Introduction and Guest Background

– Well, Cyrus, I am so excited to have you on this episode of regenerative Medicine summit. Thank you so much for joining me. – Thank you so much. Dr. Karlfeldt, it's it's a pleasure to be here and I appreciate the invitation.

– Well I am, I'm really excited in regards to our subject matter because we're talking about regenerative medicine and you are the master and diabetes.

And what's fascinating is that diabetes kind of is what you look at when you want to look at a model of rapid aging. So obviously if you can master diabetes, you're then also able to master aging. – Yes, that's a true statement is a true statement. – Well let me let have the audience just get to know a little bit more. Cyrus. Khambatta is a PhD is in New York times, Bestselling co author of mastering diabetes and has helped more than 10,000 people reverse the underlying cause of insulin resistance. He earned a bachelor of Science in mechanical engineering from Stanford University in 2003. So that means that you're really, really, really smart. As well as a PhD in nutritional biochemistry from the University of California at Berkeley in 2012. He's an expert in both type one and two diabetes has been living with type one diabetes since 2002 and has reduced the insulin used by more than 40% using a food first approach. Well this, this is exciting, thank you so much. – Yeah, absolutely.

Thank you and you know, to go back to what you were saying. Yes, we I I teach people living with all forms of diabetes and prediabetes how to reverse the underlying cause of high blood glucose or high blood sugar called insulin resistance. But the truth is that insulin resistance not only increases your risk for all of the forms of diabetes and and the complicates your blood glucose control, but insulin resistance actually is what I refer to as a central node.

It's basically the condition that has more tentacles than any other condition that I know of. And as you develop more insulin resistance over the course of time, your risk for almost all chronic diseases increases.

And that includes cardiovascular diseases like hypertension, which affects a rapidly increasing number of people today, high cholesterol, coronary artery disease, atherosclerosis. It also increases your risk for many forms of cancer. It also increases your risk for things like fatty liver disease and chronic kidney disease and in men erectile dysfunction, blindness neuropathy and the list goes on.

There's also a significant number of autoimmune conditions that are involved in the digestive tract as well that can be negatively influenced by insulin resistance.

So to say that it's only a thing about diabetes is just a microcosm of the overall problem.

Insulin Resistance as the Root of Chronic Disease

And the beauty is that when you actually can significantly improve your health using your food as medicine, then your overall chronic disease burden goes down.

And that's great to see. And we've already seen that in, you know, thousands of people that we've helped coach over the course of time. – And that's why I'm so excited about this because like you mentioned, it's not all about diabetes, this is actually about reversal of aging, it is about preventing these chronic diseases that are plaguing society and that are just, you know, just ramping up dramatically. So tell me a little bit, you know, what is insulin resistance? How would you define that and how we describe it? – Okay, so insulin resistance is sort of canonical we thought of as being a condition that happens when you eat too much sugar.

And if you go to the internet and you go and you type in what is insulin resistance or you go to instagram or you go to youtube, you go to facebook any of these social media platforms and you look for information on insulin

resistance, the majority of what you will find is that insulin resistance is caused by too much sugar, too much pastries, breads, uh sodas, sugar, sweetened beverages in general and this thing called carbs. So people say don't eat carbs.

Carbs are bad for you. Carbs will make you fat, carbs will increase your blood sugar. Carbs will spike your insulin and as a result of that, you will become more diabetic over the course of time and that's going to lower your life expectancy. Okay.

So when I first got involved with understanding insulin resistance, I was back in 2007 and I was just starting out as a graduate student getting my PhD at UC Berkeley and I happened to be working with one of the world's experts on carbohydrate metabolism. And his name is Dr. Mark Hellerstein and he is literally a good will hunting in real life. This guy is so smart that every single time he opens his mouth I have to sit there with a pen and paper and write everything down because the amount of stuff that comes at me is just too large.

So I had an awesome opportunity to be able to work in his under his guidance for five years and try and absorb as much information as I possibly could.

