DANNY LENNON: I'm honored and delighted to be joined by Professor Tim Noakes and Martin MacDonald who are here so a very special hello to both of you Martin and Professor Noakes.

MARTIN MACDONALD: Right down to you.

TIM NOAKES: Thank you Danny for having us.

DANNY LENNON: Yes, this is hopefully going to be an extremely interesting conversation. We've gone with the general theme of looking at carbohydrate intake, insulin resistance and body fat regulation. Before I start throwing over any specific questions and getting into more of the details I thought I would ask with or maybe an opening statement to give a brief answer to the admittedly large question of are carbohydrates inherently fattening and or the primary drivers of insulin resistance.

I do realized that's quite a big news question but to maybe give some starting points and some cliff notes on that. Maybe I'll start with you first Professor Noakes of your thoughts on that particular question.

TIM NOAKES: I think the answer to both is no. Insulin resistance is a genetic disorder that were born with. It gets progressively worse at different rates depending on what you eat. It's the insulin that drives the insulin resistance so that the more insulin you secrete during your life the quicker you'll become insulin resistant depending on your genes. Carbohydrates are the major cause raising insulin.

Yes, indirectly they are involved. Carbohydrates are involved. It's insulin that is the main driver of the problem. The second point is that if you're not insulin resistant then carbohydrates are fine for you. The majority of the humans that I deal with on a daily basis and the people I see at in general when I go out. Most of them in my view are insulin resistant.

We have to be very cautious when were talking – are we talking about elite athletes, your run of the mill 50 year old, are we talking about the people in my age, 68 when we talk about the insulin resistance and it's prevalence.

DANNY LENNON: Perfect, thank you for that. I will turn over the same statement to you Martin.

MARTIN MACDONALD: Yeah, similar to Tim it's the answer is no. With regards to kind of our carbohydrates inherently fattening I would say that the prevailing evidence is that they are not and that the kind of multi factorial nature of things that drive an energy surplus in terms of genetics with regards to appetite and the way you respond to macro nutrients and these kinds of things as well as the small but not to ignored and factor of a more inactive lifestyle and again the food environment which plays into all of these factors.

With regards to insulin resistance specifically it – we all sit on a scale of where we are or how insulin sensitive we are. That can go up and down. We can become – we're all on a suppose a continuum of that from birth. We can be born in a much worse place depending genetic factors and the maternal epigenetic

environment as it's commonly been called. The main driver of an increase in insulin resistance I supposed this is a key point of contention in the discussion is that insulin doesn't drive insulin resistance. Carbohydrates aren't the only driver of insulin.

We've obviously got protein and sets and specifically Imino acids being very insulinemic. It is not insulin that causes you to become insulin resistant. It's actually quite a complex thing that I suppose it's very easy to be – look at one particular blame sugar or blame carbohydrate or refined carbohydrates when in fact we can – we can see people on a particularly high carbohydrate doing relatively well. If someone was leaning lots of carbohydrates, release lots of insulin and it doesn't cause to became insulin resistant. If someone takes this idea that carbohydrates cause insulin resistance so for me the case it's an energy surplus over time with other factors of that screw up signaling. Insulin resistance caused by sleep and disruption, smoking, physical inactivity, a kind of myriad of factors that lead us a myriad of effects that lead us to insulin resistance.

DANNY LENNON: Okay. Based on that at least some level of agreement from some of those points. I think like you had mentioned Martin that perhaps most of the contention is going to rely around the concept of insulin resistance and the action of insulin and it's role there. I know Professor Noakes you bring instances there too so maybe as a good segway from that opening point to start talking a bit insulin resistance and how were actually going to classify that.

As a starting point, how should we think of insulin resistance in your opinion Professor Noakes? What are the things that maybe you feel are most important when were addressing concept and how does that relate then to nutrition?

TIM NOAKES: I think the most important point is that if you're insulin resistant you're intolerant to carbohydrate. Every time you eat carbohydrate you hyper secrete insulin. That thing causes all the complications of chronic – of the chronic diseases that we face today, the obesity, the diabetes, the cancer, probably dementias. They are all link to this condition of insulin resistance. That is the single most important medical condition on this planet.

Yet we don't teach it in the medical schools where I have trained. We don't teach it. I think it is desperately, desperately important. My view is that insulin resistance is probably our survival value and it probably starts in the fetus. If we went insulin resistant we would have never gotten our big brains because the fetus has to get fat in the third trimester in order to be born with a large amount of subcutaneous fat because that subcutaneous fat is then turned into key tone bodies which then drive the development of the big human brain.

Humans co-opted a starvation method which is ketosis to build brains. If infants weren't insulin resistant then we could have never built our big brains. There maybe other reasons why insulin resistance is so important to human survival. I haven't taught them actually. What happened was in 1977 we crossed a critical value of how much carbohydrate we were eating.

If you look at populations going up to 1977 that generally were eating less than about 35 to 40 percent carbohydrate. Then it suddenly spiked about 40, 55 and up to even 60 percent carbohydrate. That's when obesity diabetes epidemic begins.

I think it's fairly – it's fairly reasonable to suggest that it was the principal driver of the obesity epidemic was that change on nutrition. It wasn't just carbohydrates as Martin indicated. It's not just carbohydrates that change. We also have eaten a lot more sugar. We've

eaten more vegetables oils and more flour. All of those could contribute to obesity.

