DANNY LENNON: Okay. So as we were kind of chatting before I think maybe a great place to start this discussion before we get into the weeds on these particular topics is probably to set the scene in some way and to kind of get a brief overview of your current position suppose we could run it up as on the healthfulness so to speak of saturated fat, saturated fatty acids. So I appreciate that a lot to try and fit in here and it's kind of quite generic thing to throw out but nonetheless it's probably going to give us some context for where to start the rest of the conversation. So with no particular order in mind perhaps we'll go around in alphabetical order and just hear where your guys would sum up your current position on this topic. So maybe we'll lead off with you Brad…

BRAD DIETER: So I think probably the best place to start is how when we talk about chronic diseases in general you know specifically a lot of time we talk about saturated fat, we talk about heart disease and I think the best way to look at it is it's really an accumulation of a lifetime of risk. When we talk about how chronic disease develops that's really the best way to look at it and when we talk specifically about things like heart disease or diabetes is there's a number of things that contribute to that accumulation of risk and one of them

being nutritional intake. And then we kind of dive down even further we do know quite a bit about the role saturated fat plays in a lot of these chronic diseases and that it does play you know some small component of this accumulation of risk and so when we talk about that I think the way I view it is dietary saturated fat intake does impart some part of this risk equation and that from the large accumulation of evidence it plays a small role and in general it's more neutral than anything in some cases you know large intakes of saturated fat can have negative consequences, replacing some of them with some of the other dietary fatty acids appear to lower risk in certain populations and in certain conditions and so you know I think for me how I'm doing it currently is it's this piece of the risk of equation that you've got to factor into the rest of the risk of equation. And I think you know as we start to get more into some of the things we'll talk about as we go we'll start to realize you know where does dietary saturated fat intake really increase risk and what context doesn't increase risk. So I think that's probably no currently how I view it in terms of the overall health equation.

DANNY LENNON: Perfect and I will certainly be diving into some of those elements maybe I'll turn to you next, Chris for maybe your synopsis.

CHRIS MASTERJOHN: I think that more often than not it's counterproductive to think about whether saturated fat is good or bad for you and there are some specific circumstances where I'd make exceptions to that rule and one that I'll give now and I'm sure will flush out others as we go along through the discussion but one that I think a lot of people would already be familiar with is if you're dealing with someone who has a hard time controlling their blood lipids then reducing saturated fat could under certain circumstances be one of the tools in your kit they're going to use to control that variable. But first of all a lot of people aren't in that situation and second of all even in that situation it can be counterproductive to hyper focus on the saturated fat and the reason is that we don't eat isolated fatty acids, we eat foods that have complex nutritional profiles and if it were true that saturated fat could be used as a general marker for a certain type of nutritional profile then it might under that might in that counter

example be useful to just talk about saturated fat because you can just modulate large parts of your nutritional profile by trying just thinking about this one thing but it doesn't work out that way.

So for example coconut oil is extremely rich in saturated fat, of all the edible fats in the world coconut oil is the richest in saturated fat. And whilst coconut oil has some fatty acids that can be beneficial for energy metabolism or have anti-microbial effects, it has almost zero nutritional value in terms of vitamins or minerals. And then you take something else like beef which is not pure fat like coconut oil is. It's got a lot of protein, it's got a lot of iron, it's got a lot of B Vitamins, it's got all kinds of things in it that make it very different from coconut oil. But it's still pretty high in saturated fat and if you're just thinking about saturated fat you're probably going to reduce your beef intake. Take something else like eggs again it's lower in saturated fat than these other two foods but still eggs have a significant amount of saturated fat and if you're hyper focused on reducing your saturated fat you're reducing your eggs but the nutritional profile of an extremely rich in biotin, extremely rich in choline, not rich in iron is totally different from beef which is totally different from coconut oil and in fact I've even seen some authors who favor largely plant based diets who have used hyper focus on the harmful effects of saturated fat to argue that even salmon is pretty high in saturated fat and that's actually true if you're not thinking about it from that you know we think about it from the perspective of salmon is really rich in omega three fatty acids and that's true if you if that's your focus point. If you compare salmon to eggs to beef to coconut oil Salmon's big thing that stands out is that it's very rich in omega three fatty acids but if you look at the saturated fat content of salmon it's got a pretty significant amount and if you're hyper focused on trying to get saturated that really low you could argue against salmon and yet modifying the salmon as a totally different nutritional profile. So I do think that it's important to think about saturated fat and I do think that there are some people who would benefit from reducing their saturated fat intake I just think that most of the time that needs to be a minor concern

with these other concerns about the whole nutritional profile taking the front seat.

DANNY LENNON: Perfect, thanks for that round up Chris. I'm going to turn to you next Spencer, what would you like to add to this?

SPENCER NADOLSKY: Well I think we've had a podcast on lipoproteins. I didn't take my lipidology board exams yet and I plan on taking that soon so I can actually call myself a clinical lipidologist but I think we can most of us here I think all of us here will probably agree that unequivocally ApoB-containing lipoproteins or LDL-cholesterol is a strong part of the pathophysiology of atherosclerosis. So I'm coming out of for more heart disease perspectives and so without those without it will be continually proteins you don't get heart disease where the with more of them you're at higher risk right so the underlying issue with saturated fat is that as an umbrella term as we'll get into probably some more of the specific fatty acids is that it modulates the receptor and basically increases your serum levels of LDL-C, and so it will ApoB-containing lipoproteins. So the thing is though with me because I see this with patients and it's not so clear cut I like what Chris is saying about how we should look more at foods in general in than specific fatty acids because as it turns out it starts getting a little bit confusing because when people just say saturated fat and they start thinking of beef they start thinking of eggs.

You know the specific one I want to point out is butter because if you compare butter to other dairy fats like cheese and yogurt fermented dairy that have similar saturated fat profiles the butter likely raises your LDL-cholesterol are able to continue I don't proteins more than those others so it starts to get really start to get into the weeds and you see at the cheese these things out a little bit and I've actually been shown some preliminary data comparing even coconut oil to butter and then all these other things it gets a little bit interesting. From my standpoint if there is something specifically that increases the amount of LDL-cholesterol in the blood and you can modulate it or then replace it with something [then do it]. I think of mostly butter specifically because that's probably the worst offender that I see in my

patients and I think it's and you can give it give something better food not necessarily fatty acid I'll say that lowers it then I'm all for it and I think if it raises that then I think we should replace it and that's kind of my stance.

DANNY LENNON: Perfect. Thanks Spencer and then finally I'm going to turn to you Stephan for your roundup.