And he gave me a task and he said Cyrus, you're gonna, while you're here for the next five years you're gonna become the master of insulin resistance.

And what I want you to do is I want you to understand what causes insulin resistance in laboratory animals, which is mice and rats. We're also gonna be doing some human investigation as well.

And then I want you to figure out how you can rescue insulin resistance and turn it back into insulin sensitivity and prevent the onset of Type two diabetes.

And he says you're gonna be using food and you're gonna be manipulating either food or the timing of food intake in order to achieve that. And I said, it sounds like fun, let's do this. So over the course of the next five years, I performed hundreds of experiments and I read, you know, more than 3000 papers and I wrote an entire PhD thesis on this exact topic and the long and short of it here is that when I first started looking for information about how to actually create insulin resistance, when I was looking at the actual scientific research, I was thinking that I would be finding the same type of information that you find on social media that you find on google, which says it's all about sugar.

Right? So, in my head, I was like, okay, well I'm just gonna like feed these animals, like more sugar and more high fructose, corn syrup and more just like, you know, refined fructose and that's gonna actually induce insulin resistance.

Not even close, not even close. What you actually find in the literature is that insulin resistance is a condition that's caused by lipid overload lipid being all fatty acids, all types of either fat or cholesterol.

And if you feed animals and human beings, if you feed mammals, a diet that is high in lipids, then you can induce insulin resistance within the, within, within one meal, literally one high fat meal can induce insulin resistance.

And if high fat meals are consumed on a chronic basis, then you can develop insulin resistance in a chronic setting and it can become a condition that continues over the course of time. – So, just just one question in between that I want you to continue because I love where you're going.

So does that doesn't matter what kind of fat? I mean, doesn't matter whether it's a high quality olive oil versus a trans fat, you know, from French fries or chips, you know, does that matter in any way?

– 100%. The quantity and quality of the fact that you consume absolutely matters. There's no question about it. I'm gonna answer your question, but before we get to that, I want to kind of give a little bit more background and then we can kind of move into that direction. Okay, so like I said, the over consumption, the consumption of excess lipid beyond the physiological design of your liver and the physiological design of your muscles is what sets the stage

for insulin resistance.

So the way this happens is actually it's a little complex, but it's actually kind of an interesting story. So, suppose you were to eat something that's fat rich, any food that's fat rich? Give me give me an example of a food that's fat Rich comes to mind on avocado. Perfect. So you consume an avocado.

Now an avocado is a plant based fat. Okay, so what that means is that uh some of the fat comes, there's there's multiple different types of fat. There's saturated fat is unsaturated fat and there's trans fat.

Those are the three types of fat that you know, that that show up predominantly in food and avocado contains primarily unsaturated fat, which is actually a very good thing because unsaturated fats are actually associated with a decrease in the risk of chronic diseases including insulin resistance.

How Fat Intake Drives Insulin Resistance

There are foods that contain significant quantities of saturated fat that are predominantly from the animal world, and those include red meat, white meat, poultry, fish, eggs, processed meats, dairy products. And then in addition to that, there's also all oils, even though oils are marketed as though they are, you know, quote unquote heart healthy. Even though they do contain a significant quantity of unsaturated fat, there are certain oils that are saturated fat rich.

So olive oil is actually saturated fat rich, coconut oil is pure is almost purely saturated fat, even though it's marketed as being a health food. The point is that unsaturated fat is actually associated with a decrease in chronic disease risk, saturated fat is actually very problematic for your vascular health and it can set the stage for insulin resistance.

The third type of fat is called trans fat and trans fat is the type of fat that you want to avoid at all costs. Trans fat is found very, very in very small quantities in in the natural world, extremely small quantities, but the majority of the trans fat that human beings eat today comes from foods that contain hydrogenated oils. So hydrogenation is just a fancy scientific term for a manufacturing process that humans have invented to take a liquid fat and turn it into a solid fat. So, humans designed a hydrogenation process simply because they wanted to take a liquid that is harder to sell that has less appeal to customers and turn it into a solid. And then by because it's a solid, it has a longer shelf life, it can be put into more products.

