland makes is T4. And even more importantly, we need to look at T3 because even though the thyroid gland doesn't produce much T3, it's the most active form of thyroid hormones about five times more active metabolically than T4.

And this is where it kind of -- gets kind of interesting is the conversion of T4 to T3 doesn't happen in the thyroid gland, it happens outside of the thyroid gland, in the gut, 20% in the gut, 20% in the liver and the rest and other referral tissues.

So you could have fairly normal thyroid function, fairly normal production of T4 but really poor conversion of T4 to T3. And you're kind of screwed because that T3 is what activates the LDL receptor. So the things that impair a conversion of T4 to T3 are stress, inflammation, and selenium deficiency, and poor low -- chronically low insulin levels. Those are probably the four main causes. So if you go to the doctor, see if you can get your TSH and your T4 and your T3 tested at the risk of getting a little overly complicated here. We also need to look at the three levels of these hormones, three T4 and three T3.

Most hormones in there produced by the gland, they're bound to protein because hormones are fats soluble and can't be transported through the blood, which is, you know, water-based medium. So they need to be bound to a protein carrier. And as long as they're bound to this protein carrier, they can actually activate the receptors and do everything they're supposed to do.

And so, when they get to where they need to get to, that protein carrier gets cleaved off and then this hormone is called free hormone or unbound hormone. So I'm sure a lot of folks have heard of free testosterone versus total testosterone. It's the same idea with thyroid hormone.

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So to really know how your thyroid is functioning, you need to measure your three T3 because that's ultimately the end product of all of the conversion.

Rob Wolf: Because that's going to be bioactive.

Chris Kresser: That's the bioactive thing. And so, even, you know, some clinicians will measure total T4 and total T3 and they're not measuring three T3, you're still not getting the full picture. So it is a little complex, but if you find a good practitioner and endocrinologist who knows their stuff, I mean, nothing we're talking about here is going to be outside the real house.

Rob Wolf: Controversial at all.

Chris Kresser: Yeah.

Rob Wolf: Okay, okay. So, you know, with the high cholesterol action plan, this was just kind of a response to more and more people that were, you know, obviously, paleo is growing. It appears to benefit a ton of people for a variety of things, from, like, Dodd Hill total immunity, et cetera. But then some people are seeing some elevated cholesterol in general, possibly some elevated lipoproteins. And so this basically is a guide to help people both navigate through all that curriculum and also figure out some treatment strategy.

Chris Kresser: Right. Yeah.

Rob Wolf: So walk people through a little bit of what is in in the program.

Chris Kresser: Great. Yeah So, you're exactly right. I mean, for me this was actually pretty personal. I had a family member -- this had happens a number of times. He say, "Hey, you know, I was diagnosed with high cholesterol," you know, I do this for a living and they want to talk to me about it.

And I just realized I had nothing, you know, I didn't have them by a book or a video, or anything that I could send them that would just concisely

explain everything that they needed to know so that they can make an informed decision about their treatment.

Rob Wolf: You didn't want to send them national association, like...

Chris Kresser: Right, 800 hours of lectures and, you know, they lean there with their eyes rolling back in their head.

Rob Wolf: Right.

Chris Kresser: And, you know, nor could I sit down and talk to them for seven hours, you know, about it. Like, there's nothing out there that was -- that would be a good resource that has all of the information that they need without overwhelming them and practical tips for what you actually do once you figure out what your risk is.

There are lots of good resources that are really heavy on the academic side. And if you know how to read them, you can figure this stuff out. But then they don't go into actual treatment above and beyond stands.

Rob Wolf: Like Peter say -- like he's done a great job describing LPTLA and all that stuff.

Chris Kresser: Right.

Rob Wolf: But there's no treatment side on it, and that was pretty laborious to get through.

Chris Kresser: I mean, Peter is brilliant and, you know, for the people that made it through that series, it's probably about half a percent...

Rob Wolf: Right.

Chris Kresser: Of the people listening to this show because it's pretty dense, you know.