In summary insulin resistance is the most prevalent medical condition in the world. It's probably benign by itself. That's why humans were healthy until the time that we started eating more than about 40 percent carbohydrate. That's when the populations in my view started to show the evidence that the insulin resistance is a problem. I'm not going to discuss it by chemistry. It's quite obvious when you feed people insulin resistance, high fat diets they start to look much healthier.

As long as you feed them carbohydrates they continue to look pretty unhealthy. They over secrete insulin. They over secrete glucose. They get the long lack of protein concentration in the blood stream which ultimately lead to arterial damage. This is a progressive condition. That's why most of the symptoms were insulin resistant started to appear in human 45, 50, 55.

DANNY LENNON: Okay. Thank you for that. Martin, I will it over to you. Are there any particular points that you first want to address there that you may have a different opinion on?

MARTIN MACDONALD: Yes. I think it's difficult to say when this turning point occurred. One of the biggest issues with separating out this up here that an increasing population assumption lead to this increase in obesity. We do know that overall calorie intake did increase. We do know that general, physical activity levels dropped a little bit. To show that this – I don't think we can show accurately enough that the kind of data that we look out from the 60's, 70's. 80's. it's very, very difficult to draw any strong conclusions of kind of the overall calorie intake and percentage of carbohydrate in the diet.

We do know that's overtime from the 60's and 70's we got progressive increase in many different things. An

increase in meat consumption, an increase in fats and oils which are definitely don't think are benign in this. We did get an increase in – a slight increase in sugar consumption and a rise in certain process grains, flour as Tim said. The issue is that we can look at – rather than look at these I supposed looking backwards. We can test this now.

I'm not entirely sure I've seen any data that shows insulin resistance is just this thing that helps us a fetus. It helps us to put on weight. If we look at some of the more interesting data I think in certain lower carb circles there's the idea that insulin resistance or high insulin drives fat gain or drive appetite for instance. We're not necessarily. I know there are certain individuals who are born very over weight for whatever reason whether that's Leptin deficiency type scenario or kind of insulin resistance form the mother.

Insulin resistance in it of itself actually seems to be to stop people gaining weight in such a way. Actually it's one of the key reasons that were not clearing things like non astride fatty acids from the blood and glucose from the blood. One of the key issues actually is really, really key to understand the different between high insulin if you're consuming lost of carbohydrate. Your area under the curve of insulin over the day will be higher. It doesn't make you insulin resistant. These chronic low level or chronic, slightly elevated insulin levels, fasting insulin shows us that an individual and the body might be insulin resistant. Actually the problem is when cells particularly fat in muscle cells become insulin resistant we actually struggle to put substrate away in to these and deposits.

Actually we've got a lot evidence that kind of shows actually insulin is not particularly appetite stimulating hormone. We can actually show that high insulin doesn't predict future weight gain. These are really key, under pinning issues with some of the ideas that

are being proposed of the kind of insulin hypothesis or the high carbohydrates increase the likelihood of weight gain. I think that's – these are some of the key things that need to be understood and elucidated for us to move forward on some of the key things that I supposed treating people who become overweight.

In my opinion it's very easy to understand why people are gaining weight not to treat it. We know 5 to 10 factors that are massively driving obesity. Now were looking okay, and what's going to help us with weight loss.

DANNY LENNON: Right and obviously when we talk about insulin resistant there's a lot of different areas we could go with that conversation. If we perhaps start with looking and primarily focusing on body composition and this drive of body fat gain and development of obesity. I think that's where a lot of the interesting part of this conversation might go. With that if I'm getting your current view correct, Professor Noakes you said that it's not inherently that carbohydrates drives this insulin resistance. It's more that there's a certain percentage of people that are going to be insulin resistant. For those people if they consume a moderate to high amount of carbohydrate that is what's going to cause this problem. Then therefore that's going to lead the detriments in obesity development, metabolic derangement and so on. Is that a fair categorization of the point you made?

TIM NOAKES: Yeah, indeed. I think I accept what Martin says that the link between insulin is insulin prevents fat oxidation. That's what it does. It just causes the fat storage. Whether it causes I quite agree with you. The bottom line of this whole debate is hunger. If you don't understand hunger we can't progress in managing obesity because obesity is a disease of hunger. I accept what Martin said that it may well be that insulin is not driving the hunger. However what

we do know is if we've got people who are insulin resistance and it's out of their immediately reduce – sorry the majority which it's the calorie intake.

There's something about carbohydrates and insulin resistance which make people overeat calories. I don't care whether it's the insulin or whatever. In practice when you deal with human beings on a daily basis and you see thousands, hundreds of thousands, millions reversing their obesity when they cut the carbohydrates then you can't ignore. If the laboratory experiments can't prove how it happens or why it happens or support the evidence that it does happen then laboratory is not yet up to date with what's happening in the real world.

I think that's a very important point that laboratory scientists and of course we want the answers. If people come to you everyday knock on your door and say thank you Dr. Noakes for saving my life because I lot 50 kilograms by dropping the carbohydrates I don't care what causes, how it did but it happened. They'll all tell exactly the same reason. I lost my hunger. I didn't start exercising. I lost my hunger. There's something about carbohydrates and insulin resistance and the current way we eat that is causing the obesity. I don't think that exercises got one scrap to do with it. We'd written widely on this that you can't outrun a bad diet. It is true that if you exercise vigorously as I did for 33 years you might restrict the amount of weight you gain.