STEPHAN GUYENET: Yeah so I mean first I want to echo what Spencer, doctor Nodolsky said that there's very little doubt in my mind that ApoB-containing lipoproteins, especially LDL, contribute to cardiovascular disease risk so I just want to establish that first. That said I have a fair amount of uncertainty about the health effects of saturated fat because despite huge amounts of research I don't think evidence we currently have is definitive and that very much relates to the fact that randomized controlled trials in this area are very difficult very difficult to interpret they're not very they're not as informative as we would like them to be because of the fact that cardiovascular disease is a process that takes a very long time to develop and these randomized control trials are by their nature limited in interaction.

So it's it becomes hard to interpret that literature and we don't really have definitive answers so the best we can do is kind of use a variety of indirect evidence as well as adding in the limited evidence that we have from randomized controlled trials. So my best guess right now is that the health effects of long chain saturated fatty acid those that predominate in most Western diet is somewhere between neutral and mildly harmful. I also agree that you can't consider fatty acids in isolation you have to consider the food package they come in and if you take that perspective in my opinion some saturated fat rich foods are probably not beneficial while others are not harmful so an example of the former in my opinion would be something like plain whole milk yogurt and the example of the latter would be something like beef tallow and we can if you're interested we can dig into the reasons why I have those beliefs but another point I want to make is that there is no nutritional need for saturated fatty acids themselves in the diet. The body manufactures the saturated fat and needs and from my

perspective given the remaining uncertainty about saturated fat that is the open possibility that it could be substantially harmful to health over long periods of time I think it's prudent to avoid diets that are high in saturated fat at least for most people but personally I don't think the evidence currently justifies avoiding all foods that are high in saturated fat for example yogurt and in fact having written a review paper on the health effects of full fat dairy I can tell you that the current literature does not really support the idea that it's harmful.

DANNY LENNON: Perfect thank you for that and I think there's a quite a lot of emerging themes in what all of you have said so far that I definitely want to get to one of that is probably making that big distinction between saturated fat rich foods that are maybe coming from a place of different nutritional profiles. I also want to at some stage get to some maybe some different areas where the role of saturated fat in the diet can have an impact on health outside of cardiovascular disease but of course I think that's the best place to start seeing as that's where it's most been talked about and the reason why for so many years there's been so many messages to limit saturated fat intake and so maybe a good place to start and I'll probably turn to you first on this Spencer given you're coming from this from a lipid ology perspective. So many people will have heard for so many years about the reason why saturated fat is to be limited is because it can affect an endpoint of Carnie heart disease via increasing L.D.L. cholesterol or maybe L.D.L. particle number and then in recent years we've kind of had people calling into question that kind of idea so from a clinical perspective right now of the most up to date from where we're at can you maybe just outline to people where the kind of consensus actually stands on that role in the influence of saturated fat on L.D.L. cholesterol and L.D.L. particle number and how those things correlate with Carnie heart disease to give us a kind of picture of a clinical perspective of where you stand.

SPENCER NADOLSKY: Yes so it is like Dr. Guyenet mentioned, you know some of these actual trials where they looked at replacing butter and other saturated fat with unsaturated fats, these trials are really hard to do they're the data is not that good and so

when they pieced together all these things they've come up with different med analyses rip you know taken some of these trials out some of them show no effects, some of them show some lowering in event number but not changing in mortality et cetera et cetera. So a lot of what we rely on are what we call these surrogate markers so the surrogate markers we're talking about its L.D.L. cholesterol or LDL. particles or ApoB-containing lipoproteins, so the food that raises it consistently is butter and thing like piratic acid specifically but as mentioned before like they say you know just in recent years there's been some studies comparing whole fat dairy with like fermented yogurt or even cheese compared to butter and they tried to you know compare similar fatty acids, the permeated acids and specifically and they noticed that the butter raised the L.D.L. cholesterol whereas the other dairy did not.

So this kind of what Dr. Masterjohn was talking about these food major cities or food differences, quality differences really matter so it's hard to then say yep saturated fat for sure causes disease when we're you know these trials that have been done you know kind of show positive or neutral differences and then the surrogate markers are different with each different types of foods you know they mean so like for sure butter increases and that's what we know and so from my standpoint if it increases it and we kind of have some data showing that there may be some changes in those trials then I would say just I would I would personally cut out butter if it does increase your own cholesterol because as I found that it doesn't actually do it every patient and there may be some individual changes, differences. So from the data standpoint butter is the one that I kind of focus on and beyond that you know we're just looking at surrogate markers. So it's hard to say that there are actual hard and clinical welcome differences.

DANNY LENNON: True and I think that's a really good point you make about the specific type of saturated fatty acids because I think it was on the I think it was in a Dutch cohort I'm sure you read the paper where they saw a positive association with Corning heart disease risk and I think it was per manganic acid maybe but not with the total saturated fat intake and again

that's any of course one paper on and they're still trying to tease apart these different things but at least it's lending itself to showing maybe in the future the way to go is look at these individual saturated fatty acids. One thing that we do see certain benefits to lowering saturated fat intake in certain cases but it seems at least from what I've seen in literature depends on the type of nutrients replacing it and maybe I'll ask you about this Chris because typically it's been polyunsaturated fatty acids that been promoted as the nutrient to replace some of the saturated fat you're going to lower with although that has certainly been called into question itself in recent times. So based on when it comes to the different kind that it's possible for those with elevated risk reducing saturated fat. What does the literature tell you right now Chris about the different effects of these different nutrients that could possibly go up when we do bring saturated fat down?

CHRIS MASTERJOHN: Yeah I don't I don't know that the literature is all that helpful from my perspective here so one thing that Stephan has mentioned before this history of randomized control trials that we have that are relatively difficult to interpret a lot of those have focused on replacing saturated fat with polyunsaturated fat and that was rooted in ideas developed experimentally in the 1950s where replacing saturated fat with polyunsaturated fat lower cholesterol. There have been some other studies more recently that were observational in nature that suggest that if you're replacing your saturated fat with carbohydrate you could actually be increasing your risk for heart disease but I don't really find that line of evidence all that helpful because first of all when you're focusing in on the macronutrients you're leaving behind what are the typical sources of saturated fat or the typical sources of carbohydrates so a lot of people when they are eating carbohydrate instead of eating saturated fat they're not necessarily sitting down to a bowl of steam to lentils or something like that.

So I think that behind that literature what we're probably witnessing is that people are replacing relatively poor quality foods with other relatively poor quality foods and in that sense I don't think it's that informative of what to do on a

practical level for someone who really cares about their health and I think another part of the problem here in the literature is that I think it makes a big difference whether you're in caloric balance or you're overweight and in a hyper clerk state because a lot of the mechanistic information that we have about for example what does per manganic acid do to this cellular mechanism or that cellular mechanism is done using either free fatty acids or fatty acids that are bound to albumin which is basically how three fatty acids circulate in the blood stream and a lot of the research that's done observationally is done in people who are overweight and who are in constant hyper balance and it's in the overweight hyper caloric state where your insulin resistance state where you get a lot of circulating free fatty acids and I think you really enhance any negative effects of those fatty acids on those cellular mechanisms. So I suspect that if we were looking at healthy carbohydrate foods or healthy fat rich foods even in populations who are eating diets that favor leanness and favor caloric balance we're probably going to see that a lot of these things matter a lot less.