Rob Wolf: Right.

Chris Kresser: And so, yeah, I wanted to make something a little bit more accessible and more practical. So, what it is it's a nine-week course. And it's about five and a half hours of video, multimedia video presentation broken down into 9 weekly modules. And I purposely done it this way. I deliver one module a week because I've learned in the past that if you just lay five and a half hours of super dense content all at once, it can just be

completely overwhelming. And so, it's a sequential course that allows people to kind of digest and absorb the materials they're going through.

I have PDF transcripts for people who prefer reading, like myself for example, I never watch video.

Rob Wolf: Right.

Chris Kresser: I'm way too time pressed for that, MP3 recordings of all the presentations for folks who like to listen to it on their iPhone or their Android. And then I've got a step-by-step action plan, which is kind of a decision tree graph where I'd take you through exactly what test you should get, how to interpret the results, and then ultimately, how to evaluate your risk of cardiovascular disease based on the test results. And then you got dropped into one of four treatment protocols based on those particular results.

So in the first four weeks of the program are really about how to calculate your risk. And, you know, we have to keep in mind that this isn't a black and white process here. We can't say, "You've got, you know, 73% risk of dying from heart." We're not there yet. But we can get a really good idea of risk based on what we know from the current literature.

So in part one and two, we talk about how heart disease develops. We go over a lot of the stuff we've been talking about now. We talk about the main underlying causes of heart disease and then also the main causes of oxidative damage of lipoproteins that we haven't gone into.

Week three and four, we talk about how to determine your risk of heart disease. So we talked about the standard lipid panel and some more detail, and then we talk about the NMR, how to measure your LDL particle concentration and some other markers on the NMR that we haven't discussed in this show.

And then we talk about some of the more advanced tests like lipoprotein A, C reactive protein, LpPLA 2, homocysteine, iron panel with ferritin, which Rob alluded to earlier. I hand over those actually with little known risk factor for heart disease.

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We talked about blood sugar markets because, of course, if someone has got metabolic issues, they're going to have the...

Rob Wolf: Blood sugar problems?

Chris Kresser: Yeah. We need to fix that. We talked about calcium scans and the pros and cons of that test. And then in week five, that's when the -- we started talking about what you actually do about this stuff. So I talk about a heart-healthy diet and lifestyle. And, of course, the paleo primal diet is based on that. But I'll go into a lot more detail about specific tweaks that you can make to, you know, to make it more hard housed.

Rob Wolf: So, like, if somebody is showing iron overload potential then we might minimize red meat for that individual go more, like, fish and chicken and stuff.

Chris Kresser: That's right. So, I'm sure a lot of you know that I'm a big fan of Oregon meats in general. I'm always encouraging people to eat liver. But if someone is iron loaded, liver is the last thing they want to be eating because it's going to increase their iron and iron is a powerful catalyst of free radical production. And then there are studies that show that people that are -- have elevated LDL particle member have, you know, an increased risk of heart disease. People who have elevated iron saturation, which is a measure of iron overload have also increased risk.

But when you put elevated iron saturation and elevated LDL particles together, they're increased for the heart disease goes out by about 500%.

Rob Wolf: Because we have oxidative stress with the LDL particles.

Chris Kresser: That's right. So then, and then we talk a lot about basic micronutrient repletion, supplementation, you know, basic nutrients that I think everyone needs to be doing for it to protect against heart disease. We talk about exercise. I mean, particularly exercise for cardiovascular risk management, which is a little bit different than it might be for, like, you know, increasing your performance, for example, and then we talk about stress management, which is crucial.

And then week seven is really all about statins, and maybe we should talk a little about statins if we have a moment.

Rob Wolf: Yeah, yeah.

Chris Kresser: So, statins -- the operative question that we should all be asking about statins is how do they work, who do they work for and how do they work for those people? Because it's not enough to just say statins do this or don't do this. We have to be very specific about the populations because as it turns out, they have really different effects and really -- and different

population. So, for example, statins have never been shown to increase lifespan. And people even at moderate to high risk of heart disease that don't already have heart disease.

