00:02 Welcome to another fat emperor "Podcast Short where we'll clarify science and health matters so you can better understand how to optimize your health. So today we're going to talk about the cholesterol story and we're going to keep it short and sweet and give some of the basics. So what's the real story with LDL, the bad cholesterol and indeed HDL, the good cholesterol? Well, let's take a look. So first thing we should know is that 25 years ago, William P. Castelli, the Framingham director - of the biggest heart study ever done - indicated that unless LDL levels were very, very high, so 7.8mmol (that's around 300 milligrams per deciliter - for LDL alone).

01:12 So unless they were really that high, the LDL measure on its own was not much value in isolation for predicting coronary heart disease events. So that's important to note. LDL is a very "dependent" variable. Whether or not there could be a problem depends hugely on many other more important variables. Another thing that Castelli said is that the RATIOS of your cholesterol are vastly more important in all of the studies and that's remained so to this day, 25 or more years later. So the ratio of your total cholesterol, number, to your HDL good cholesterol number (or the ratio of your triglycerides to your HDL) are much, much more predictive for reasons we now understand. So that's another key intro to this talk. So Cholesterol units 101 - there are different units used around the world and this can cause a lot of confusion. So we have American units (mg/dL) and European Units (mmol/L).

02:14 So pretty simply, if you have American units here, in milligrams per deciliter, usually the values are in the hundreds for total cholesterol or LDL. Well to convert, you divide them by 38.7 and get the approximate European millimoles. You can see on the right to convert from European millimoles to American mg/dL, it's the reverse. So if you have 6.8 mmol/L total cholesterol, you multiply it by 38.7 to get 263 milligrams in American units. So that's the conversion factor. For triglycerides, you have a different factor. It's 88.6, so to go from American milligrams here to European divide by 88.6, and to go from European to American you multiply by 88.6. So these are just the basic conversion factors and it's important to note the triglyceride is a different number to multiply or divide by. The all important ratios then - I'm just showing mine here the total cholesterol over HDL ratio - You can see my value there in American units and you should be below 4.5 for this Total/HDL ratio. My target would be below four and I'm around 3.5. Then the triglyceride over HDL ratio. Again, we're using American units here to keep things simple. The guidelines are to be below two in this ratio. I would say below 1.2 ideally to have healthy LDL - and mine is around 1.0. So there are the ratios, just giving my own as an example. You can use the online conversion tool here, uh, to do all the conversions for you, which might make it easier. So LDL, the bad cholesterol, we all know and fear it, right? And it's shown here depicted as a little demon. But let's have a look at some studies. So here's the study. They tracked over a hundred thousand men and women over many years, eight years, and we see that the LDL very low below 140mg/dL, so a low average - compared to a high LDL above 140 American units, there's almost no difference really in the rate of ishaemic heart disease here, right? So LDL very poor performance, not sure what to do with it, but we

see that in the same study with triglyceride over HDL ratios, we see a doubling of the risk for heart disease by just being higher in that ratio. And this is very impressive. A 2x multiplier and that is a very good metric, Triglyceride over HDL - not infallible, because these metrics all just indicate what might be going on under the hood. But it's a much better metric than LDL clearly. And the reason it's better is because it better reflects insulin resistance or hyperinsulinemia - a major issue in heart disease. So the low triglyceride over HDL ratio people, will generally be lower insulin resistance, lower insulin levels, lower glucose levels. And that's why it's a powerful ratio because it reflects mainly that kind of problem, which is an epidemic in the modern world.

05:38 So LDL here would not appear to be such the demon after all - and in all the other studies we see similar kinds of data, we look at just one more on here, LDL in Group A in this study, an eight year follow-up of middle aged people. We see that the multiplier or risk multiplier for future heart attack scene, when they tracked the people, there was no difference between being a low LDL and a very high LDL. And in Group B in the same study between LDL very low, and LDL very high, and these who were very high LDL up around 150 US UnIts. In this group, we don't see much difference in future heart disease. If anything, the highest LDL has a lower risk multiplier. So that's quite confusing. But again, it shows LDL as being a very weak predictor if anything. But you might wonder what's the difference between Group A and Group B because there's clearly a doubling of risk by being in Group B. Well I'll show you: group B had high total cholesterol over HDL ratios. So just like we said before, it was the ratios of total to HDL that showed all of the risk multiplier for future heart attacks and the LDL, when you take account of the RATIOS - the LDL becomes almost useless. So that's an important thing to know about cholesterol. Again, the LDL here is not such a demon and after all, but the RATIOS certainly are. So risk assessment tools all over the world, We have many algorithms used to make medication decisions, so it'd be interesting to see what LDL does in the risk assessment tools. So we'll put in a person here with a 300 total cholesterol and an 80 HDL, good cholesterol - and the risk calculators don't take LDL, they don't bother with it. But by putting in a very high total cholesterol and a high HDL, we know we've put in a person who must have an LDL up around 190 or more, which is really high.

07:50 So let's see how the person does and the risk calculator. Well, in the risk calculators that do use the calcification score, which is the best measure of your heart disease level, we can see that this person with a huge LDL is actually ultra-low-risk over the following 10 years, they're incredibly low risk. So That's interesting. And if we use the calculators where they don't have the calcification result in there, we see that the person is still very low risk even though they don't have a zero calcification or any result. Just the blood risk factors. We see that this huge LDL person is very low risk below 5%. So certainly no medication needed. So it just indicates that even in all the world's risk calculators, if you contrive to put in a person with a very high LDL - if their blood pressure and their other ratios are good, they don't get a high risk.