In the end it's what you put in your mouth that determines what your body fat content is going to be. That is driven bureaus your hunger. That's why I like to tell people that if your diet does not take away your hunger it's not going to work.

DANNY LENNON: Right. One thing that I think perhaps people may respond to that and I'll ask you what your thoughts on it is and maybe we should for this separate between once obesity has already been established and

interventions for those people versus the initial gain of body fat from someone that's going from healthy weight to overweight to obese. In those circumstances of course with obesity we know there is some sort of appetite dis-regulation going on, their hunger signaling tends to be screwed up. For someone that is not in that position yet but is gaining weight. We obviously know that sure there might be something going on with their appetite and their hunger. How would you respond to people then who would say we can have clear classes where people are going to overeat and consume more calories that have things that have nothing to do with hunger. Things like just their general behaviors.

They're picking calorie dense hyper palpable foods. They're novelty of foods are picking. Their peer group, the food environment around them that's causing them to eat even when they're not hungry. Is that a part of it or do you still feel that's still being driven by these I supposed homeostatic regulation of appetite if that question makes sense.

TIM NOAKES: Yeah. No. I think that makes a great sense. I think this is where Martin is correct that what drives our eating isn't just hunger. It's all these other factors and that therefore there are many factors that are driving obesity epidemic. I fully agree with him. What we do find out is you can't give people simple rules and the rules are associated with carbohydrate consumption. If you can get them to eat a sufficiently small amount of carbohydrate and not to over eat on fat because this is quite true. There are some people – we know 10 percent of people who go on a low carbohydrate diet and she put on weight. That's because for some reason their brains are stimulated to eat more calories when their eating fat.

For most of us eating more fat and we consume less calories. I absolutely agree that emotional eating and all that is really important. What frustrates me is that the general public is getting a very confused message.

If they were just be given a straight message it will be much easier for them to get the message right. The reason why I've been incredibly successful with my own weight loss program is because I know the rules. The rules are so simple. It's 25 grams carbohydrates a day and those foods which contain carbohydrate I don't eat.

Once you do that you restrict your opportunities for eating and of course sugar. No sugar. Once you cut sugar and you restrict your carbohydrates you then take out all the stimuli that drive your hunger and make you want to be in the notion of eating. That's my issue. My issue is that the only way we can get people who have got emotional disorders and et cetera, those are the factors which are driving them to overeat calories is to take away the drivers, the macronutrient drivers of hunger which are in my view sugar and too much carbohydrate.

Once you can get people to understand that they have choices, eating you like and try to moderate it. That doesn't work or you restrict your foot intake to a certain range of foods. The rules are very simple. Once you do that you find that actually weight loss is pretty simple. I think the failure of the weight loss programs is we just – we're not giving people the right messaging. We're telling them it's complex. It's difficult. It's not. If you follow the rules and for a majority of people it's quite easy.

DANNY LENNON: Sure. Martin I'll turn to you because I know at least in certain circumstances I would imagine you probably agree with the point that a lot of the typical messaging most people hear around diet can be not the best information or the very least confusing. How would you separate that from the I supposed the topic of then what to do about it and how does that play a role with for example advising low carb, high fat diet and maybe then to touch on some of the points that Professor Noakes brings up around appetite and so on and regulating that through carbohydrate restriction.

MARTIN MACDONALD: Yes. I there was a lot of points there that we would probably all agree on with regards to general – I'm certainly not here with any one listening to try and say that low carbohydrates diet don't work or even ketogenic diets don't work. They 100 percent do. I think often it would be great for this podcast to provide some clarity that it's not a one side against the other. I supposed that's where being the middle ground is sometimes isn't very sexy. Certainly with dietary guidelines that might not work. The idea that we just need to eat a little bit less, does notoriously fail without much more input.

To touch on that thing of I've been quite critical of dietetic associations and the all information they have given out. I've never gone to the extent of saying that say this 25 grams of carbohydrate figure. I do think an absolutely massive factor is this simplicity of the 25 grams of carbohydrate number for instance or even forget that. You just say just don't eat these foods. It's a very, very simple message. If we take a couple of things I just want to iterate of what Tim said there is calories are driving – it's great to have it on air said that calories are driving the weight gain. What is driving an increase in take? It's appetite through homeostatic and non homeostatic mechanisms.

We have got food environment. We have got Hyperpalatable foods. All of these different things driving it. I don't think people should be using exercise alone to and try in these weight sets and they ought to agree with that. I think it's brilliant for weight maintenance. I think it's got some excellent other health benefits. This idea that when were talking about like fat doesn't suppress appetite. That's suppose another maybe key difference in our messages like we have many, many, many studies showing and I think some of the poor dietary guidelines that or at least the way that they were maybe put by the media. We had short term studies showing that fat wasn't preventing intake. Actually if

you put some of the low fat diet they lost a bit of weight or they certainly didn't gain weight.