DANNY LENNON: Yeah I think there's a few really important points and actually one of those that I was hoping to bring up some stage you actually mentioned there Chris of trying to compare someone with a high or an increased amount of saturated fat in the diet that is leading to an increased calorie consumption is probably a different context as someone who has a relatively high saturated fat intake in a kind of you caloric condition the other one was the context that many of you have mentioned already of the not only the type of food that someone is consuming but within the context of maybe the diet and the other nutrients that are there and one I remember people discussing before particularly in the concept around using buttered coffee for example one of the big problems there is you have this huge load of saturated fat but you don't have the other foot of nutrients and fiber etc. We may have in other mixed meals that may prevent some of the toxemia that sometimes can revolt. So if someone has some goat's cheese salad for example is very different from consuming that via butter. Brad I'll come to you to ask you about some of these issues around placing context around

where saturated fat and trying to how do how does someone start to put this together and where do you think there is a cause to be more cautious verses where it's probably going to be a bit more following.

BRAD DIETER: You know one of the things that everybody so far has brought up is a lot of the literature that we talk about really has it's very difficult to take it in bring it down to a personal level rights and we talk about a lot of the observational studies and we see associations with bad outcomes you know part of the problems with all those research studies is they don't take into account how that saturated fat is consumed in the diet right so typically if we take you know an average person and we look at on general the people who are having higher situated fat intakes are usually also consuming more processed foods they're eating less vegetables, they're eating less fruits, they're exercising less et cetera et cetera.

So you know we look at the observational literature I think it's really hard for us to say anything substantial about how the saturated fat increases risk at the individual level. So to bring that back to like daily habits and nutritional pieces is I think it's fairly clear kind of like Chris said you know people who are you know overweight or obese have type two diabetes or have insulin resistance the literature is fairly clear at this point at least from my perspective that you know higher levels of saturated fat intake in those people I would say is net negative. It's pretty clear that it does increase your risk of cardiovascular disease it does increase insulin resistance and that replacing saturated fat with other nutrients you know whether it's carbohydrates or polyunsaturated fats you know even context independent like you know Chris was talking about it's fairly clear that there is a benefit so when you talk about people who do have you know a lot of these metabolic issues, saturated fat appears to be a lot more negative in that population than it does in an otherwise healthy population so I think you know when you're working with people who have a lot of these you know earlier weight obese have type two diabetes they you know have an increased risk profile for heart disease. It is very prudent to try to limit dietary saturated fat intake in

those people because that all of the data points towards the risk to benefit ratio really strongly favoring lowering it.

DANNY LENNON: Excellent just before I move on to the next point Stephan is there anything that has come up so far that you wanted to add anything to or put any response to that we've mentioned so far?

STEPHAN GUYENET: Yeah first of all I think the calorie balance and leanness are important contributors to cardiovascular disease risk and I think essentially over nutrition or eating too many calories carrying too much body fat basically contributes strongly to all of our so-called diseases of civilization or disease of affluence in other words non-communicable metabolic and cardiovascular diseases. That said it's kind of interesting to hear the perspective of some of the other folks in this conversation because my impression was that in folks who are heavier people with obesity or overweight that often saturated fat actually has less of an impact on blood lipids in those people it's kind of like they have already, they are already suffering the negative consequences of their own excess fatty acids and putting saturated fat on top of it is not really not really changing the situation very much but it is true that I mean people who are in that situation of already being metabolically compromised, already being cardiovascular early in a compromised state are a lot more sensitive to all sorts of environmental and dietary influences that are harmful so someone who's in very good health can respond constructively to challenges from the diet and from the environment where someone who's already their health is kind of off balance they're going to have much more negative impact from those things. So if you look at the randomized control trials for example where they try to manipulate diet or manipulate physical activity to make people healthier you can't make a healthy person healthier there are three there but you can make an unhealthy person healthier.

CHRIS MASTERJOHN: Hey Stephan, can I jump in for one minute to respond to something?

STEPHAN GUYENET: Yeah sure.

CHRIS MASTERJOHN: So just to clarify I think when you're looking at the person who has high levels of circulating free fatty acids, who is obese, who is insulin resistant, who doesn't suffer the acute effect of adding icing to that cake so to speak because they're already drowning in their own fatty acids the way that I'm thinking of that is someone who has put on 20 years' worth of out a paucity from a high saturated fat diet is likely to have high circulating saturated fatty acids because the fat in your diet is having a very direct influence on the type of fat that's in adipose tissue and so I guess I don't I don't have the evidence to show this because how are we going to get this twenty year dietary evidence but it seems to me that the person who's in who's in that state of drowning in their own fatty acids their diet over the last twenty years probably does affect how bad it is to be in that state.

STEPHAN GUYENET: Well it could be partially true but when you look at the correlation between dietary and adipose fatty acids there's actually not much of a correlation between in the saturated fat realm. There's a very high correlation between polyunsaturated like omega six but I don't I think saturated fat percentage and your adipose tissue is actually must be fairly well regulated because there's not really much of a correlation between diet and adipose proportions but one thing I wanted to say just to kind of wrap this up there is it's really interesting study called the lip gene study. I think this is a European study and they put people on a few different diets for six months and two of them one of them was kind of a low saturated fat one was a high saturated fat diet. And at the end of this study they looked at a bunch of different parameters including insulin sensitivity and blood lipids and what they found was that people in these two groups that differed in their saturated fat intake had no differences in blood lipids had no differences in insulin resistance. It's kind of interesting because actually I think you learn a lot when you do a systematic literature view where you try to find every study you can on a particular topic and when I did that a few years ago what I found was including this Lip gene study as well as the others there's really very little randomized controlled trial evidence that saturated fat causes insulin resistance in humans.

There's pretty good evidence that it causes it in animal models but in humans and this Lip Gene study is just one example the studies are prior primarily not also they primarily haven't really found any effect of saturated fat rich foods on insulin resistance and I think the other thing that this Lip Gene study raises another possibility that it raises that I've often wondered about and I don't know the answer to this but this is something that I've often wondered about is that all of these randomized controlled trials showing that saturated fat increases L.D.L. cholesterol or at least certain types of saturated fat those trials are almost exclusively three months or less and so I wonder how durable those effects are and this Lip Gene study is one of the studies that makes me wonder that does this effect really persist in the long term at least in the you know theoretical average person.

