

VIDEO_ Diet Doctor Podcast with David Diamond (Episode 27)

Dr. Bret Scher: Welcome back to the Diet Doctor podcast with Dr. Bret Scher. Today I'm joined by Dr. David Diamond. Now, Dr. Diamond has a PhD in biology and he is a professor at the department of psychology at the University of South Florida. Now, interestingly, his work is in cognitive and neuroscience and he's done this for decades.

But because of a personal journey, he has now gone down this whole path of cholesterol and statins and low-carb lifestyle, and really trying to say, what does the science say, what does the science support in this realm. Now, this is a polarizing topic, especially with mainstream medicine, mainstream cardiology being very much in the camp of LDL is causative of heart disease.

And Dr. Diamond is on the other side of that, saying wait a second, I don't think the evidence supports that statement. Now, I've got to be honest, this is a very important topic for me, a personal topic for me. I had a huge list of notes and I kind of went a little bit all over the place because I was just so interested in talking to him and talking about the different topics and getting his thoughts on different things. So, I apologize if this interview doesn't flow as seamlessly as I would have liked.

But I think we cover a lot of different topics. Now, quick disclaimer; if you have high cholesterol, if you are on a statin, please do not make any medical decisions or changes based on this discussion. This is merely to explore some evidence, to explore one side of this equation, hopefully in a balanced way. But if you are going to make any changes or any decisions about your medications or your health, please talk to your doctor first. Do not make any decisions based on this discussion alone.

Now, with that disclaimer, we talk a lot about the science, we talk a lot about the practicality of how this implies to individuals and a low-carb lifestyle, and we explore a number of different topics about cholesterol, LDL, statins, and their benefit. So, a couple of quick definitions, which I think we go over, but relative risk reduction versus absolute risk reduction.

So, if you have a one percent risk of something and you can reduce it down to a half of a percent, the difference, the absolute difference, is a half percent, that's the absolute risk reduction. Relative risk reduction however, I would say that's 50 percent reduction because half percent is half of one percent. So, we talk a lot about that, Dr. Diamond has been very vocal about sort of truth in advertising between those two things.

We talk about Mendelian studies and basically that's just a natural history experiment of genetic mutation and following what happens to people over time with that genetic mutation, that's called a Mendelian randomization trial, I think I use that term a little bit in here. I think hopefully that's all the definitions you need, and I hope you enjoy this discussion with professor David Diamond. You can see the full transcripts on dietdoctor.com.

Again, please realize this is not medical advice, this is just simply exploring a fascinating topic with a fascinating human being. So, enjoy this discussion with Dr. David Diamond.

Dr. David Diamond, thanks so much for joining me on the Diet Doctor Podcast.

Dr. David Diamond: Thanks for inviting me, Bret.

Bret: It's a pleasure to have you here because you have been a spearhead in this movement of questioning the role of LDL, questioning the role of statins and more importantly, how does that apply to a low-carb lifestyle. But this... this is not even your job, this is not your profession. I mean, you have a regular job as a professor in the department of psychology, so tell us a little bit about how you got from point A to point B here.

David: Right, so, my training, my primary expertise is in neuroscience, studying the brain and memory, which I started over 40 years ago. But what happened about 20 years ago was that I found that I had extremely high triglycerides, I was actually diagnosed with familial hypertriglyceridemia, which happens to about 5% of the people in the population. I eat some bread and my triglycerides go sky high. My triglycerides were about 700, 800 and these people who have high triglycerides also have low HDL. So, my ratio of triglycerides to HDL, which should ideally be like 1:1, or 2:1, mine was about over 20:1.

Bret: Wow, that's amazing.

David: And, so... and it was for about 10 years. My doctor's keeping track every year, I'm getting blood tests, I'm working out like crazy, I'm on a low fat diet, and every year I just got fatter and fatter and my triglycerides were up. Finally, my doctor just sat me down, said you know, you've done your best, your diet and exercise have failed, just like they say in the commercial. You've got to go on a statin as well as other medication.

And I just figured, well, you know, I've got a background in biology. I know a lot about the brain but not much about heart disease. Least I could do is read a few papers before I go on the medication. I read a few papers and by this time, I've now read a few thousand papers. And that has helped to guide me and my decision not to use medication. Instead, I learned about the value of low-carb diet. I was able to cut my triglycerides by 75%, raise my HDL 25%, lose a good bit of weight, feel much healthier now than I did 20 years ago.

So, I'm a strong advocate for a low-carb diet but also realizing that medication wasn't appropriate. And in the process, I've been in a sense indignant about the statin research. I actually express this when I give my talks about how I realized that the cholesterol theory, which is cholesterol causes heart disease through LDL, it's really not well-supported and frankly, what I express is the obscene profits that have been made through the food and drug industry that have maintained a hypothesis that has failed.

Bret: Very controversial and interesting theory which you back up with a lot of research. So, I want to talk about that but I think your example is a perfect example of what's happening in this low carb-world and the medical world in general that whether it's an engineer or whether it's a scientist, frequently an outsider from the medical profession has a personal experience, but then they have the tools and the knowledge to dig deeper and provide us with a whole new perspective.

And I think that's so valuable because, you know, in the medical world, if you're in your own echo chamber, only hearing the same people, the same experts, the same drug companies. Although, we fall into that same risk I guess, in a low carb world, right. We can be our own echo chamber too, so we have to reach out into other areas and keep our ears open for other opinions.

Now, one of the things that you're very critical of is evidence and how we portray evidence. And we talk about evidence-based medicine all the time and we talk about what is the evidence for keto, against keto. What is your perspective as you've looked into things about the state of evidence in the medical world?

David: Well, I think it's very important that I don't come in with a bias. You know, I've actually been very well-funded by drug companies in my neuroscience research, and I'm not personally or professionally opposed to any drug company research. I had never seen the distortion of data... distortion of the presentation of data before going into the cardiovascular field, before reading papers on effectiveness of treatments with cardiovascular, particularly lowering of cholesterol drugs.

And I have to tell you that I was astounded, I was offended when I saw how the data were manipulated to greatly overstate the benefit of cholesterol lowering drugs, which actually goes back decades, originally talking about cholestyramine in a 1984 paper in which you had, starting off with about half a million men, they got that work down to about 600 people at the highest levels of cholesterol, and using an older drug cholestyramine, which lowered cholesterol.

The amazing thing was after seven and a half years, there was virtually no effect and there was no real statistically significant effect. It was a 0.4% difference between treated and untreated men. And I look at that, and what they should have said, you know something, we were wrong... lowering cholesterol didn't have any benefit whatsoever.