Animal model show the high fat diets in mice made them gain weight and even in humans the same. If you massively reduce carbohydrate people loose weight. It happens exactly the same way. If you massively reduce fat intake it also works. We've got these studies even the metal analysis I think it's Bueno if I said that right shows that ketogenic diets are better, slightly better or significantly better by .9 of a kilogram over 12 months. They're not calorie controlled but they are carbohydrate in control. Some of the people say we can eat libertine. At the same time you're still having to restrict certain foods whereas in the other group you're not really restrict to any food. You're just restricting calories to a level. All of these – this is the problem of saying that we could have a simplistic message. The problem is it would be just as bad as the low fat guidelines to go as simplistic as Tim's mentioned this 10 percent figure. I don't know where that comes from.

Some people are not served well by ketogenic diet. What they have to do? They are told to eat less. They are told to intimate fast which many people know I'm a bit of a fan of personally not as a cure. You need to start eating less food, these fatty foods. The problem is – is you got the low carb community telling people you should have these fat bombs. I don't know if you have heard of these. You should have some fat bombs. You should be sticking coconut oil or butter in your coffee to suppress appetite. It doesn't work. Cutting carbs seems to help. This is the other thing, a really important thing for the general population is we know that when we tell people to cut carbs they tend – we tested this. We know this. They tend to eat more protein. Protein out of all the macro nutrients is the most satiating. I have no disbelief that Tim is helping people to loose weight. The unfortunate fact is in my opinion it's muddying the waters.

It's confusing other people because they're not served well by Keto Diet or they can't stick to Keto Diet. We know full well if someone increases their protein in take, uses behavior change methods, environmental methods, cutting calories methods, increase vegetables, anything that spontaneously reduces your calorie consumptions such as intimates of fasting or timed eating, windowed eating or even just improving their sleep because that for a lot of people helps them regulate hunger better. We can get them to loose weight. The problem is just to end on this we have the studies that compare ketogenic or very low carbohydrate diets versus the alternative, moderate low fat. We're talking 30 percent or less calories from that which isn't low fat. Every one looses weight. Often the Keto Diets loose a little bit more.

The problem is there were not measuring fat loss after when fat loss is looked at it's very similar. When protein isn't equated Keto works. When protein is equated they come out the same. Every one regains weight after six months or a year to a similar extent. This is the issue is if you just go down this route of 25 grams of carbs or ketogenic diets you miss the word for the trees which is we need to be focusing on calories. If it doesn't serve you well to go Keto then you need to know that you can improve diabetes if you're insulin you can improve that on a super high carb, vegan, vegetarian –

TIM NOAKES: Please, please, please. Please, please.

MARTIN MACDONALD: We've got many studies to show this.

TIM NOAKES: Which? Where? Where? Where's a study showing vegan reduces diabetes? The Neil Barnard Study failed to show any effect. They finished up with HbA1c of 7.8 after 62 weeks. That is still full on diabetic. That is a fallacious study. There is no study showing that a high carbohydrate diet can reverse diabetes. Yet two days ago in the Lancet there this study showing low calorie intake reverse diabetes in

something like 50 percent. There's a study coming out at the end of year from Bertha Health in California showing 97 – sorry, 89 percent of people with a diabetes, type II diabetes can reduce their insulin or come off their insulin when they eat a high fat, low carbohydrate diet. There is no error of carbohydrate.

MARTIN MACDONALD: I totally agree. I totally agree.

TIM NOAKES: If it's diabetes.

MARTIN MACDONALD: On a low carb diet you can definitely do those things. There was a paper published November 2017 by Silvettski that showed a high carbohydrate, high fiber, low fat diet and results in weight loss among adults of high risk of type II diabetes.

TIM NOAKES: Yeah. You said it reverses diabetes. You said it reverse diabetes and that's not the case.

MARTIN MACDONALD: You can improve insulin sensitivity. This is the key thing we've shown time and time again insulin sensitivity –

TIM NOAKES: It's how you measure insulin sensitivity. Did they measure liver insulin sensitivity? That's the key. That's the key driver in diabetes is what your liver is doing. You can't reverse that on a high carbohydrate diet with all the exercise you like. You may change in resistance in the periphery by eating a high carbohydrate diet. That's fallacious. You're just adopting to a high carbohydrate diet. If you are adept to people to high fat diet of course they become insulin resistance in skeletal muscle. They have to because they're not getting any carbohydrates. They've got to spare their carbohydrate. That's a biological response. It's not a disease state. It's not a pathological state. You're confusing pathology with physiology.

MARTIN MACDONALD: There are more high studies again that use macrobiotic diet. They show tremendous result in reducing people's insulin needs. Again this stuff is all

happening. People are able to reduce – we know that weight loss is the absolute key thing for people. Again you started by saying we need to work our appetite. If people cannot be hungry and people cannot be hungry on a higher carbohydrate, moderate to high protein, lower fat diet. They loose weight and they improve insulin sensitivity whole body, muscle adipose tissue and they improve all of the metabolic syndrome markers. They can improve their triglyceride even which again is that key marker liver, insulin resistance. These things are – they are happening in the research measurably. What's driving it is a calorie deficit and weight loss. The way someone chooses to do that is the really key thing. If we go to a dogmatic sense of low carb is the only way. It's just not serving the population well.