SPENCER NADOLSKY: I want to mention you guys are talking about three fatty acids are not a certified treat fatty acid I just want to clarify it in the in the like a clinical setting it's usually not measured but those are very good points so you know usually the standard lipid count and you get a total cholesterol on H.D.L. cholesterol triglycerides and then. L.D.L. is calculated you can we do actually with more advanced testing we can get the particles. And then we can test those present as and so from my standpoint I've seen in both the literature and in my patients in both insulin resistant patients and insulin sensitive patients have profound effects on their actual non H.D.L. cholesterol despite their insulin sensitivity because just because of the modulation of the L.D.L. receptor. So from my standpoint I've seen both but if we did measure the effects, that as it's what you can do now it would be interesting to see the differences.

DANNY LENNON: One thing that I did want to maybe turn to on that's on a similar level is another kind of concept that I've seen promoted or talked about from certain areas when any of the at least the observational data between saturated fat in taking coronary heart disease comes up especially people who are very against looking at increases of L.D.L. cholesterol alone. Something to the effect of I think we've seen this actually in a lot of reviews of intervention studies that have seen that lowering saturated fat intake does indeed

produce a significant decrease in L.D.L. cholesterol and most of time we see a reduced risk at least in cardiovascular events but a lot of time there doesn't seem to be the same decrease in overall mortality and then you see certain people throwing up the point and speculating on well maybe we're seeing a case where we're reducing cardiovascular events via these dietary changes but these dietary changes are just increasing disease rates in something else and therefore it's not really of any benefit or at least kind of the kind of theory that goes. Brad maybe I'll turn to you first and anyone else feel free to chime in where do you come down on the these kind of statements that people tend to throw out where it might be coming from and how you might typically respond that based on what you've seen?

BRAD DIETER: So I'm sure Spencer will have a lot of thoughts on this since it's really a very clinical outcomes relevant question but we've done quite a bit of work just looking at clinical trial data and things like this and you know one of the questions you're actually bringing up is you know this idea of an intervention modifying the risk factor so in this case saturated fat modifying the risk factor and then that associates with cardiovascular disease and events but not mortality right now there isn't. One of the really hard problems about that piece is if you did that same study today and you did that same study thirty years ago the mortality data could be very different because of changes in standard practice of medical care right so there may be people having cardiovascular events but not dying.

There may be different causes of death in this cohort versus thirty years ago so you know when you do a study and it's you know you've got your modifying a risk factor like L.D.L. which we know is you know a risk factor for cardiovascular disease and then you see changes in cardiovascular outcomes but not death outcomes you know it's not always the intervention in the change in that risk factor that kind of muddies the water for some of the end outcomes. It can be you know changes in the landscape of medicine and I think that's you know something we really should be really focused on when we start to look at these trials as they go you know trials in the 90s are much different than trials you know

today and how those clinical outcomes change because standard of practice changes right you know the other thing is. That standard of practice does impact rates of cardiovascular disease and rates of death on top of the current treatment so you know studies in the eighty's you know Staten use was not standard practice for all people with diabetes or elevated cholesterol now it is so that does change the equation and it changes the intervention. So I think Spencer probably also have some additional thoughts on this topic but you know from my perspective the type of research that I do you know that's one of the ways that I look at that kind of data and try to make sense of it.

DANNY LENNON: Spencer I'll turn over to you.

SPENCER NADOLSKY: Yeah no and he basically stole a lot of things that I would have said I mean one of the things that drives me nuts is when you know looking at certain stats. And you know I don't want to talk about stents per se but a lot of people say all look the death rate is the same it's like yeah but the events lowered you know if you've ever seen somebody that's had heart attacks or strokes or anything like that despite having the same longevity the quality of life is reduced so much after those events that it's like listen you don't want to have yet you may not live longer by doing some of these things especially because the quality of care is changed but you don't want to have a heart attack you don't want to have a stroke and be more disabled because the rest of your life could be severely diminished in terms of quality. And so the other thing I will mention is a lot of that when a lot of these things just weren't powered there are under-powered to look at real mortality as opposed to maybe events so I agree with what Brad's saying.

DANNY LENNON: I'm keen to address some of the other areas outside of cardiovascular health and one of those is on maybe food intake and this is probably within your wheels particularly Stefan and if we look at some of the negative health effects that we know we're going to occur with excess caloric intake we know for example that saturated fat rich triglycerides are going to affect the structure of the creaminess that the flavor of different foods they have then the potential maybe in

certain cases to enhance say food palatability and stability that you are going to be very difficult I suppose to replace without losing those kind of properties so where does this come in from your understanding of the role of saturated fat maybe in impel ability, its effect on caloric intake and what kind of context of the place on does a higher saturated fat intake diet inherently lead to a more palatable and therefore more likely risk of consuming excess calories or how do we have to frame this whole discussion.

STEPHAN GUYENET: Yes So I think that you know saturated fatty acids are found in a wide variety of different foods and those range in palatability. And I don't think we can systematically say anything like higher saturated fat equals more Pollard billet. But I do think that there are and I'm getting a little bit speculative here and bring in some just some of my own personal observations. I think that there is a kind of texture profile associated with certain saturated fat rich foods that we do find particularly pleasant and so for example what I'm talking about really I'm talking about foods that are solid at room temperature but melt in the mouth and so I'm talking about chocolate and I'm talking about butter those are those are really the two big ones for me and that to me and I think to other people not sure about that but to me that kind of solid at room temperature of melt in the mouth that sensation of something melting in your mouth is really a nice one.

But on the other hand I mean you can go too far so I for example. I had some deer meat in my chest freezer and those who have hunted deer or eaten deer know that in the fall when you're allowed to hunt them they have a lot of subcutaneous fat under the skin but also that fat is really doesn't taste very good the problem is it's waxy it's so saturated that it will congeal on to your plate into like a wax like substance in moments as soon as you serve the dish so as you're cooking it it's liquid put it on your plate and it will like congeal into candle wax and it's really not something that you want to eat like you eat it barely melts in your mouth it like coats your mouth this waxy substance so if you want to make it palatable what you have to do in my experience is you cut off all the fat that you can from the piece of meat

which is not that hard because it's not really integrated into the muscle like it is in domesticated beefs.

On the outside it's subcutaneous predominantly and so you cut off as much as you can and then you add another less saturated fat to dilute it such as olive oil and then you get something that's closer to like beef or pork fat so I don't think we can systematically say that saturated fat is more palatable I think added fat in general or fat period and especially added fat things that are separated out from the nonfat component like so would be no oil or butter or olive oil those things are a major palatability factor and driver of calorie density in our diet but I don't think there's really any systematic association between palatability and saturated fat that said I do think there are some of the most palatable fats butter and chocolate are highly saturated so I think yeah that's my perspective.

DANNY LENNON: And purely from maybe evolutionary or historical perspective of how we would have typically consumed saturated fat rich foods do you think maybe the potential now where a lot of issues are coming up is the ways we can have very high saturated fat meals or this could be total dietary fat meals in a form that even if the individual ingredients could be deemed healthy they can still be in a form that are extremely palatable if you just use a blender and the right combination of these different dietary fat with something that's sweet enough you suddenly have something that you're getting a vastly higher saturated intake than you maybe would have if you were just eating a piece of meat for example.