But they turned that 0.4% into a 24% improvement in outcome. And so, this manipulation of the data and that's using relative risk rather than the actual outcomes. So, to me, this is just not right in how you report the data to the public and to the medical field.

Bret: Yeah, you've been very vocal about the relative risk versus absolute risk. So, the absolute risk in that setting would have been the 0.4%, but when you do it in a percentage, it's a relative risk, so if you have a 1% risk, you lower your risk to 0.5% percent, that's a 50% reduction. Now, what's interesting to me, as a cardiologist, I've inundated with that type of relative risk reduction publicity, and to me it was just how it was done.

Until I started, you know, digging a little bit deeper and realizing it's a completely different conversation if you have the absolute risk reduction. But the fallback is there is a change, there is a difference. So, even in the statins, and I guess maybe we're jumping a little ahead here, but even in the statin trials, if there is a 1% difference, it can be a statistically significant 1% difference, which then they publicize as a 36% difference.

But it's hard to argue if there is a difference, so the question becomes when is it a big enough difference to make a clinically useful intervention, and that's a hard question to answer, isn't it?

David: Right, the first thing is that we need truth in advertising, we need accurate reporting. So, what's very important is to report both - the absolute risk and the relative risk. They should both be in the abstracts, they should both be presented to doctors and to patients. People should know both.

What is actually the difference in the rate of events in people of placebo versus the treated people? You shouldn't only be told the relative risk because that's deceptive, and we know it's both in doctors and the public. When you hear about a 50% reduction in risk and that's all you hear, you think that half of all people are now not going to have a heart attack. And that's exactly what doctors interpret that.

So, again, first... I'm not against reporting a 50% risk reduced with statins, but that's got to come along with the absolute risk as well. People need to have both data forms. And the second thing is, you are right. There are numerous studies showing benefit with statins, and that benefit typically is on the order of single digits. There's never been a statin study I know of in which you actually have a double-digit improvement.

And I have to just briefly tell you, in my field of neuroscience where we actually study depression, is such a great controversy because people with mild to moderate depression, given a placebo, have actually a rather dramatic effect as a benefit. And the controversy actually is that the antidepressants only improve outcome by 10% compared to placebo.

Well, there's never been a real 10% improvement outcome of any kind with statins. So, I agree with you completely, there are studies that have shown the benefit of statins when you're

looking at coronary events, as well as coronary mortality and all-cause mortality and those numbers are relatively small, but they are real.

Bret: Yeah, I think that's a great perspective that you bring from the field of psychology and depression and they're looking for a 10% benefit and we're talking about 0.5% to 1% benefit. And it's interesting that the phrasing, the wording of these studies, that they're blockbuster, that they're revolutionary. I think we've sort of lost perspective of what blockbuster and revolutionary really are. Like treating tuberculosis, that was revolutionary, that was blockbuster. Sanitation, anesthesia, you know, those were blockbuster.

A half of a percent difference, is that a blockbuster? But then people say, cardiovascular disease is the number one killer in the world. Millions of people are going to suffer from cardiovascular disease, so if we can make 1% difference and that's a lot of people. And in a way, that's a valid argument when you're talking about a population basis.

David: I agree completely. If statins had no adverse effects and you say 1% of the people from having a heart attack, I'd be all for it. Maybe I'd take it myself if we were absolutely certain there were no adverse effects. I mean, this kind of grabs you. You think that a hundred people are going to take the drug and I one person out of a 100-- 99 take the drug and then there's no benefit whatsoever, but again it gets down to adverse effects. Now, what has happened is people are really not aware of the adverse effects.

They've been greatly minimized by the key opinion leaders. And I've also talked about this. Now, we actually were invited to write a commentary recently by Plus One. And in that commentary, which just came out a few months ago, we reviewed the literature on adverse statin effects. And it's not small, it's extensive.

We reviewed about 60 papers published in peer-reviewed medical journals of about 20 different categories of adverse effects. The most obvious is development of type 2 diabetes. And this has really been minimized by the key opinion leaders. But when you actually look carefully, and you have an RCT and an actual trial in which you get blood samples and you look at the A1c levels and you look at fasting glucose and other insulin measures, you actually find that over the course of six years - this is in men - that there's a 5% increase in new onset type 2 diabetes.

So, this particular one was done in Finland funded by the government in which you have a spontaneous increase in type 2 diabetes with placebo as 5%. But in those that were on statins, it was actually 11%. So it's doubling in the rate of type 2 diabetes, which is a relative risk measure. But we're not talking about 1%, we're talking about a 6% increase over the course of about six years, and so, that's just one adverse effect. There are really well described cognitive effects.

We've published a paper on cognitive effects in statins, and there's actually a beautiful paper that has shown that people diagnosed with dementia, older people diagnosed with dementia, which, when they were taken off the statin, their dementia disappeared. Put them back on the

statin, the dementia returned. This is not something that doctors are aware of, the extent of the adverse effects of the statins.

Bret: Yeah, it's very interesting, because when you talk about adverse effects of statins, the most common is the muscle aches, that's what everybody talks about. And the argument is you can't compare muscle aches to heart attacks, right? Those are not on the same level, especially when the vast majority of the muscle aches disappear when you take... when you remove the statin.

But even with the muscle aches, there's significant controversy. I mean, you look at the trials and they report one in 20 000, you know, risk of significant muscle aches, and of course, these are designed by the pharmaceutical companies so there's a run in period which weeds out a lot of the other people who would be intolerant, so, they're not included in the trial.

But then, my favorite is how you called out Roy Collins and, you know, how he would state there's one in 10 000 risk of statins but yet his commercially available product to test for statin myopathy risk, quotes a 29% risk. So, where do you see in trying to evaluate the evidence? Where do you see the muscle aches really lie? Where do you think that is? What is the real number?

David: This is very interesting because you listen to the leaders of the field. Steve Nissen, for example, calls it the nocebo effect, in which the patient is told that the statin causes muscle aches and therefore, they say they have statin-induced muscle aches. But he calls it actually a nocebo, meaning it's all in their head. And there are some very poorly designed studies that support that.

What I am presenting today is actually Steve Nissen and Christie Ballantyne and Steve Nichols strong statin advocates, talking about muscle pain caused by statins, they're not calling it a nocebo effect. And their estimate is 40% of the people taking statins stop taking it in part because of muscle pain. So, I caught them on a video in which they're being candid about what actually happens in the clinic, why people stop taking statins.

Bret: Interesting.

David: Yes.