TIM NOAKES: No one said it's the only way. It just happens to be the most effective way because you revert to the story about the regain of diet, the regain of weight because people start eating more calories. Why? Because they get hungry. The studies that you referred to maybe lasting six months to a year. Those people – they're not committed. You see the trouble – the different between laboratory research and research out in the field, watching people loosing 130 kilograms or the most people I see loose 20 to 40 kilograms on this diet. They don't regain because they know the rules.

If you're on a clinical trial there is no incentive for you to stay on that diet because it's difficult. The food environment is all wrong. When you've got a person whose got diabetes and has got peripheral vascular disease and they said listen you're going to loose your legs if you don't eat 25 grams of carbohydrates a day for the rest of your life. They've got motivation and their weight stays off and their diabetes improved. That's the difference, the motivation. You can't – what's happened is the scientist are thinking that their research reflects the real world and it doesn't.

It affects what happens in the laboratory. When you go outside the laboratory where people have real motivation to change their ways then you get results that make much better sense or make much bigger differences. That's the problem. We have to see the totality of the elements. You can just argue from the laboratory data. The laboratory data is specific people who are not particularly motivated to stick with the diet. There's no incentive for them to do that. They will gain weight at the end. In those studies no one ever quantifies exactly what their eating and at the beginning – everyday of the trial whereas if you're in a clinical trial. We're there to help. Everyday what you eat is getting reported. You're getting told, listen you ate too many carbohydrates today. Your glucose is elevated. You got to reduce the carbs.

That's the type of interventions we need if we want to see what diets really do because my point being we accept what the passion says. Of course I comply to the diet. we don't know that they did. They gained weight. Then when you see them it's just because of biology. It's not. It's because they changed their diet. They started eating more carbohydrate.

MARTIN MACDONALD: I think this is the thing is. It's a fallacy to say that people in research are completely different than those in real life. These people are in diabetic centers. They are at risk of all of these issues, diabetic retinopathy, you're going to have your toes, your foot chopped off, et cetera. They are – to say that they are less motivated is – there's no absolutely no evidence of that.

TIM NOAKES: The studies you were quoting. The studies you were quoting not very patients of conventional weight loss programs. There's no –

MARTIN MACDONALD: We're talking about diabetic patients who are looked in these studies, who are in a multi-centered trials.

TIM NOAKES: That's fine because we've got no argument there because diabetes the only diets that really work in

diabetes as you will see when the Bertha Health Labor comes in a months time or as you will see when you read the Lancet Paper that came out two days ago. it's either extreme calorie restriction, 600 calories a day or else it's a higher fat, low carbohydrate diet. It my opinion when were going to look at it we'll see that it's much easier to comply with the latter. You can't comply with the 800 calorie diet for life. It's not possible to survive on that. The answer study is really interesting. It's not relevant. The Bertha Health Study coming out in a month's time where so many people have got HbA1c below 6.5 and now it's technically in remission on diabetes. Those are the studies that we have to listen to. Those are the ones where they've cut the carbohydrate intake.

MARTIN MACDONALD: It's crazy to say that 800 calorie would be – someone will need to exist on that to life. They don't need to. If they loose the weight and they're able to maintain it they – insulin stays …

TIM NOAKES: Insulin resistance is still there. Listen, I'm 20 kilograms lighter than I was. I'm just as insulin resistant as I was when I lost this weight seven years ago. All the patients that we – the insulin resistance that's what I was saying if you really measured properly. If you don't, if you measure in peripheral, skeletal muscle of course it changes a little bit. It doesn't – the insulin resistance that matters in diabetes is insulin resistance in the liver. You can't change that. That's the only way you can change that is in the small proportion by cutting the calories extremely amount or cutting the carbohydrates. Unfortunately it's not the obesity. I've written an editorial coming out in clinical chemistry in a months time.

It goes with another study, a genetic study. It's obesity or insulin resistance and the evidence as I see it is that the insulin resistance comes first. You can loose all the weight you like. You're still insulin resistant. I don't agree with that at all.

DANNY LENNON: if I can just interject I think one point just to clarify what were seeing here Tim I know earlier when we talked about carbohydrates and one of the kind of things you had mentioned is that for weight loss as a in general were saying that low carb, high fat is from your perspective at least the best method we have right now. It is only one of a number of other methods that could work. It seems that it's coming from the perspective of someone who is insulin resistant. You're a bit more stricter or tighter on how important that carbohydrate intake is for that given person. Is that a fair reflection that you're saying if someone has established insulin resistance then the only way for that person to either loose weight or just for them to be healthier in the long term is to have a carbohydrate restrictive or a very low carbohydrate intake.

TIM NOAKES: Yeah. You're question makes me weight it in health. I think if you talk health it's obvious because if you want to – if you drop your carbohydrates you immediately raise your HDL and your triglycerides come down. Those are critical predictors of long terms health. Your HbA1c comes down. Your post to insulin comes down and those are key markers to long term health. Then will only come down and that was shown by Raven in the 1980's although he quit on the research unfortunately. That if you've got insulin resistance the only way you can improve your metabolism, metabolic to the way you look in those variables that I've described is to reduce the carbohydrate content of the diet.