STEPHAN GUYENET: Yeah sure I mean I don't know how much that's really related to the saturated fat per se right other than just the calorie density and palatability of the ingredients. I mean you can you know you could use almond milk or you know something with a lower saturated fat intake instead of something with the higher saturated fat intake it would probably be almost equally palatable and in that case kind of a setting I mean if you go to let's say a Thai restaurant. You know often the dish will be quite oily and that is at least in the United States that's almost invariably going to be soybean oil and that that

oil in there is a major part of why we like eating Thai food but that's a very that's a relatively low saturated fat oil. So I don't I don't think we can really say systematically I think it's very difficult to systematically connect that saturated fat specifically.

DANNY LENNON: Sure got you, it's perhaps more of an issue of the reason why maybe it's so easy for many people to have a high saturated fat intake although I'm guessing that's mainly just down to the high amount that's going to be in typical processed food people are over eating anyway. One thing I'm keen to ask about is maybe looking at things more at a similar level so I'll turn to you Chris on this first. Can you maybe touch on some of the differences we see in the different maybe oxidation proneness of the different types of fatty acids maybe the role of incorporating those into cell membranes and if there's any implications based on that for higher or lower proportions of our fat intake coming from saturated versus polyunsaturated fats.

CHRIS MASTERJOHN: Yeah when you when you talk about oxidation you talking about pre oxidation or you talking about [Indiscernible 00:42:44]

DANNY LENNON: Peroxidation, so want to get them incorporated within the cell membrane.

CHRIS MASTERJOHN: Yeah I actually want to talk about both because I think these are probably deeply connected to one of the problems with polyunsaturated fats that is not really the converse is not necessarily a specific benefit of saturated fat it's because when you're looking at the risk of harmful oxidation of the fatty acids you really group saturated fats and model and saturated fats together and polyunsaturated fat separately and that's because fatty acids that have two or more double bonds have one or more carbons that are between two double bonds and those carbons are for you know reasons deep into the organic chemistry of the molecule extremely vulnerable to harmful spontaneous oxidation and that leads to a process called peroxidation which is a free radical process where oxygen comes in and damages the fat further et cetera and that probably played some role in degenerative

diseases across the board not you know not the sole factor in any disease but certainly it plays a role in broadly in degenerative diseases and so in the cell membrane.

Your cell membrane fluidity is fairly tightly regulated but it's not regulated one hundred percent anywhere and different membranes are regulated differently according to the different tissues in the different cellular compartments. So the end result of that regulation is that if you eat a diet that's very rich in polyunsaturated fatty acids then all of your membranes will tend to be enriched to some degree in polyunsaturated fatty acids some of them not so much others relatively strongly and in fact I think the strongest of the fact is actually that your adipose tissue is going to become enriched in in polyunsaturated fatty acids any you may think that that doesn't matter in the sense that it's not impacting your I don't know mitochondrial membrane in your liver cell or something like that but actually it doesn't matter because wherever you have enrichment of polyunsaturated fatty acids the vitamin E. Follows because Vitamin E. Is most important.

Really only well-established role is to protect polyunsaturated fatty acids from peroxidation. So if you have a long term diet that's over the years very rich in polyunsaturated fatty acids you're going to get in a rich slow enrichment about a post who fuzz polyunsaturated fatty acids over time and your vitamin E turnover is going to be your vitamin E transport is going to be directed to the adipose tissue and the vitamin e's going to turn over much faster than those polyunsaturated fatty acids to protect them in the long term consequence of that is that you raise your vitamin E requirement. Now most vegetable oils that are rich in polyunsaturated fatty acids have more vitamin E. So it could be fairly controversial whether that plays out in support of vitamin E. Status over time I actually think that what it probably the end result is that and actually this is probably one of the harmful effects of the transition to a saturated fat rich diet let's say someone's been eating soybean oil for the last four five six years their vitamin E requirements a lot higher because they're because of the reasons that I just talked about and now they switch from

soybean oil to coconut oil the coconut oil is has hardly any vitamin E. Because there's no there's hardly any polyunsaturated fatty acids in the coconut oil that require the vitamin E.

And so now you have this person who has an elevated vitamin E requirement from a history of consuming vegetable oils and they switch to a diet that's much lower in vitamin E. I actually think that's the that that is one of the worst case scenarios for someone for a transition in the sense that that that person might take several years for their vitamin E. Requirement to go back down to one that's well suited to coconut oil. But I think even though vegetable oils tend to contain enough vitamin E to protect their content there's once you get those buffers in your cell membranes you are not just relying on vitamin E. That vegetable oil has vitamin E to protect itself it doesn't really care about your cell membranes and when you're enriching polyunsaturated fatty acids into human cell membranes you're not just increasing your requirement for vitamin E. You're increasing your requirement for vitamin C. For good if I own for all the other aspects of the anti-oxidant system and you're also introducing an oxidative liability so I want to be very upfront that I that I you know what a mapping out is a hypothetical scenario and there is no randomized control trial evidence showing that if someone needs a vegetable for four years you know these harms result but you can and you can hypothesize. That if so if someone is has their cell membranes enriched with buffers and they don't have sort of other sources of oxidative stress going on than that might not harm that person but then that person is exposed to iron overload or is exposed to cigarette smoke or is exposed to some other source of oxidative stress all the sudden that history of enriching their some brains and poof is becomes an oxidative liability and that becomes their most you know they're sort of Achilles heel in terms of their ability to cope well with those with those situations. And in that perspective I think there's a real open question about what are the effects of high buffered diets on aging because oxidative stress is not you don't have to just it's not just oh you started smoking it's also something that just naturally increases with aging and

so you as you get into seventy's and eighty's for example or even fifty sixty seventy's.

Whether you've accumulated that oxidative liability may become more important to you in terms of being exposed to more oxidative stress and having more damage come as a result. I want to make one other point related to the beta oxidation of these fatty acids. So I think I think that one of the reasons that in some experiments we see beneficial effects on metabolism of polyunsaturated fatty acids is because the body tries to correct for proof intakes by regulating them in a way that will minimize all the harms that I just talked about. So if you look at animal experiments if you feed rodents really high polyunsaturated fats they not only beta oxidized them at a higher rate meaning they burn them for energy at a higher rate but they beta oxidized them so much that they spill over into other pathways of fatty acid synthesis and they actually wind up converting some of them to saturated fatty acids, they also shift their buffers away from the cell membrane and towards adipose tissue they also excrete them into their fur into the oils of their fur preferentially and you could argue that there are specific rules of any of those things but when I look at all of them together it looks to me like the body is trying to make it so that dietary buffers don't have that much of an effect on cell membrane buffers because it wants to regulate the fluidity, it wants to regulate the liability to oxidative damage and so on and that creates a position where sometimes in short term effects. You see experiments in animals or humans where at least in the short term feeding buffers has positive metabolic effects so let me give one example there's a study that over two weeks feeding people diets that are rich in saturated fats versus polyunsaturated fats you get more of liver fat when you eat saturated fat you get less when you eat polyunsaturated fat. Well I think that's because in the liver your beta oxidizing the polyunsaturated fats at a higher rate not in favor that affects caloric balance across the organism but in a way that leads to less liver fat because you've up regulated beta oxidation in that tissue. So I think these things are deeply connected and I think the end result is that although there's a lot of uncertainty probably on the short

term polyunsaturated fats are more likely to show benefits but in the long term those benefits are likely to fade away and you may see harms from increased oxidative damage.