Bret: And it is difficult to decipher the real-life effect, the physiological effect versus the placebo or nocebo effect. That's why you need a randomized control-- placebo controlled trial, but those trials frequently excluded people who were at risk of having muscle aches. So, I don't think we know the true answer. But the bottom line is if you think it's causing you muscle aches and you're not going to exercise because of it, we have to ask is it impacting your health favorably. And makes you wonder, doesn't it?

David: Well, that's another important point. What happens is we know that statins interfere with metabolism, you have less coq10, which muscles need to be able to have energy. And there's some very nice work from... out of UC San Diego-- Glome?... it'll come to me later. But very nice work showing that many people have fatigue much more rapidly, especially under exertion conditions, and so, we do have less energy.

People have less energy when they've taken statins, and we do have muscles breaking down, which contributes then to kidney disease, kidney injury. There's well-established actually public papers. So, I think we are looking at very real physiological effects that have adverse effects globally on the body.

Bret: Yeah, so, we started with the muscle aches and then, diabetes is the next big one. And what's interesting about the diabetes is people say, well, look, if you're having an increased risk of diabetes, but you're still showing a reduction in cardiovascular events, doesn't matter. And that's very interesting when you're in a five year trial. But when people are on these drugs for 20 to 30 years, we're left to determine how are we going to interpret that data?

On the one hand, people say, well, if the cardiovascular benefit is one year or five years, it's going to be 2 years or 10 years and 4% at 20 years. Okay, maybe we can make that reach, but how is the diabetes going to impact that? And we don't know the answer to that question, do we?

David: No, we don't because most of the trials are stopped at about three or four years. It's Beatrice Golomb by the way--

Bret: I knew you were going to get it.

David: She came back to me, and she had done some beautiful work looking at statin effects. What you'll find with the statin advocates-- I look at this, really it's outside my primary area in which I was just a basic scientist. I am still a basic scientist looking a brain function. But to see people who I now consider advocates for statins, that's not the way science is done.

And what's happened with the statin advocates is they consistently take that number needed to treat-- which may be small after one year-- and they simply change it... one out of 100 people will actually have a benefit from statins. And then they'll say, well after 20 years, you only have to treat five or 10 people. Because that benefit will accrue over 20 years. And they refuse to say the adverse effects can also accrue.

So, if you're looking at 6% additional people who develop diabetes after about five or six years, what's going to happen after 20 years? And what's going to happen if there's actually an exponential increase in adverse effects? But once tissue starts breaking down, then you've got to be even more concerned with that happening at an even more rapid pace, especially with elderly people.

And by the way, also, the way I also present this is if the tobacco companies had the control that the drug companies have now, overlooking only with the onset of starting to take the statin after only about four years, you look at the development of cancer, it's only four years that you've started smoking, we never would have known about the link of lung cancer to smoking. So, understand, these trials were stopped really before most cancers can develop.

But when you look long-term and there's actually a nice epidemiological study looking over 10 years, you see twice the rate of breast cancer in women who are on statins chronically compared to equivalent groups of women either with high cholesterol, low cholesterol. And so, there's also evidence of cancer in men as well, but you've got to look at older population more vulnerable over a longer period of time.

Bret: And that's interesting because that's where there's some contradictory evidence, because there's meta-analysis showing no increased risk of cancer as well, and all has to do with which trials you'll include and how long is the follow up, and it becomes confusing and it's difficult to say with certainty. But then you hear these statements, the preponderates of evidence, right.

Taking the evidence as a whole shows that statins reduce cardiovascular events. That's also difficult because where does the preponderates of evidence come from? It's mostly the Pharma sponsored trials. So how do we interpret Pharma sponsored trials, I mean the data is still the data, we can't-- it's not like they're falsifying the data, but what is the impact the pharmaceutical companies have on the data we're seeing?

David: I actually give pharmaceutical companies a lot of credit. I don't see any evidence of fraud. The deception is how actually the clinic directors present the data to the public and to the medical community, and again, that gets back to the relative risk versus absolute risk. The fact that they report such miniscule beneficial effects... to me, I give them credit.

That clearly to me doesn't appear to give me any reason to accuse them of fraud because they're showing so little benefit. And again, I don't think we want to automatically demonize studies that are funded by Pharma. These are very expensive studies and it's very difficult to get government funding for long-term studies on cardiovascular disease. The other challenge is it's a very low rate at which people develop heart attacks.

About the only time you see a high rate of death is with heart failure, of which statins are actually no benefit at all, people with high cholesterol live much longer than people with low cholesterol following heart failure. But when you're looking at heart attacks, you're actually seeing in the general population such a low rate that frankly, to give the Pharma credit, it's difficult to much of a reduction in heart attacks.

You even take people with high risk of heart attacks and you'll only get about typically 3, 4, 5% who will have heart attacks and you'll have a low rate of mortality. So, this is part of a methodological challenge for this area of research. So, now like in a cancer study you may have

50% of the people die in a short period of time. But in these heart disease studies I don't think people appreciate that there really is relatively a low rate in placebo treated people. And this is why I tell people...

I show them studies such as the Lipitor study, which was famous in the Lancet early... around 2000. Or the British Heart protection study, you're only looking at about 3% or 4% of the people who died. They're terribly uncooperative as a way to put it. And about 97% of the people don't have heart disease, and the way I also present this to people, I say, listen, you can go to your doctor and say, if I don't take the statin, if you give me a placebo... what's the likelihood in the next five years that I'll have a heart attack? And the answer is 97% likely that you will not have a heart attack. And so, to me, that's the reality of it as well.

Bret: Yeah, so, that goes down to the-- from a doctor standpoint, the shotgun approach of let's give this drug to as many people as possible hoping one is going to benefit versus the more... the more laser beam focus of let's really find out who's at the highest risk and then maybe add a statin as part of their regimen. So, how do you interpret the calcium scoring data that's come out recently?

You know, another big study, Walter Reed, that showed absolutely no statin benefit if your calcium score was zero. It showed a very small benefit if your calcium score was between one and 100. I think it was... the number needed to treat was about 100 over 10 years. But then, as that scores go over 100, all of the a sudden the number needed to treat to save one cardiovascular event-- not death but cardiovascular event-- goes down to 12. So, how do you think about that more laser focused approach than trying to better identify who might benefit from a statin as one part of their overall treatment program?

David: Right, so I think there is evidence. Actually, going back to before that, 25 years ago, now including the calcium scores for people show that the people more vulnerable to develop heart disease are actually... do benefit from the statins. And, so you're absolutely right. That study showed that the people who have a high calcium score showed a benefit of reduced coronary events, no difference in mortality as you say as well.