They do reduce heart attacks and strokes in that population, but, you know, essentially we're talking about healthy people at high risk of heart disease. Statins have never been shown their increased lifespan. I think it's important for people to know that.

Rob Wolf: Right.

Chris Kresser: I'm not saying that reducing heart attacks is something we should ignore. That is an important outcome, although it's actually -- statins are much less effective at doing that and healthy people than --- a lot of people assumed. But I think most people who are prescribed with statins by their doctor just assume that it's going to protect - -it's going to reduce their chances of dying prematurely, right?

And then that's why a lot of people end up taking them. But the truth is, statins have never been shown to do that in healthy people without preexisting heart disease. Another population who -- that doesn't benefit from statins in terms of reducing their life -- or extending their lifespan are women. And this is true not only in women without preexisting heart disease but also women with heart disease.

Once again, statins do reduce heart attacks, and that's from heart disease in that population. But they don't extend lifespan even by a single day according to the current research. So we'll go to a lot of detail about statins and how, you know, all the various population, how effective they are. And then we talk about side effects and risk with statins, and we talk about how to minimize those side effects and risk if you are taking a statin.

And let me just be clear that, you know, I've been critical about statins in the past. And I think they're over prescribed. But there are certain populations that they can...

Rob Wolf: Hey, folks, just a little sound issue there, but we are back. So, Chris, you're talking about statins.

Chris Kresser: Yes, I just want to say I've been critical to statins in the past, and I am still critical of them when they're prescribed in situations where the evidence doesn't support their use. But that doesn't mean I think statins are, you know, horrible across the board and shouldn't ever be used. I do think

there are maybe certain circumstances where statins makes sense particularly in patients with familial hypercholesterolemia.

So in module eight, in week eight, I talk about a lot of natural ways to reduce lipid protein particle number that are evidence-based, and also to reduce the potential for oxidation of the lipid protein particle, which is another main risk factor for heart disease.

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But my purpose in the statin module, and overall on the plan is just to help you make an informed choice with your doctor about whether statins are right for you. I'm not, you know, my goal isn't to tell you to take a statin or not take a statin. It's to just educate you about what the evidence says on the statin efficacy in various populations and what they do and don't do in those populations so that you can make an informed choice.

And then as I just mentioned in week eight, we talk about natural prevention. There are things like tocotrienols and panthothen and fish oil that can reduce LDL particle number. And also, other risk factors for heart disease. And then we talk about some therapies that can reduce the potential for oxidative damage. So this is above and beyond the basic micronutrient support we talked about back in week six.

And then finally, in week nine, is when we bring it all together. Everything we've covered in the plan up until now comes together in this decision tree format where I take you step by step through all the test you need to get, how to interpret the results and then how to determine your risk of heart disease and then what treatment protocol you would end up based on your particular test results.

And then I lay out the treatment protocols for each of those levels with specific recommendations for diet and lifestyle and basic supplementation and then, you know, more specific supplementation and then evaluation of statins and whether they might be right for you in that situation and then what to do if you decide to take them. They reduce or mitigate the risk of side effects.

And there are a lot of handouts and kind of cheat sheets and worksheets that you -- that are included with each in the module. So, you know, for quick reference so you don't have to go back and wait through the presentation to, you know, get the topline info. And then we've got some great bonus material interviews with weight loss experts, like Stephen Guney, and sleep expert like Dan Pardy and, you know, some ancillary

stuff that helps kind of support the overall heart healthy diet and lifestyle.

Rob Wolf: Thanks. So, you know, for folks that have been, you know, maybe you receive some blood work, things didn't come back the way that you might think that you would like to see it, your doc maybe, you know, is concerned about what appears to be some bad blood work. Again, this plan will help you kind of navigate through and figure out, "Okay, do I elevate a cholesterol or do I have elevated lipoprotein? If I have elevated lipoproteins, what are my other risk factors, like metabolic arrangement, potential thyroid disregulation, you don't get into the gut hold specifically in this that's more personal. And then also you're going to have some work down the road looking more at the gut.