DANNY LENNON: Yes thanks for that very comprehensive round of Chris I think that definitely and I know you some food for thought but maybe put some context on some of the questions that we still need to come elucidate and answer from that before starting rounding this up with a couple of final questions is there anything that anyone wants to add on to any of the last couple points have been made or out in the context to those.

SPENCER NADOLSKY: I just want to ask Dr. Stephan about what about the inflammatory effects in the hypothalamus, we are guarding higher saturated fat diets you know since you're the neurobiologist. You know I've seen a lot of studies regarding high saturated fat diets increasing inflammation of the hypothalamus which may because we're seeing in appetite and psychiatry and possibly the reward system. So I don't know if Danny you were going to ask about that because that's that would be my question.

STEPHAN GUYENET: Yeah sure so all of those data to my knowledge all of those data are in animals I'm not aware of any studies in humans that have specifically linked saturated fat intake to hypothermic inflammation and there are some studies where they have fed animals diets higher in saturated fat versus other types of fat or versus low fat and shown pro-inflammatory lipid accumulation in the hypothalamus and greater inflammation and that sort of thing but if we step back for a moment and say does it actually make them fatter. What you see is a range of answers on that that are not very consistent between studies so I search for all the studies I could find again I find systematically richer searches to be very useful in understanding in answering specific questions. What I found was that there are so this I did this maybe five or six years ago and at the time I found that there were an approximately equal number of studies suggesting that higher saturated fat diets cause greater weight. Fat gain in animal models and approximately the same number of studies were showing that they cause less weight or fat gain in animal models and so one thing that was a little bit more

consistent is that the higher saturated fat diet did seem to promote insulin resistance more than particularly mono-unsaturated rich diets like olive oil. So I don't know it I think since then there have been more studies coming out I think the balance has been shifting a bit in favor of the saturated fat rich diets promoting more obesity and linking that with type of the hypothalamic accumulation of inflammation and fatty acids but there are definitely specific studies that are persuasive on that but if we look at the overall literature and say are animals gaining weight or not when we feed them higher saturated fat diets I think relative to other types of fat I mean then the picture is a little bit less consistent and so my overall view of it is that it's a plausible hypothesis but I'm not I'm not totally convinced of it yet because of that inconsistency that I see in the results of different studies.

BRAD DIETER: Yeah and one other point too for you know a lot of people who end up reading especially rodents studies and we talk about nutrition especially dietary fat studies. Dietary fat carbohydrate metabolism in a rodent is substantially different than humans so when we're looking at you know second or third order effects from nutrition based studies in metabolism and rodents I think Stephan hit the nail on the head as their hypothesis generating really a best. It's going to be really hard to make substantial jumps from rodent metabolism to human metabolism. We talk about things like feeding the animal saturated fat and how that impacts appetite so I think that's one other thing to keep really clearly in mind. This is how different rodent metabolism is from human metabolism.

DANNY LENNON: I'm keen to kind of start turning this into maybe some practicalities for people listening and there's probably too main things to touch on that I'll probably ask all of you guys about one is when people are first looking at guidelines or recommendations for their saturated fat intake if we look to some of the main bodies are putting out this information so for example the dietary guidelines for Americans at 2015-2020 has saturated fat intakes recommended to be ten percent of calories or less and within there I think it goes on to state that there should be a shift in the intake of fats coming from solid fat to more oil based things so shifting

from using butter stick Margery and coconut oil and instead replacing that with more vegetable oils when cooking away going for more seafood and knots rather meat and poultry and then using salad dressings and spreads made rather than solid fats. For that I'm keen to ask first of all your guys thoughts on that as a general recommendation for most of the people and again that's in a public health context and then secondly when it comes down to more of an individual level how much focus does an individual listening actually need to place on what proportion of their diet is coming from saturated fat and that question is more coming from the perspective of if saturated fat is more really the straw that breaks the camel's back as opposed to something that's going to be inherently the cause of something. So if we have someone whose sleep is perfectly in order, they're physically active, they've got a good body composition and the food quality is generally good, how much of a difference in proportionately more of their calories coming from such a fellow is that going to have. So I realize a couple of different questions in there so maybe I'll start with you Spencer on number one diet recommendations right now and where that comes in saturated fat do you think that's a useful starting place for people number one and the number two for individuals that you are giving recommendations to how much they actually need to focus on a saturated fat intake number per say.

SPENCER NADOLSKY: Yeah I look more at dietary patterns so you know I know the Ha that is you need to be focusing on you know vegetable oils and things like that when you look at like the big major trials I know Brad and I have discussed the Predamid study where they added in olive oil or not it's worth as a control there are some issues with that study but you know from those stand points, those actually lowered heart and points alike and then the lion diet hard studying and you actually see more dietary patterns so that's what I kind of do I don't I don't look at these specific fatty acids and say hey we need to lower this below ten percent of their calories I actually do more of a dietary patterns so like when I look at their specific what they're eating now so if it's if their lipids are normal I kind of talk about their dietary patterns but like if they're having a

high if they have high lipids specifically and then we start shifting their dietary pattern they me at maybe on a high but are paleo type of diet and we search shifting it more now instead of the better use olive oil maybe they need some more legumes and oats in their diet that's pretty much what I do from a clinical standpoint.

I don't actually go hey you need to have temp most of my patients don't count their calories and do macro accounting because it is just they just practicality only five percent end up continuing it may be fewer than that so I don't actually do this ten percent thing that the H. As I basically say hey you have any butter, how much you know you're putting in your coffee stop doing that can hope you're having putting butter on your rib eyes you should probably not do that generally we start shifting more to that. Nuts, olive oil, avocados and again because of the hypothetical things that Dr. Masterjohn talked about peroxidation all these things. I actually am more in favor of model unsaturated in the dietary patterns well like that like the nuts and olive oil type of thing as opposed to you know vegetable oil so that's just my clinical standpoint.

DANNY LENNON: Perfect I'll turn to you maybe Chris with the same questions.