And I think it's actually important to go back this relates-- Well, first of all, when we're talking about calcium score, I want to point out, everyone agrees high calcium score is unhealthy. I mean, it is a fact. The interesting thing is numerous studies have now come out showing that people on statins have increased their calcium score. This is also-- there's no difference of opinion on this-- the remarkable thing to me is now that we say, well, that must be a good thing because increasing calcium stabilizes the plaque.

This, to me, came out of nowhere. It's like increased calcium score is bad unless it's induced by the statin. Then it becomes a good thing. So, that's remarkable to me. So, what I will yield here

is that there is evidence of benefit of statins given to people with high risk. And the important thing actually is there's an analysis of people in the 4S study that was done 25 years ago using someone on statin and actually, that was one of the biggest effects ever in which actually had a 4% reduction in mortality. And for secondary prevention, people already had a heart attack.

David: And frankly, I had to go back 25 years to find any study as good as the 4S study. It shows how weak the effects have been since then. But even accepting it was a study run by Pharma, the data were analyzed by Pharma. It's okay, a 4% reduction in mortality for people at high risk. A reanalysis of that study came out seven years later published in *Circulation* and it showed the entire benefit was in people that basically had metabolic syndrome, people who had low HDL, high triglycerides and high LDL, the entire benefit.

Now, when you look in the 4S study, which is so important, the people that had the same high LDL but high HDL and low triglycerides, secondary prevention, no benefit whatsoever. And this is so important, getting back to low-carb, because that's exactly what happens when people go low-carb. Their HDL rises, their triglycerides drop just like it did for me. So, what this is saying is you have a choice, okay. You can take a statin and basically have a crappy metabolic syndrome, or you can go low-carb, make all those improvements and the statin won't have any benefit over that.

Bret: I think that's a great perspective, I'll talk about that real quickly, going back to the statins causing an increase in calcium. I think that's a great point. The immediate reaction from the community was oh, this is a good thing. And to be honest, we don't know, could be perfectly correct. Well, there's a mechanistic way to think that that is correct but to not have the evidence and just dismiss it because of a mechanism. Would get thrown out if it was contrary to the common belief. It shows how a common belief can really direct a conversation. May not be right, may be wrong but it's just a perfect example.

So, that was good. Right, now getting back to the LDL and the environment it's in, and that's something I think we really lose perspective of because even going back to the Framingham data, same thing. There was an association, all-- a complete, total association between rising LDL and rising cholesterol and risk of cardiovascular disease.

But when you see the Framingham offspring data and they break it down according to HDL levels, all of a sudden, that association is lost at higher HDL. So, it shows there's something to this more than just LDL, and it probably has to do with metabolic health like you said, a reevaluation of the 4S trial, says that. Now, that being said though, you know, LDL is causative of cardiovascular disease. We heard it in 1980s with Brown and Goldstein, we heard it again last year with the European society of cardiology.

The definition of cardiovascular disease as an APO-B containing lipoprotein in a macrophage in arterial wall, therefore, it is causative. Now, with so many people certain in the medical community that it is causative, what are they missing?

David: So, when you say it's causative, you're just quoting-- I don't know your opinion on that--

Bret: Sorry, I should say I am quoting the literature, right. I am not stating my opinion; I am quoting what I see in paper after paper after paper.

David: Sure. And just to mention Brown and Goldstein, they stated as a fact that LDL causes heart disease in a complete absence of any evidence. They did an elegant work linking LDL abnormalities to familial hypercholesterolemia, but they never showed that LDL was actually causative of heart disease. This is again where we have to really look at the evidence. It's all I really care about. So, we have a drug that lowers LDL as much as statins and also raises HDL, this is CETP inhibitors.

So, the great thing about this drug is a completely different mechanism from statins, and initially killed people, and so those trials were stopped. So, people are dying with lower LDL and higher HDL, but after that they were able to clean up the drug, so it has almost no side effects. The CETP inhibitors, drug company has invested over a billion dollars. This was to be a blockbuster, because not only did it lower LDL, it raised HDL.

This is one of the biggest failures ever in Pharma history. So, these are the people who primary, secondary treatment with the drug, dramatically lower LDL, and absolutely no difference to coronary events or mortality, so no benefit, no harm. This, to me, is sort of the death note for the LDL hypothesis.

This is saying, no, you're lowering LDL and you're making no difference in coronary events. So, that's the first thing. The second is we have to realize there's... there's a lot of money involved in blaming LDL for heart disease. What we got is a new generation of drugs. Well, let me back off, a lot of people say it doesn't matter whether statins lower LDL or not, as long as statins provide a benefit, we don't care about the mechanism.

And that's one side of the argument which actually we can talk about. If statins have a benefit and they don't have any adverse effects, fine, who cares how they work. But what has happened is we have this new generation of drugs, that's the PCSK9 inhibitors. This drug specifically targets LDL.

So, if we actually look objectively at the research and we drop LDL and we simply accept that LDL doesn't really cause heart disease and statins work and we stop right there, that would be fine. But because the drug companies have invested over a billion dollars in the PCSK9 inhibitors, we've got to continue to target LDL. Now, part of this is I just want to talk about familial hypercholesterolemia.

These are people with extremely high LDL levels, two, three times normal. And in my papers that I've written which I'm covering in my talk today, I'm covering how people with FH, people with LDL, 200 to 300 or more, live a healthy normal life... that they have a normal lifespan. These are people who live into their 70s and 80s with total cholesterol of 400 and their LDL 300. Well, that's clearly counter to the idea that LDL is killing people. It doesn't make sense.

Bret: Yet there's a subset that clearly develop cardiovascular disease at a young age and die at a young age, but when taken as a whole, the overall life expectancy is not that much different. And when you compare those who get early cardiovascular disease to those who don't, it doesn't seem that LDL is the predictor, does it?

David: Right, absolutely. So, again, and let's be clear on the numbers. When you look at - it's a ratio - of the age of death versus decade of life... so the first thing is, only about 1% of people die in their first 20 years. In modern society, we have very low mortality rate, first 20 years. And when you look at rate of death for people with FH, that that is not statistically different from people in 20 years, 20 to 30, 20 to 40. There is no overall difference in death rate.

It is remarkable; there is a greater increase, there are greater incidents of coronary events, but the actual death rate, this goes back whether you're looking at the 1960s, to Harland's work... though the decades there have been a dozen of papers published. And Mundal et al, this is beautiful work out of Norway in which you're looking at about 5000 people documented FH in which you have no increased rate of death all-cause mortality at any age.

And in fact - this is untreated, so this is not looking at statins having an effect for people 70 years of age with FH, they have a significantly lower rate of death for the next decade compared to the general population.