Now what you also learn is that every one has a certain threshold which their carbohydrate intake drives their hunger and they eat too many calories. Working with a lot of people who are severely obese it's astonishing how a change of 20 grams of carbohydrate a day makes a difference between loosing weight and not loosing weight. I think that's a point that people don't understand because most people are eating less like 300 grams of carbohydrate

a day. For them to go down to 150 grams I think they're eating no carbohydrate. In fact for many of them they're going to have to go below 150 grams.

There's a threshold for all of us. That's the key to understand that if you're above that threshold it's very, very difficult to maintain weight loss. I think it's because the carbohydrates continue to drive hunger so that you just – you eat a few more carbohydrates next week and the next week after. Soon you're back to your 200 grams of carbohydrates a day. It seems to me once you get the carbohydrate below some sort of threshold it's likely it's an addiction threshold. Once you get it below that threshold people will find it much easier to cut the calories and not to be hungry.

That is not being proven scientifically. When you observe patients as we do and you get reports back it's astonishing that the small amount of carbohydrate that converts someone from loosing weight to regaining weight. The margins are very small. I learned that from all the people working with this died in North America. They stressed that fact that listen there's a cut off at the amount of carbohydrates. If you don't get below that you are in threshold. You're not going to really get a very result.

DANNY LENNON: All right, one thing maybe just for listeners that maybe are cool with this and having confusion about hearing about different types of diets. How can they consolidate what you said around we don't currently have a conclusive research on this. Look, we have this clear set of anecdotes where all these people have been helped in this manner. They turn around and say well I know someone from the vegan community or I know someone from this other group who says they know loads of people who tried a specific type of diet and seemed to work. How can they try and wrap their head and consolidate these opposing idea where they're having people like how did they know which anecdotes are actually better representative of what's going on versus poor anecdotes if that makes sense?

TIM NOAKES: Danny you've hit the nail on the head. The view is you don't have to worry. You have to try it yourself and then see what happens. You try and find out what works and within a week you'll know it or in two weeks. If you loose a kilogram in the first week on a low carbohydrate diet you will loose 20, 30 kilograms if you got it to loose. It's as simple as that because it's clear that the diet is working for you. All the people that we've seen who loose a lot weight loose within the first week they already lost a kilogram or two. That predicts a really good outcome. That's all you have to do just go on the diet and see if doesn't work leave that diet and then try something else.

The beauty is that all the science in the world and all the – all me preaching here. I'll say this for Martin's sake. All my preaching doesn't mean to say this diet is going to work for you as an individual. You have to go and try it. All I'm trying to say is that unfortunately the message gets so – now we've not been able to say a low carbohydrate is effective because every one has said no. It's not effective. Now fortunately the public have benefitted from it. The message is getting out that it actually is effective. There is a lot of science out there. Five years ago no one listened. Now people are listening.

Martin and I can resolve our differences by simply me agreeing with him and saying Martin you're absolutely right. There's no one size fits all. All I'm saying is try the carbohydrate diet, low carbohydrate diet but follow the rules. You have to follow the rules. For example what are the rules? The rules are if you're profoundly insulin resistant, a type I, type II diabetic you can only eat 25 grams of carbohydrate a day. That's it. No more. If you are a healthy person with minimal insulin resistance you can eat 200 grams a day quite comfortably at least for 10 years or 20 years. You monitor yourself. You measure particularly your HbA1c, your glycated hemoglobin. If that value starts to rise after a few years and it goes above six you're in trouble. You're hitting towards diabetes. If it stays at

5.5 and you're eating 200 or 300 or 400 grams of carbohydrate for the time being you are safe. That's perfect.

The diet is working for you. Once your HbA1c starts to rise above 5.5 you're on the way to type II diabetes and you'll be there in 10 or 15 years. That's a simple messaging. Find out how tolerant you are of carbohydrate. If you find that you don't need a low carbohydrate diet to loose weight then that's perfect. What frustrates me is that people are told by the British Dietetics Association that they have to eat a plant base diet. That you can't eat meat. You can't eat a high fat diet because it's not going to work. That's not true. The evidence is completely the opposite.

DANNY LENNON: Yeah. At least speaking personally I think maybe as supposed to thinking of this as someone trying to get information to improve my diet. When I think about does a low carbohydrate, high fat diet work the answer is clearly yes in the sense that if you look at trials where people have gone on low carb diet and has seen that they have improved either health or weight loss outcomes you can clearly point to different pieces of literature as well as personal anecdotes that many different people have. However for me at least the more interesting question is not did it work. It's why it works.

I think that's where I think most of the contention still lies between yourself or Martin or people in similar difference of not does it work is the fact that why it works. I'll just it over to you Martin if there's anything you wanted to address of what's been said over the past few minutes that you wanted account for.

MARTIN MACDONALD: Yeah, I think it's really key to notice that. There are these studies and I'll give this one to Danny so you can link to it. I supposed like lots of the people who are very passionate in the way that Tim is about this low carbohydrate way of eating are people who stringently

oppose the eat starchy carbohydrates with each of your meals in a day. That's where I'm totally on board with this. As I said at the beginning going to the other end of the spectrum and saying that every one with diabetes should eat 25 grams of carbohydrate a day is where there's very clear and evidence that that's not the case.