CHRIS MASTERJOHN: So I think that the idea of using more liquid oils to cook with if that means olive oil and avocado oil I think that's one thing but if you're if you're talking about using high polyunsaturated fat oils there be beyond everything that I said they're not very good to cook with because when you're looking at an oil there's the nonfat components that are contributing to the smoke points and that's one thing but the polyunsaturated fatty acids are vulnerable to peroxidation during the cooking process and those oils the high polyunsaturated oils are the ones that are most vulnerable to producing small aldehyde by products that are probably not very good to be consuming in the diet.

So from a cooking standpoint I think you want to use I think if you're talking about what do you cook with you want the oil that both has a low smoke point and also is not that rich in polyunsaturated fatty acids but I think more broadly that

if we wanted to make a blanket recommendation for people to improve their health who are not tracking their calories and who are not going to calculate their percentage intakes which is really what the dietary guidelines are aimed at I mean they'll say ten percent calories but. But they're not expecting most people to actually even read that report let alone calculate ten percent of calories if we're aiming something at the general person then I really think cooking with less oil is probably going to be more beneficial than shifting around the oils in the diet in the sense that it's so easy to add more oil than you need to the pan and consume more calories by cooking and a lot of oil and on top of that it's when you're cooking with oils on the stove top your foods reaching higher temperatures and I think that's fine as a treat but I don't think that's what you want to be doing all the time when you're cooking so I think simpler and gentler cooked foods would be a good broadly applicable recommendation for people.

In terms of the person whose health conscious who would track their calories or would track their macros and their micros I think it really totally changes the game so I do agree with the point that shifting saturated fat out of the diet can be a tool in the kit for someone who has difficulty controlling their blood lipids. I don't I don't see it as the thing but it but certainly a thing but I think there are many more health concerns than that and so I think for the average health conscious person who would track what they eat they really want to be looking more at their micronutrients and the diversity of their diet so if there are foods if you let's say let's say you're tracking your macros in your micros in chronometer or something like that. If there are foods that help you maintain better caloric balance then that should be one of the things that you're looking at but there are many other concerns like are you getting enough potassium, are you getting enough you know are you getting enough colon, are you getting this and that and so I think that that should take preference in the sense that when you're concerned about your nutrition you're looking at things like meat can be important eggs can be important and you start to realize that the added fats in your diet aren't contributing that much to

your micro nutrition. So I'm not against olive oil but I think you'll find that if you pay attention to the micronutrients that you're getting less olive oil and more vegetables or more meat or more eggs or more other whole foods that have that whole package are doing way more for your nutrition than your added fats are.

DANNY LENNON: Perfect thanks Chris. Brad anything you'd like to add on either current dietary recommendations for saturated fat and then also for people individually saturated fat they're consuming how much they should be thinking about that.

BRAD DIETER: I think maybe I should start with a little bit broader viewpoint and talk about you know guidelines in general when we talk about at least the way modern medicine is practiced is a lot of it is a guideline based so any of these large medical bodies that try to help clinicians practice is they're going to have to give some sort of quantifiable guideline. So you know I think at least from my perspective is remember I view these guidelines is there essentially tools to try to help guide people in his governing bodies you have to have some sort of guideline right that people can quantify and look at so I think that's the reason they're there and that's probably the best way to look at it moving past that I think it's very clear at least that all of us understand that each person is very individual and their dietary needs are not the same as everybody else's so guidelines really need to be starting points for kind of discussions and in trying to get people on the right direction you know I'm I would say I fall more into line with what you know Spencer mentioned is trying to have people hit a very hard number and talk about some of these exact nutrients and their diets really not something that's a feasible or be even worthwhile for most people because it's not like if you hit just over this magical Guideline number you're going to have substantial health problems it's really you could take the guidelines and say you know they're recommending we try to keep saturated fat more to a minimal moderate level how do we construct an overall quality diet that gets us in that ballpark.

So it kind of takes that perspective that Spencer has you know really it's about food patterns it's about what you

choose and it's the whole context of that and then I think you also bring a lot of the things that Chris and Stephan have mentioned too is you know think about the other nutrients in the food that you're getting with right so if you're consuming you know saturated fat maybe even a little bit above what guidelines are you know is that occurring in the context of a lot of other vitamins minerals like your nutrition and then how does that fit into a diet that sustainable for you long term that kind of develops healthy eating patterns. Are the saturated fat choices you have are they some of those super hyper palatable foods you know the chocolates and the butters or are they part of your eggs, your steak things like that so I think the guidelines are there for specific you know logistic reasons. And they know they're not super far off from what you should probably think about in terms of your overall diet quality but I think food patterns and food context really are what matters in terms of how you take those ideas and put them into practice.

DANNY LENNON: Sure thanks for that, Stephan I think you need to add on recommendations before I move on.

STEPHAN GUYENET: First of all I think that the dietary guidelines have gotten bashed a lot and I want to say that if every American followed the letter in the spirit of the U.S. dietary guidelines we would probably be much healthier as a nation than we are today so I just want to acknowledge that first at the same time I want to say that I don't I don't think it's that useful to focus on specific saturated fat targets simply for the reason that we've all mentioned today and that is that we eat foods not saturated fats and I think that there's a broad range of different types of foods with different partners and different benefits that can contain saturated fats and furthermore there are also the practical problems for individuals at least of following those recommendations.

So my overall feeling about how much we should focus on saturated fat as individuals personally I would avoid a diet that's very high in saturated fat due to our concerns due to my concerns and uncertainty about the potential harms and I would get my lipids tested you know go get him tested and see what your blood lipid profile looks like and if there's a

problem work with your doctor about it and if there's not a problem then there's not a problem and then eat a whole food diet that controls your calorie intake appropriately. So a diet where you're likely to get all the nutrients you need and where you're not over consuming and I think if you do that and try to at the same time you know avoid going into this potentially higher danger zone of the very high saturated fat intake you're probably going to be in really good shape and the second thing or the last thing I'll mention is that extra virgin olive oil is probably the added that has the most evidence behind it being healthier in terms of cardiovascular and metabolic health. So I totally agree with everything Chris said about added fats in general I think if you're trying to control your calorie intake not something you want to use a lot but if you're going to use an added fat I think if you want the safest thing from cardiovascular and metabolic standpoint probably focusing on extra virgin olive oil is your you're your most rational bet.

DANNY LENNON: Awesome, thanks for that round up from everyone I think some really important points there and probably a lot of areas that we could continue to go in if we had much more time I'm going to start rounding things up purely because you guys have been so kind with your time already and we were literally could go on for hours on different areas even things that were just mentioned there around for example individual response and getting into a pose for all these types of things we could go on all sorts of rabbit holes on so rather than that as maybe a way to wrap up we'll maybe finish with some concluding remarks from each you guys on either on maybe a key point that we haven't had a chance to discuss yet that you think is particularly important to bring up in this whole conversation for people to go away with or if not maybe just a couple of the real key points that you would want people listening to take away from this whole discussion and that they can actually keep in mind when it comes to saturated fat and what they would be so to do that maybe I'll start this time in reverse alphabetical order so maybe I'll start with you Stephan some of concluding remarks to leave people with.