Bret: Yeah, and that's--

David: So, LDL is clearly not relative. Now, we published a paper. My medical colleagues and I published a paper on medical hypotheses in which we reviewed the FH literature, and this is so important and it's ignored by the statin advocates. You have so many papers that have shown that what kills people with FH is coagulation factors. These people naturally, it comes along with high LDL, they also have a genetic anomaly in which they have significantly higher coagulation factors, higher fibrinogen, higher factor 8.

And their platelets are much more reactive to epinephrine. So, you put some epinephrine in a dish with platelets, platelets coagulate, okay, they aggregate. Someone with FH, put their platelets in a dish, put in some epinephrine, they're 100 times more sensitive to epinephrine than a controlled population. Now, you don't hear much about that because no one's excited about reducing platelet aggregation, I mean who wants to give aspirin to someone who's got FH, right? There's no money in platelet aggregation, far more money in targeting LDL.

Bret: Yeah, so, what's interesting about that is people have a problem mechanistically understanding that because there can be, you know, 20 or more different genetic mutations than the LDL receptor to cause FH. So, how can they all individually also effect coagulation? It seems like a disconnect. The LDL receptor genes also affecting coagulation genes. So, people have a real hard time mechanistically understanding that. Are you able to explain that?

David: I think that it's a different gene. There's actually a very nice study showing different gene forms for prothrombin, which is involved in coagulation. And it's the subset of those also have FH and equally high LDL between those who have cardiovascular disease and those who don't. But a subset of those also have the gene anomaly, which dramatically increases prothrombin and those are the people who have cardiovascular disease. So, it looks like it is potentially linked to the LDL gene anomaly, but it is a separate gene.

And so only a subset of people with FH now have this reactive, and those are the ones. The other thing to keep in mind, people with FH are just like everybody else. They are susceptible to the same risk factors. So, people with FH that smoke have a dramatically higher rate of heart disease, much more than the general population. And if you talk about stress reducing heart disease, well, the FH person is going to be more sensitive to stress.

And diabetes, so higher blood sugar is going to trigger platelet aggregation, so that FH person will be more sensitive. But to the individuals that don't have these risk factors and yet have sky high LDL, no heart disease.

Bret: Yeah, I think that's one of the most important points to the make. It's that the augmented facts, we know smoking is bad, we know diabetes, hypertension, metabolic syndrome are dangerous for your cardiovascular health. But for those with FH, it is a magnitude or a higher risk for the average person.

David: And I think it's important for the person with FH to realize that this is across the entire population, that it appears that they all have this increased susceptibility to platelet aggregation. But it's the subset then that had the additional risk factors. Such as the high blood sugar. But you know what is disturbing to me is that I read the reviews on FH, I read about treatment for FH, and we're talking about 20, 30 authors writing a massive review on FH. The word "platelet" does not come up once. Coagulation does not come up once. Total focus in on LDL.

Bret: Yeah, that's interesting, do they just not-- they just disregard that it's even an issue because the papers are there, the science is there. You might say, I don't believe it's such a big issue, but you can't ignore that the science is there, and they have to address it.

David: Yeah, that's what they do. And it's not just one or two papers here and there where people can't find it, and you know, we're talking about 50 years of research looking at people with FH. And there's some anomalies, kind of interesting and people who get their FH, it's

heterozygous so it's either from one parent or the other. It just turns out that there's a maternal influence. People who get their FH from their mother are much more likely to develop heart disease than people who get it from their father.

Bret: Really? I haven't seen that.

David: Yeah, it's out there, it's confirmed LDL levels appear to be equivalent. It's interesting and it says that maybe-- I mean I've hypothesized that coagulation factors come along with maternal FH and not with paternal FH. They may be more reactive but nobody's talking about this.

Bret: Yeah, there's no money in studying it and there's no real benefit in studying it because we have the bogeyman, we have the treatment, so why complicate the issue.

David: Well, that's also the other thing. There has never been a study on FH going back 50 years. Never been a study on FH with a placebo-controlled trial. And there's a lot of modeling that you will see, no one ever-- from the beginning they thought it was ethical and we got people with FH, we got to give them treatment, two different treatments because we've got to be able to save them.

And the way to look at it is there's no evidence that statins have any benefits or any other benefit as a treatment in FH because it's never been compared to placebo.

Bret: Right, but historical data shows in the statin era, risk of cardiovascular disease has decreased tenfold is what you would read in most papers since statin treatment has been instituted. Now, as we know from epidemiological studies, there are lots of other things that can happen and coincide with that. The relative risk drop since statins have been introduced is impressive. I mean, when looking at data from that standpoint, but my guess is you have a different interpretation of that.

David: Well, no, it's just a matter of looking when is it that death from coronary heart disease has declined, it actually began in the 1960s. Death peaked in the 1950s and you can actually see that decline began in the 1960s, and really, the slope in the decline hasn't changed much with statins.

And the statin research has shown a very low effect on overall mortality. So, there's no reason to believe that the statins have any effect on population mortality from cardiovascular disease. So, clearly, and there are papers to read in the 1970s questioning why is it so much fewer people are dying from heart disease now than they did 20 years ago. That may very well be that it is better care and it's actually post-coronary care that may be reducing-- it's death from heart disease that has declined over the last 40 years or so.

But probably the incidents of heart disease may be increasing with obesity and diabetes. But actually, what it should be potentially the use of antibiotics. It's actually very important because you do see a linkage of infectious disease with heart disease.

Bret: Yeah, we hear about smoking, we hear about blood pressure management.

David: Oh, yeah, you know, that's so important. The decline of death from heart disease has come with the decline in smoking too, which is again peaked in the 1940s and 1950s.

Bret: Could have also been treating tooth abscesses or treating, you know, chronic smaller infections. The point is we don't know the answer. We could come up with lots of hypotheses.

David: But statins don't deserve the credit for reducing it because it preceded statin development by decades.

Bret: Yeah, oh, okay. So, we just went down a little rabbit hole. I think I'm going to do a lot with you here because there's so much to talk about. But I was starting from the point of asking is LDL causative of cardiovascular disease, and sometimes I do get in trouble of making statements that make it sound like I support them when I'm really quoting the literature and trying to play devil's advocate.

But I think there's so much controversy about being involved and being causative and we blur the lines far too often. So, I mean, would you agree that APO-B containing lipoproteins like LDL lipoprotein are involved in the atherogenic process and involved in developing cardiovascular disease?

David: It's certainly possible and I am open to any possibility; I'd like to learn more about it. But what just doesn't make sense to me is when you look at people that have astronomically high LDL and they don't have heart disease. if we're talking about it being causative, I mean why is it not being caused out by itself? We'll talk about the environment, the metabolic environment.