I'll give this study again. I don't like to push any one towards Veganism particularly. That's probably bad of me to have that bias. There's this study by Soren in 2014 I mentioned with the macrobiotic diets. I'll link to that because again the average carbohydrate intake in that group was 335 grams. They had an impressive improvements in their metabolic parameters around type II diabetes, fasting, blood glucose, et cetera. That study is an interesting one for people to look at and maybe Tim to look at. The fat percentage in that was so, so low that it's almost like the ketogenic diet of the low fat world. It's the ridiculously low fat instead of the ridiculously low carbohydrate, instead of this middle ground which doesn't serve people well.

I think the key thing to say is that Tim talks about this 40 percent threshold and people weren't getting obese until we went above 40 percent. Then goes on to say that 25 grams a day is what you'd be aiming for. Just let me finish.

You've got again this whole idea that a quote from you, Tim, sorry. The world's population is becoming fat and diabetic since following a low fat diet guide. The problem is we really, really know that the population isn't following the guidelines. Certainly the guidelines have contributed to poor messages by food industry which again I'm really, really opposed of in terms of cereal companies and sponsorship of breakfast studies in a very unethical way in my opinion. We know that people are eating too many carbohydrates and too much fat and too much sugar. The problem that we have got here is that they are consuming excess calories.

That people can exist, we've got numerous populations, numerous healthy individuals consuming far more than this supposed 40 percent threshold which doesn't exist, which isn't evidence based. I complete agree. If you go on low carb and it helps you then all power to you. That's absolutely fantastic. One, you definitely don't have to go ketogenic and reducing your carbohydrate intake could be really helpful. Increasing your protein intake is often very helpful for almost every one. It's not to be dogmatic about high protein intakes either. Then we've got this idea that we can eat as much fat as we want. It must be stressed that right at the beginning of this little podcast we covered that the issue here is calories.

People need to find a way that suits them to reduce calories. We get people off their insulin medications and off Metformin and these kind of things by getting them to find a diet that they can stick to and loose weight time, manage their appetite and that where that sits is going to be individual. It's really, really important not to say you must go on a low carb. Like test it if it works for you but likewise there's so many Keto dieters out there that I see on the internet talking to people like Tim and saying I'm eating Keto diet and I'm not loosing weight. I can't t do it. This is probably where this kind of I supposed as far as I'm concerned made up. I don't literature. I would like to see a reference.

This 10 percent figure of keto doesn't suit those people and they gain weight or don't loose weight. If people were just told it's about calories. Find a way to manage hunger and they can – and I do really, really side with a slightly lower carbohydrate in take, slightly because in the studies it seems to lower things like triglycerides. It leaves room for us to slightly increase intake of saturated fats, poly and saturated fat and mono unsaturated fats. You like good balance intakes of those which will support good HDL production. We can get the reduction LDL for instance. I know

were getting off into cardiovascular disease here. You can be super healthy if you maintain body weight, exercise and find the diet that suits you which it's completely disingenuous to say that a low carbohydrate diet is necessary for almost any one unless they personally picked that one.

I use to do a ketogenic diet very well actually. I feel absolutely fantastic on it. My non-hedonic and taste preferences stopped me doing it. If I was to believe I'm insulin resistant. I must do that it wouldn't serve well. I can stay healthy eating plenty of carbohydrate and even perhaps more sugar than. We can have quite high sugar diets and can be quite healthy. Sugar isn't driving insulin resistance. It's driving and lots of people excess calories which is leading to excessive body weight and insulin resistance which is not good.

DANNY LENNON: Right. I think unfortunately were just close to coming up on time here guys. I know this is a topic I would happily talk about for many more hours so just before we do round up this conversation I will hand over to each of you to maybe leave people with some concluding remarks that you like to leave people with based on what we've discussed today, some of the key things that you would like them to take away that you feel fairly summarize your thoughts on all that we've talked about today. Again I'll turn it over you Tim maybe first. Some just concluding remarks that you'd like to summarize and finish off with.

TIM NOAKES: Yeah. Thanks Danny. You know I've been through a three year trial for promoting a low carbohydrate diet. It was 25 days in court just the first time a scientist in modern terms has been prosecuted for his opinion. That's why I feel fairly strongly. I was prepared to go to court to fight this because I feel so strongly about it. I've written a book called Law of Nutrition that came out two weeks ago. It describes all the evidence for that there is no evidence that low fat diet is healthy. It presents all the evidence for why the change in the diet in 1977, all the evidence why that was linked

directly to the increase in obesity rates. It talks about all the evolutionary evidence that humans are designed to eat high fat diets.

I appreciate that you have to have protein. You cannot eat more than 35 percent of your calories from protein or else you will die. You have to find some other source if you're not going to eat carbohydrates. That comes from fat. If you're eating at 35 percent protein diet you still need to find 65 percent of your energy from somewhere else. Most of that the diets that we prescribe is from fat rather than carbohydrate.

The fact that you can't eat more than 35 percent is really important to make. You have to eat something else. I think that the world is changing. The dietary guidelines in United States will change in 2020. We've been allowing too much carbohydrates in the diet and that we should not restrict how much fat people eat. They will say that there never was any evidence for changing to a low fat diet in 1977. I think that they will way that this was one of the major errors that we've made.