08:45 So keep that in mind if you have a slightly high LDL. So LDL here may not be quite the demon that it's made out to be - of course. But I will clarify that we're talking about Ldl c for the last few minutes and that's the concentration of cholesterol in all your LDL particles. Now the new advanced lipid protein measures the advanced cholesterol panel, it is Ldl p and that's the number of LDL particles rather than the class stolen them. So let's talk a little about the Ldl p because it's becoming much more common in measurement. So Aldi LP is kind of the number of the LDL particles per unit volume of blood. So have you got a lot of particles per drop or have you got not too many? And if you have not too many, it seemed to be lower risk. Okay. Shown here, and if you have a lot of LDL particles, it seemed to be higher risk.

09:49 Okay then - We'll explain a little more. This person on the left versus the person on the right, they've got the same LDLc, the old fashioned LDL - they are both 130 milligrams in American units, but they've got different risk in the algorithm and let's see why? Well, the person on the left (lower risk) has fewer particles, but they're bigger. So they have the same cholesterol concentration overall, but it's made up by fewer particles, each of which is larger. The person on the right has smaller, denser particles - and a lot more of them - and that's why they're seen to be high risk, because the number of particles and the small size is a pretty good risk indicator. Okay. So this is the LDLp or also called ApoB. If you hear about it in the test, the challenge is that having more or fewer particles is only one factor in a very complex set of factors that will decide whether or not you have a heart disease problem.

10:57 And I call these other factors "layers". So Layer Zero is oxidized LDL's, whatever about your number of LDL's, do you have oxidized, damaged LDL's in your bloodstream from High Glucose or inflammation or high insulin or many other factors or smoking? Right? So that's an important question. If you have a higher number of LDLs overall, what is their state? The second layer is the Glycocalyx and this protects the inner wall.of your artery and it has a sieving effect on these LDL particles and it controls access of particles and other inflammatory molecules to your arterial wall. And that's where Atherosclerosis (or vascular disease) actually occurs. It's in the wall. So the health of your Glycocalyx here will be very important as to whether or not a high number is an issue for you - or not. Then you've got your endothelial cell, and this is a single cell layer on the inside wall of your artery, which kind of allows LDL's to come across, to sieve or come through the cell or even between the junctions between cells. So the health of your Endothelium, this layer is hugely important in whether or not a large number of particles floating in your blood really becomes a large number of issues in your arterial wall. So this health of the Endothelium is, is huge. So you need to think about this too. And then we've got the Proteoglycans in your arterial wall and whether your LDL's and your blood is of high quality will dictate how much LDL particles will get caught down in the wall on these Proteoglycans. So if you have inflammation and issues, you will have more pro proteoglycans building up and you will have more likelihood of catching small dense LDL and trapping it and letting it be comparative, the atherosclerosis problem.

12:55 So this is an really important layer as well. And finally you've got the health of your HDL - your HDL "efflux capacity" it's called, or the ability of your HDL to very effectively remove cholesterol as necessary from the wall of your artery. And there's a huge difference here between the person who has unhealthy HDL, who is in an inflammatory state - and someone who is healthy, who's HDL is working properly and doing its evolutionary job. So it's very important, your HDL health - and that will dictate also whether having a larger number of particles is a problem or not. So in short, basically we could have a person here who's very unhealthy and inflamed who has a high particle number in their blood - and these particles (because all of these layers are not in good shape for this person) - therefore a lot of particles will get down and get trapped in the wall and there they will be oxidized and can become part of the problem. This person has, you could say and LDL particle problem, and they could benefit from having the numbers of particles reduced and that could mitigate or reduce their risk for sure. So that's the unhealthy person. But then we can have a healthy person with the same number of particles in the blood - they'll get the same lab measurement of high LDLp, but all of their layers are working great. So they end up with very few particles down in the arterial wall and even the ones they do - this healthy person has really functional HDL working properly - and it's removing anything that needs removing. So this healthy person has the same high number of LDLp's, but they actually have very little problem in their vasculature. Yet to some professionals they would be high risk because they have a high number, and obviously this would be a very bad engineering judgment because you're missing out on assessing all the layers.

15:00 So this person could actually have a perfectly good LDL situation, even though the number could be on the higher end. So we leave it at that for the moment. In a later podcast short, we're going to go through much more detail on these layers and explain them all and how they work and how you can assess whether yours are in good shape. We'll just close now with the calcification scan I mentioned quite briefly, this is a five-minute, ~$100 CT scan and it sees the calcium in your coronary arteries and whether or not you've got disease and how bad the disease is, so it'll dictate your future risk or unless you take action and do something to stop the calcium increasing. So just to show a low score there on the left, you've got a very low 10-year event rate for heart disease or heart attacks, and it's not zero - because no measure is perfect - but it's extremely low, ultra low. Higher scores then, you can see a greatly increased, maybe 10 times increased rate here of heart attacks based on having a higher score. And if you have a really high score, then you've got a super high rate in the next 10 years unless you intervene and stop the progression, which we'll talk about in other podcasts shorts. So I'll finish with our book from myself and doctor Garber, which goes through all the detail, meal plans, recipes, and everything else you need to know for future health and to assure your future health. The book has also got over 300 scientific papers referenced, and basically explains everything that you need to know. And you'll see now the subscribe button. Hopefully you can subscribe to get future podcasts as soon as they come out. And you can also see on the right, a link to a free viewing of the Widowmaker movie, which explains the calcification scan and the fascinating

history of how it was developed, and how it became the best measure of atherosclerosis in the world. Until next time, bye now.