What you've got is a harmful metabolic environment and you've got people who have high blood sugar and high blood pressure, which is causing damage to the endothelial, it's causing damage to the vasa vasorum, and potentially one could say is then you've got infection, that the LDL is found at the scene of the crime.

And again it gets to the association versus causation. I mean, the police are always found at the scene of the crime, and so one can make an argument that police have caused the crime. It's the same kind of argument. There's good evidence that LDL works with white blood cells, with macrophages to target pathogens... to target and be able to kill bad viruses and bacteria and that is why, in fact, you find LDL in damaged artery. And you also find white blood cells. Wow, this guy is saying that these white blood cells obviously must be atherogenic.

You find calcium in your artery, well, calcium must be causing heart disease and you find lots of bacteria in these arteries, well, bacteria must be causing. LDL is found along with other things inside the arteries and essentially, there's so much work showing that LDL is a part of the immune system. And when you find actually bacterial remnants, this is very common in the plaque, you find bacterial remnants.

Infection is often associated with heart disease. And so, LDL is found where you have infection. And so that helps to understand LDL's role, which is a part of our immune system. So, I would say at this point, there is no evidence of causation. And, in fact, to take it to another level, there are different kinds of LDL. And this is so important to the low-carb community because we have to see that is so obvious is that the LDL changes depending on the environment. And so, what you find is-- and there's so much work by Ron Krauss and others-- is that the LDL changes under the condition of low blood sugar.

So, you don't have that abnormal LDL. I mean, natural, native LDL is large-- as I say-- large and fluffy. And when you surround it by sugar that is glycated and oxidized, well, you end up with what's called small, dense LDL. It has much less cholesterol in it and it's much more reactive. The way to think about this is that is not the way LDL is supposed to be.

That small, dense LDL is associated with an endothelium, with the lining of the artery wall that's damaged. And so, what you got in conjunction with too much blood sugar, too much blood pressure, and then you've got damage to the wall, the LDL itself is damaged. So, I would actually say at this point, I think small, dense LDL is potentially... think of it as atherogenic. But that's because it's contributing to the noise, it's contributing to the damage. But the native LDL in a healthy person is not contributing to the damage.

Bret: So, here we have a lifestyle intervention that can improve metabolic disease, improve insulin levels, improve glucose levels, can take small, dense LDL and make it the larger fluffy LDL, can lower triglycerides, raise HDL, lower blood pressure, it can do all these impressive things. Yet, the medical community is afraid that it can also raise LDL. So, would you say this is a completely different paradigm and environment than has been studied before and we're outside of any realm of evidence that medicine can point to?

David: Right, and what I'll be talking about today is that there's so little work relating ketogenic diet to so many factors that people assume have to do with heart disease as well as other disease. I mean, we could talk about the microbiome. People say you've got to have fiber; you've got to have vegetables because this bacteria must feed on the fiber. Well, no one that I know has ever looked at ketogenic diet - the microbiome-- So, we don't know what really a healthy microbiome looks like in someone that's ketogenic.

The same way with LDL, there's been sufficient work looking at LDL in people who are ketogenic. There's no work I know of looking at statin effects in people that go low-carb, and my

guess is who wants to fund that study, because the low-carb will blow away statins and the benefits. So, the person who's going low-carb in a sense - and I say this - and you don't know what the outcome will be because there's never been a study on low-carb and ketogenic diet and coronary outcome.

And sometimes people... really atrocious work saying that low-carb actually increase mortality, people die from low-carb... Truly awful epidemiological work. But the answer is we don't know that ketogenic diet will reduce coronary events because no one's ever shown that. It's reasonable to assume that because the biomarkers all move in the right direction, it should all be protected from coronary events. And the LDL will turn out to be completely irrelevant.

Bret: So, the argument of course saying the LDL still matters. Let me rephrase that because there's two arguments. One is the one you just made, we don't know and we have reasons to believe it's going to be protective.

The other is we don't know, so we really shouldn't treat this as a special circumstance until we do know, and we should lump it all together. And then when you... if you go that route and that's sort of the mainstream medical community would go that route, they really point to three versions of evidence to support that any elevated LDL is going to increase your risk.

There's the Mendelian randomization, the genetic trials which we sort of talked about with FH, but there's also the PCSK9 gain-of-function, which... so, PCSK9 basically is involved in the degradation of the LDL receptors. So, if you have a higher functioning PCSK9, you're going to actually have more LDL receptors, you're going to clear the LDL faster.

So, there's a population that had a lower risk of cardiovascular disease with that gain-of-function, and thus, the development of the PCSK9 inhibitor drugs. So, just a study like that showing benefit from lower LDL with higher receptor action, I mean is that enough to say, okay, there is more evidence there to say that a lower LDL is beneficial for some people, so therefore, we should air on that side.

David: Yeah, the original PCSK9 work was based on people who had abnormal PCSK9 and so they had significantly higher LDL receptor density therefore lower levels of LDL and somewhat lower levels of coronary events. But that was really related to a relatively small number of people showing no overall mortality difference between those with the PCSK9 abnormalities and the controls. Now, the reason was-- and again, target is LDL because that's where all the money is.

The recent work has targeted the PCSK9 inhibiting drugs. The thing that's so important to realize is when someone takes this drug, what they're doing is increasing their LDL receptor density, okay, which is abnormal. There are beautiful negative feedback systems to maintain LDL receptor just to the right level. This drug blocks the neative feedback so you're increasing LDL

receptors, meaning where is that LDL going to go? It's going to buy into these receptors and go into the cell.

So, the cell will become chock full of LDL that shouldn't be there. The cardiologists love this because now the LDL is taken out of the blood, so you drop LDL levels by 70%. But that LDL doesn't disappear. The LDL is being crammed into liver cells, and ultimately - my prediction, they've only looked like two years now, and there's no real difference in cardiac events when you look at the PCSK9 trials.

My prediction is you're going to see a really screwed up liver. You're going to see liver damage in these cells that have too much cholesterol inside them, and so 5, 10 years down the line, you'll be looking at people that will be harmed by this drug.

Bret: Wow, that's a great hypothesis. And we need longer term studies because so far, they've been only two years. In defence of the PCSK9 inhibitors, they take the highest risk patients already on a statin, they give them the PCSK9 inhibitors... they drop their LDL further, two big studies, one showed about a 1% reduction in cardiovascular events with no mortality difference.

One showed a 1.5% reduction with a small mortality benefit at two years. So, the proponents say, well, if we had this effect in two years, think of the effect we're going to have at 10 years. And of course, your response is what are the side effects and the risks will be at 10 years and we don't know the answer to that question.

David: We don't know that answer.