To make the point that Martin raises you know it's one size fits all. My belief is that if you want to be healthy you shouldn't eat too much carbohydrate. That if you're over 200 grams of carbohydrate a day you're eating too much. If you're eating any sugar it's unhealthy because it gives you non-alcoholic fatty liver disease which is one of the drivers of insulin resistance. I would say if you're diabetic like me and you have a HbA1c which is elevated you need to get down to 25 grams. I think that's the point I'm trying to stress. Once you have type II diabetes the only way you can survive and not develop all the complications of diabetes is by eating a carbohydrate restricted diet.

I speak because I have type II diabetes. I've followed the diet. My father died from this disease and I watched him die. There is no worse death than type II diabetes and eat people eating high carbohydrate diet.

Those are some of the factors that drive me. Again I want to make a point that there's something magical about cutting carbohydrates. It reduce your hunger in a way that you can't believe until you try it. I would encourage people if you had been eating a low fat diet, you're following all the dietary guidelines and you think you're eating this fabulously healthy diet and like you were overweight surely you have to ask the question this diet is not working for me. Maybe I should try something else. What is really working in this country is getting people to cut the sugar and reduce their carbohydrate intake. It's working better than else has ever worked on national basis in my opinion.

DANNY LENNON: Thanks for that Tim. I'll turn it over to you Martin for your concluding remarks.

MARTIN MACDONALD: Yeah. As I said a couple of times I do – like I 100 percent understand why like to give some props to Tim, his work in hydration was actually it changed the way that people spoke about hydration and his kind of critical minds on that. It did bring the scientific community and the public guidelines for it. This kind of challenge is really great to hear when people do challenge it. I think the key thing in this instance is that Tim does rightly say and it's good to hear him say it. It's like in my opinion and in my experience.

We know that personal experiences do cloud judgment. Observations are flawed with areas that we – that's why we do science to try and test these things. My key point to begin with is just that if someone is doing a certain type of diet and it's failing them and particularly kind of I suppose in the U.K. it's called the eat well plate guideline. If you're doing that and it's not working for you do try something else. Don't do the insanity thing of doing the same thing and expecting different results.

I don't want to discourage people ever from trying to lower their carbs and even towards Ketogenic levels if

they think they've tried everything else. Don't think that it's the cure because it might be that they're just doing the eating low fat and eating low protein and actually still trying to fit in a lot of junk food and their hunger not being managed sufficiently. Just to go back to I supposed the key points that we've covered here is like there's this paper by Gartner et. al. and you know try to stratify people by insulin resistance or insulin sensitivity. We know that they found no significant difference in people who were insulin resistant whether they consume a low carb or a low fat diet. You link that then to the Bueno Paper that I did – that I mentioned. I encourage everyone if you could link that Danny that that's a metro analysis of low carbohydrate, ketogenic versus low fat alternatives.

In numerous studies between four and six study of each of these different things they showed no difference between the ketogenic diet and a low fat diet and improvements in HbA1c which Tim mentioned and fasting blood glucose and fasting insulin levels. There was a slight difference in weight loss of 9.9 kilograms over a year so again nothing really to show home about on that content. Finally just two things, that the healthiest people in the world who live in the blue zones you know Sardinia, In Okinawa and all these different people. People take about maybe genetic differences. Obviously they have huge lifestyle differences, stress and some like in exercise. They do consume a decent amount of carbohydrate, more than 40 percent carbohydrate for instance whether it's rice. We know that they're not ending up with cancer and insulin and diabetes like we see in Western populations who eat too much sugar, too much refined carbohydrate, too much fat from all sources and just generally too much in general likewise too stressed, too little sleep, too little sunlight. All of these factors that play a big role.

The takeaway that I want to people to understand is – is that the low carb community because lots of them feel like they've been oppressed like Tim face

prosecution for whatever reason. That really drives a level of look, there's a conspiracy. People are trying to cover this up. I 100 percent get because I spend years. There's things dietatic forms around the internet telling people to kind of spam my website because I'm pointing out that's some of the things Tim's is. All I was saying is that they're wrong and not that there's necessarily a one size fits all kind of scenario. The key thing is do try low carb if you're struggling. The evidence suggest that you can do in a number of different ways high carb, low carb. It what you can stick to and you need to again this is why listen to podcast like this is so helpful in making people realize the certain genetic differences. If you've got high appetite you will struggle no matter what it is.

There's plenty of low carb ketogenic doctors out there who still struggle with their body weight. Actually in my opinion it might be that low carb helps them to begin with but maybe changing that round if you go to the Cornea 2005 Paper. Once their insulin starts to improve slightly maybe slightly more carbs and less fat might have helped them. Who knows? Yeah, don't be dogmatic. Don't think that low carbs is going to solve everything. You can improve your health on a wide variety of method. I think we can all agree that dietetic messages needs to change to be more inclusive of a greater variety of preferences for people to eat with.

DANNY LENNON: Yes. Thanks for that Martin and with that we'll round out this episode. Both of you have been kind to give up the time you've given today as well as your information and your viewpoints. It's been great to be part of this and it's been honor to talk to you both. Thank you to Martin and thank you to Tim for coming on the show today to talk through this topic with me.

MARTIN MACDONALD: Thanks very much.

TIM NOAKES: Thanks Danny and thanks Martin for an inspiring debate. I really enjoyed it.

MARTIN MACDONALD: Thanks Tim.

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