But this thing will allow somebody who maybe have some questions about whether or not they're in a good spot with cardiovascular health to be able to make some informed decisions about advance testing, what that advance testing means and be able to sit down with your doc and then make some decisions about, like, okay, you know, even though my total cholesterol is high and my particle count is low, I have super good metabolic parameters. I don't have insulin resistance. So the likelihood of having cardiovascular disease is low. Or maybe we have something a little more murky in there, maybe we have some familial hypercholesterolemia and we need to really think about, you know, if you're following a paleo diet that you need to do some modifications on that. You need to follow more of like a Mediterranean paleo type diet to minimize the saturating fat.

If you've got iron overload issues, then you do actually avoid some bread meat and...

Chris Kresser: Donate some blood.

Rob Wolf: Yeah, and donate some blood. Yeah, go do some bleeding. Greg actually did an article on blood donation for the performance menu back in 2005, 2006 which is very, very good article. So, Chris, how do folks track this thing down?

Chris Kresser: Yeah. It's at highcholesterolplan.chriskresser.com. And you can learn more about the program there. I go into a lot more detail about what's in the modules and you know what the program consist of. And, yeah, I think that's about it.

Rob Wolf: Cool. And, Chris, tell folks really quickly, like, we get to hang out a little bit, we've been able to deep kids and diapers and all that kind of stuff. Part of the trip was that Chris did some talking and showed some of his modules to the folks at specialty health. So, what's going to be happening with your modules now with regards to CMEs and CMUs?

Chris Kresser: Yeah, that's exciting. I'm glad you brought that up. This is a great program not only for, you know, patients, consumers, whatever you want to call it, people who are just concerned about cholesterol. It's a great program for clinicians or anybody that works with clients or patients as a, you know, healthcare practitioner, health coach, nutritionist, acupuncturist, chiropractor, medical doctor, whatever.

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So, one of my goals was to get certified for continuing medical education, CME, and continue on education units so that people, you know, folks who are professionals could take this course and actually get credit for it. And that's what we discussed in the meeting with specialty health.

They were really excited about it and they're going to get it certified for SME and CEU units. And then they're also going to offer it as part of their risk assessment program, which I think you've talked about a lot on the show.

Rob Wolf: Yeah, we will be rolling out a direct-to-consumer blood testing, basic panel initially, kind of doing very similar to what we do with the police and fire fighters doing a basic panel. And then if we see some lab values that would indicate the need for advance testing, then that's where we would reckon in going with LipoScience for the NMR and then especially helpful. We're offering some health coaching basically providing interpretation of what these lab values means so that, again, you could go back and work with your doctor and work with your primary care provider to do some follow up when and where necessary.

Chris Kresser: Yeah, I'm really excited about that.

Rob Wolf: Yeah. So super cool stuff. Keep your eyes open on that. Definitely, check out Chris Kresser's high cholesterol action plan, you also have Chriskresser.com. Of course, your podcast is available on there

I think that's most of the stuff. Can you think of anything else that folks need to check out?

Chris Kresser: No, I think that covers it.

Rob Wolf: Cool. Well, the babies -- I hear them screaming in the background. So, I think Chris and I are going to be on a short leash now. But, folks, definitely check out the high cholesterol action plan. Thanks for coming and hanging out.

Chris Kresser: My pleasure. Thanks for having us.

Rob Wolf: Yeah. So everybody have a good time and give me some feedback on the, you know, what -- how many of you are checking this thing out? Definitely, I know a number of people have shut me questions about cholesterol lately.

So, give this thing a look, see and we'll catch you all at episode 152, and Greg Everett will be back for that. I know some people missed his warm snugly self. So, he will be back. Talk to you all soon.

[0:57:20] End of Audio