Bret: So, there's the Mendelian study, the genetic predisposition, and then there's the epidemiological studies, which we sort of touched on but studies like Mr. Fit, like Framingham which showed the association between total cholesterol and LDL and cardiovascular risk. Although, a small association but an association... now what about--?

David: Can I interrupt you?

Bret: Yes.

David: I'm going to be talking about Mr. Fit today. This is an amazing study because Mr. Fit showed a 400% increase in coronary mortality based on cholesterol levels going from the lowest to highest. And it's actually right now at the University of Minnesota website, you can see Mr. Fit.

And this is looking at about 400,000 middle aged men and they've got their cholesterol levels and they had followed them for quite a few years, seven years. The mortality rate from the lowest to the highest man was 1%, the actual mortality rate was 1%. And they have distorted this to turn it into a 400% mortality rate. So, you mentioned Mr Fit. That was an abomination of science. Framingham, I think it's all very clear.

When you look at unhealthy people, you look at LDL in an unhealthy environment. Potentially, it's either trying to save the unhealthy environment or it's a part of it. But again, it means the patient needs to sort of take his life into his own hands or her own hands. They need to take control of their own environment, they're not going to find health in a pill has been my point.

And so, the person who has diabetes and is obese thinks they're going to be protected by taking a statin, well the answer is still they're going to be very unhealthy.

Bret: Yeah, and that's one of the traps we fall into as a medical community, just trying to make things so simple for the patient. Make it easy for them, and that easy doesn't always work.

David: Right, and so, for the person who's going low-carb, improving all the biomarkers, and yet they're still concerned about the LDL. So, when we look again, getting back to 4S, which I think is so incredibly important. The 4S trial, again run by the drug companies, and so even though I'm skeptical looking at the data going wow, this is amazing.

The people have the kind of biomarkers you see with someone on a low carb-diet showed no benefit whatsoever with statin treatment. That tells you a little something about what to predict when we have someone that is low-carb, and therefore, they don't need the statin because there is no benefit.

Bret: Right, not proving that the low carb is-- the low carb eliminates the benefit, because that wasn't tested but you can draw a hypothesis with that evidence if you want.

David: Yeah, and there's every reason to believe that adverse effects don't discriminate. There's no reason why there shouldn't be adverse effects in someone on low-carb. And so the adverse effects are just the statin effects in physiology. So, potentially, they're looking at the cognitive effects and the muscle damage and the liver and kidney effects as well.

Bret: So, what's interesting, though, when you specifically the cognitive effects and the risk of diabetes, I mean that's what low-carb is purported to be able to benefit, so I would like to think that that would be a safety mechanism to hopefully reduce those side effects; again, no data behind it.

But it certainly makes empiric sense. So, if I have someone on a statin, I would actually want them on a low-carb diet. One for the metabolic benefit and to help with the LDL beyond what a statin could do but also to reduce potential side effects. Now, you've pointed out to me that there was actually a paper showing some beta cell dysfunction in the pancreas, so maybe low-carb isn't going to be enough to help reduce the risk of diabetes. What do you think?

David: No, not at all. When you think cognitive effects, the brain makes its own cholesterol and it needs the cholesterol to make new brain cells to make memories. Well, we actually published a paper showing that the statins that actually are lipophilic, which means they can get into the

brain, are the ones associated with adverse cognitive effects. And so that statin is going in the brain independent of whatever the person's diet is.

It interferes with brain cholesterol synthesis, which is essential for making memories. And so, no, I don't think it has anything to do with the person's diet, this is now just simple physiology. You interfere with cholesterol production in the brain, you're going to interfere with brain functioning.

Bret: Yeah, and the critics say it's difficult to measure that because if statins are being used in an elderly population, elderly people are going to get reduced memory function anyway, how do we quantify it without a trial, same thing. But it comes down to what are you most worried about. Are you most worried about developing Alzheimer's disease and cognitive decline or a heart attack, and as we age that may change?

And age is such a fascinating topic when it comes to cholesterol and LDL in general because whether it's Framingham study or whether it's the Honolulu Heart study, there are a number of different stages. Taking it together suggests there is again maybe a bimodal response in the 50s and younger, there's a tighter association between LDL and cardiovascular risk, but in the 70s and over, that association seems to flip. And you've been very big about pointing that out. So, tell us about that difference.

David: Yeah, so, what I would still go with is risk factors. What you've got there are risk factors that kill people relatively young; smokers and diabetes. These risk factors potentially interact with oxidized and small dense LDL at a younger age. You make it into your 70s and 80s, then you basically don't have those risk factors, you'll much less likely have the risk factors. And so, you don't see obese people typically living into their 80s and 90s.

And in fact, what you do find is that people with the highest LDL-- and there's more than 50 years of studies-- people with the highest LDL actually live longer than those with low LDL. So again, it's completely inconsistent with the idea that LDL causes harm on its own. And we published this paper in BMJ Open a few years ago.

We reviewed and looked at every paper that looked at mortality in relation to LDL levels. There wasn't a single paper that showed increase mortality in relation to the general population in older people, that's over 60, with the highest LDL, compared to lower LDL. So, that's completely inconsistent with the hypothesis that LDL itself is causal to heart disease. Because it's not killing older people who are at the highest risk of death from stroke and coronary heart disease.

Bret: Yeah, the comeback there is that as people get sicker, their LDL declines, so as they're on their death bed, their LDL is going to lower.

David: That's really the reverse causality argument, which really completely fails because it's not looking one year after someone has had a blood test, which actually does happen. Someone

dies and you find the year before death, especially if it's a cancer death, LDL levels do decline. But these are 10, 20, 30, even 40 year-long institutional studies.

You got a blood sample from someone in the 50s or 60s, and 20 years later you look at who's died and so, you're looking years beyond and these are people who had good health to begin with and you eliminate any people that had died in the first couple of years. You're still looking 20 years later. Those who had the high LDL in their 50s and 60s are still living in the 80s and 90s.

Bret: Yeah, so, again, observational data doesn't prove that the high LDL is what is improving their health, but certainly flies in the face of high LDL is dangerous and going to kill you.

David: These are completely inconsistent with the idea that LDL is causal. It's so simple; essentially it relates me also to the vegan versus carnivore diet. Vegans love to say how bad red meat is for you. If only the people who were eating red meat in their 40s would die of a heart attack, it would be so simple.

Well, if the people who demonize LDL and say, well it causes heart disease and people die, well, if people with high LDL would just die, in their 30s or 40s, it would be so simple. But they don't. The people with high LDL are living into their 80s and 90s and even 100; we're going to hear that today that the people who are 100 years old have the highest LDL of those measured. It just simply doesn't make sense to think of this as causing heart disease.