STEPHAN GUYENET: Yeah sure so I think I have I've already painted a picture of my overall views on things and practical course of action but one thing that I would like to come back to that I didn't get a chance to earlier is I wanted to expand a little bit on something that Dr. Nodolsky said about the statistical power of these randomized controlled trials on saturated fat replacement. So basically that question is you know because mortality total mortality is an outcome that we really care about right we don't want to die we also care about not having a heart attack even if we survive not having a stroke but some have argued that the fact that these randomized controlled trials have generally not shown reductions in mortality total mortality means that we shouldn't care about the results and I also don't find the argument very persuasive I think that when you do these types of studies you're going to have a lot more people having cardiovascular events than you have dying so there's a lot more events than death and what that means is that if you want to detect a statistically significant difference in deaths you have to have a much larger study that's called statistical power. These studies are not powered generally to detect differences in mortality and so that is a pretty straightforward explanation for why they generally don't find differences in mortality and so I think if you want to understand you want to interpret these studies as well as possible and interpret them in the context of how they were designed you have to look at the outcomes that the studies were powered for and typically that was events not mortality.

DANNY LENNON: Thanks for that run up Stephan. Spencer I'll turn to you next for some of the concluding remarks.

SPENCER NADOLSKY: Yeah my just very practical advice is you know all of this butter on our food to taste good whether a little bit here and there is going to affect us a lot I think you just got to test it yourself you know even these boy proof coffee drinkers. You know I've actually had patients that they drink and have absolutely no changes in their lipid profile when checked multiple times when then I've had some that just explosions in their lipid profiles. It's quite amazing that there's probably some genetic things that we haven't looked at I've looked at him he status and all sorts of different things I can't find a

pattern per se my brother is actually doing a randomized control trial of BulletProof coffee [coffee blended with butter and MCT oil]. So that should be interesting whether it shows in the differences but my practical advice is literally just well see if your lipids are elevated and you have a lot of butter in your diet. Cut it out see what happens if it warrants good you know you could test it a few different times and experiment yourself it's a relatively cheap test to get to your lipid panel, you can get some more advanced testing it will be pretty inexpensive as well. So I think just testing yourself and really finding out for an individual standpoint. Just from lipid sample and again we've talked about some of the other effects but if you really want to just look at your lipids you might as well just test it on. That's pretty much my practical advice.

DANNY LENNON: Awesome thanks Spencer. Chris I'll go to you next.

CHRIS MASTERJOHN: I'd like to conclude apart from just reiterating I think two things that we're all largely in agreement on which is that foods are more than the sum of their parts and that different people have different dietary needs I'd just like to add that I think also our own needs change over time and I think this can be very relevant not so much to saturated fat but to some of the foods that are rich in saturated fat and I'll just give one example from my past that I think illustrates this really well. I was vegan for a couple of years and I developed a lot of health problems and felt really terrible and for a while after that I always felt better when I had red meat in my diet and I think I was undernourished in certain nutrients that are more dominant in animal foods and red meat happened to be a really good source of those but over time over the years I started to feel worse when I had a lot of red meat in my diet and it turns out that I am homozygous for a certain for the less severe form of hemochromatosis genetically and so I'm pretty genetically predisposed to iron overload so when I look at that in my own story it looks to me like I was under nourished at a certain point and I really benefit.

That a lot from including foods like red meat in my diet and then I reached some kind of turning point some inflection point where all the sudden with respect at least one of the

nutrients I was heading into over nutrition and I think we need to be conscious of the fact that you know there's a lot of people because of their age, because of their sex, because of their B.M.I. their lifestyle et cetera et cetera where cardiovascular risk is the thing that they should be caring about but there are a lot of other people who may have been in my position during that that time where their main thing is they're just undernourished they're younger they're not overweight they're not at risk for cardiovascular disease with respect to their blood the blood lipids or the other measures that would look at but maybe they don't feel right mentally maybe they don't have enough energy maybe they can't support their workouts and they have a they have totally different needs and that might be you right now but ten years later might not be you. So to recognize that even within ourselves our own nutritional needs are going to change over time and that's going to impact how we should think about these foods I think is an important point.

DANNY LENNON: Thanks for that Chris, brilliant round up. Brad I'll turn to you for your concluding remarks to finish us up.

BRAD DIETER: I just I want to highlight the fact that we have forward you know very different people from very different backgrounds and experiences and training and this is often considered a controversial topic but I think it really shows our discussion was very you know we're all in the same page in which comes to what the research says you know what the interpretations are and what role it really plays and overall health specifically towards disease status is like cardiovascular disease.

So I think it's really important for people to realize that as a community of scientists and researchers you know we don't have all of the answers but we do have a pretty good understanding of how nutrients like saturated fat really do impact over our overall health and so I think you know that's just the message I want to get across to people is. Nutrition isn't quite the black box a lot of people think it is in there is a substantial amount of research that can tell us what we do know and what we don't know and I think you know as a community we've done a pretty good job of trying to pin

those things down probably some of the other things to conclude with is you know kind of reiterate one of the things I said at the start is you know any time and this kind of dovetails into what Chris just mentioned you know anytime you're talking about a disease especially a complex you know chronic disease like heart disease or diabetes or even obesity is something like saturated fat is one piece of the equation that adds up to this accumulation of risk in disease development.

So we are really doing the saturated that piece as a partial answer to what makes up that risk really kind of puts it into perspective of you know how do you go about your constructing your diet to minimize the risk for that disease you know like Spencer was saying do you have a risk factor like elevated L.D.L. if you do we know that dietary saturated backing contribute to that so let's try and mitigate it. So it's really you know as a nutrient it's not something that needs to be viewed as something to stay away from at all costs and it shouldn't be viewed as something you know you need to eat a whole ton of because it's got these huge health properties it's really in the context of your overall diet and your overall risk profile for diseases how it should be viewed.

DANNY LENNON: And that was actually one thing that I was going to mention myself and I'll echo that again Brad it's amazing to see four guys I really respect and the four of you who have essentially shown with the context and Cabot's you've given this discussion that moving people away from irresponsible conclusions about one specific nutrient either being something to demonize or the thing you should be having as much as possible and really it all falls into place of the overall context not only of the diet near the foods are consumed there but also the other lifestyle factors we know are going to have a much larger role than any specific isolated nutrient. So I think this conversation has been particularly useful and hopefully for people listening that's one of the big things you've taken away apart from the individual points of just seeing how it's being discussed by these guys I think is quite eye opening and really want more of the industry in my opinion needs. So with that we'll from things up here and finish it off I think we've done a good job on getting across

most of the main points you guys have been very kind with your time I really appreciate that and for all the input you've given today so I want to say a massive thank you to Brad, Chris, Spencer and Stephan thank you guys so much for coming on.

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