There is an environment, a toxic environment where you will find LDL, especially in the younger people. A toxic environment has to do with smoking and high blood pressure. And so again, if we think of high LDL coming to the rescue, now, the reason why we want to think of LDL being beneficial is that people with FH have a lower rate of death.

Again, got to emphasize, it's not statins. People in their 70s have a 40% reduced rate of death because they have a normal rate of death from coronary heart disease but a lower rate of death from non-coronary heart disease in their 70s. Less death from infectious disease, less death from cancer. This is how you look at it; if you live up to your 70s with high LDL, you've got a more protective immune system, and no difference in cardiovascular death.

Bret: Yeah, it's interesting to see it's certainly not talked about it from that standpoint.

David: There's no money in talking about LDL as protective.

Bret: Right, and then there's the concern about time of exposure, that has something to do with it. Whether you have LDL in your 40s or LDL in your 70s, that it's a different... a whole different time of environment, a different time of exposure. but more than time of exposure, is likely what else is going on from other risk factors and metabolic health.

David: The person that has FH and is in their 70s have had 70 years of exposure. And so again, they call that lifetime LDL burden. And if you actually look at some of the work you cited earlier,

they're saying that FH untreated, you can expect people to be dying in their 30s or 40s. And again it simply doesn't happen.

Bret: Right, right. Where else to go? There's so much to talk about here, so much more. You have been criticized and any time anybody goes against the mainstream medicine, of course they're going to be criticized. But one of the criticisms has been that you're cherry picking your studies and cherry-picking the data. How do you respond to that?

David: Yeah, I think the people who have criticize statins are called statin deniers are cherry-picking the data and actually their criticism goes beyond that. They are actually saying that this is an internet cult and they say these people are no scientists. I have no bias whatsoever. And again, I'm just a scientist.

My first priority was to improve my own health. I have no reason to be biased to pick the studies that would basically make a point for me. If I want to be showing that LDL is not harmful and I picked those studies, but ultimately I don't care about my own high LDL. I mean, it harms my own health. So, I have no bias. I have no interest in this other than looking at good science. I want to look at all the science and come to valid conclusions as a scientist.

Because I get no money from this, I have no pay, I have no funding for my interest in cardiovascular work. It's purely a personal venture for me. I don't want to be biased, I don't want to cherry-pick the data. I'm looking at the entirety of the literature and then coming to conclusions.

Bret: Yeah, and so, it leaves us as doctors and clinicians facing someone who's improved their health, improved their blood pressure, improved their metabolic parameters but have a high LDL, being confused what to do. The average doctor out there who doesn't see this every day is going to have the knee-jerk reaction that this is dangerous.

Someone say ignore the LDL completely and you don't have to worry about it and some are trying to really put it into context. But it's because of work like you, because of Zoe Harcombe and Aseem Malhotra and Malcolm Kendrick. People are willing to go against the juggernaut of the medical community and Big Pharma to say wait, we need to look at this differently, that allows clinicians the ability to say, okay this is something different, there is something to this. You've put yourself out there to really help move this forward and you've gotten a lot of attacks for it. I mean, has your skin really thickened from this?

David: Actually, I'm not sure what attacks you're talking about. I think in general the statin advocates have ignored to a great extent the people who have been critics. I know it came out there an article in the UK paper recently specifically criticising Zoe Harcombe, Malcolm Kendrick, Uffe Ravnskov.

They left me out of this because I'm not a UK person, but that article was truly awful. I mean, attacking them and saying, you know, how wrong they are. But really, I don't even think... we're not coming out against Pharma, speaking for them as well, there is no bias whatsoever. I am not looking to praise LDL and I would grant that the small dense LDL, which is an abnormal LDL, may be contributing to disease along with-- it's almost like LDL, small dense LDL may very well be the gas on the fire, but it didn't make the fire.

So, I don't take it personally. And oh, I actually do recall that there was a cardiologist at Duke University, who wrote a note specifically about me saying that I was causing harm to her patients, that people would all die because I was explaining how statins have adverse effects and how overall the adverse effects are greater than the benefits, to which I wrote a rebuttal to that cardiologist to reply.

So yes, there was one example I can think of which I've personally been attacked. But then again to me, it's all just science, it's not something I take personally.

Bret: I think that's a good perspective, it's all science. And actually, just to talk quickly about that article in the Daily Mail where they compared LDL cholesterol deniers to the anti-vaccine movement. Which I think is fascinating because they drew that comparison to the doctor who was falsifying data about the vaccines.

And I thought that was awful, I thought that was clearly overstepping the bounds because you are not falsifying any data. You are helping us see data that exists, that other people did, that's either being ignored or been promoted in a different way, you're just helping us re-see that data; there's no falsification there.

David: Well, there's a strategy in combat, which is to dehumanize your enemy. And what people do is say, they're not real scientists, so you can call them an internet cult. You can say that they're just like the anti-vaccine people. And that way, in a sense, you dehumanize them, you denigrate them and therefore they'll have less credibility and that's just wrong. What we have to do is talk about science and I'm open to any aspect of the science.

From the very beginning, I just wanted to learn how is it I can make myself healthier. And what I realize is that I did ignore the LDL and I did ignore my LDL now, which is quite high and what I really care about and what matters is blood sugar triglycerides, HDL is important but it is the canary in the coal mine. You don't want to take a drug that'll raise your HDL. HDL tells you about your lifestyle, triglycerides tell you about your lifestyle telling you you're consuming too many carbohydrates. LDL doesn't tell you much.

Bret: Yeah, and I think that's a great point and a great way to sort of summarize this, is are we talking about causation or are we talking about markers of our underlying health and our underlying lifestyle? That improves with a low-carb lifestyle. Your markers improve and then that should give us the evidence that our health down the road improves. I hope that we get

that long-term evidence and in the absence of it there's certainly reason to believe it's going to be so.

David: That's a great summary.

Bret: Okay, good. Well, thank you for joining me, I really appreciate it, and where can people hear more about you, about your thoughts and your research?

David: Well, you know, I don't sell books. I don't have a book, I don't have a blog, I don't have a website. This for me is still, it's personal. I have my day job in which I still do my neuroscience research. I will be... I actually don't have any talks planned for the future. For me, it's important to write medical publications, so I'm in the process of writing more papers to be published in medical journals.

So, I'm really approaching this as a scientist. I don't promote myself as anything, I am not making any money from this, so I welcome the opportunity to talk about it with you, thank you so much for inviting me, but frankly, I don't have anything to share as far as promoting myself.

Bret: That's a breath of fresh air, we don't hear that very often. Thank you for doing that.

David: You're very welcome.