It doesn't oxidize as quickly and as a result of that, it stands a chance of actually making more profit. It is a purely economic decision. So food manufacturers invented a hydrogenation process which takes unsaturated fatty acids which are generally liquids and turns them into saturated fatty acids.

And the process of saturating these fatty acids is called hydrogenation. Here's the problem when you hydrogen eight fats in a laboratory setting, you end up significantly increasing the risk for atherosclerosis inside of humans, which is the hardening of blood vessels. It significantly increases your risk for high LDL cholesterol, which is the bad cholesterol and it significantly increases your risk for the development of insulin resistance and all the diabetes related consequences associated with that. So, trans fats, to answer your question, avoid at all costs, saturated fats are the fats that are actually most closely linked with the development of insulin resistance and unsaturated fats are the types of fat that are actually more beneficial, even though there's a certain threshold which you don't necessarily want to pass. Okay, so you give me an example, Go ahead. – Yeah. So because you look upon saturates saturated fats, I mean when you want to cook with something than you, you feel that the saturated fats they are more stable saturated fat.

That's our can become more carcinogenic if you would cook with them. So yeah, go into cooking later on actually, you know, saturated unsaturated later on.

And then yeah, sure, definitely. – We'll talk about cooking in a little bit and there's no question about it. It's a great topic actually. So when it comes to uh, the avocado that you mentioned here, you said, okay, I'm you know, fat rich food, which is predominantly unsaturated avocados contain what are called mono unsaturated fatty acids, which again, are associated with a slight decrease in in the risk for chronic diseases, especially insulin resistance. Now

I'm gonna add to that.

I'm gonna say, suppose you decided to eat some chicken. So you had like a, you know, a drumstick of chicken and then maybe you also had an avocado to come along with it and then maybe you had a little bit of a salad to go along with it.

Right, So that meal actually contains a significant amount of saturated fat from the chicken, unsaturated fat from the avocado and then more carbohydrate material that comes from the salad. So when you consume fatty acids, what happens is that the fatty acids are actually locked up as a molecule called triglyceride. So triglyceride is basically the storage form of fatty acids. They rarely exist by themselves.

They're locked up in a triglyceride and the triglyceride basically is just a glycerol backbone, symbolize that with my hand. Okay, so it's a glycerol backbone and then you have 123 fatty acids that are attached to a glycerol backbone.

So that's why it's called a tri triglycerides, three fatty acids attached to a glycerol. So the triglyceride comes into your mouth. It travels down your esophagus.

It gets inside of your stomach, inside of your stomach. There's basically an acid reactor and it starts to unfold a little bit. It starts to sort of like make the protein present in that meal more linea arised and then it starts to begin the process of digestion. Once that food is then passed into your small intestine, inside of your small intestine is where the bulk of all nutrient digestion occurs.

So inside of your small intestine, you have digestive enzymes that are secreted by the walls of your small intestine that are also secreted by your pancreas and put into your small intestine that are also secreted by your liver and put into your small intestine.

And so inside of this inside of your small intestine is where enzymes are are dropped in. And these enzymes have the ability to basically act on the food and take complex molecules and break them down into simpler and simpler building blocks. So the triglyceride molecule itself is basically the three fatty acids are separated from the glycerol backbone, The glycerol goes on to do other things. The three fatty acids then become effectively naked and these three fatty acids then can get absorbed through the walls of your small intestine and then they're put into these particles known as kylo microns that circulate Now the kylo, this is where the story actually gets really interesting because the Kylo microns are these little spaceships that hold fatty acids and they also hold cholesterol and their responsibility is to go deliver these fatty acids to tissues.

So their responsibilities to go give a little bit of fatty acids to your muscle, give a little bit over here to your vasculature and give a little bit over here to your liver, Give some over here to your kidney and beyond these kind of micro particles are basically like they're they're the amazon delivery trucks of fatty acids after a meal.

What ends up happening is that when you eat a fat rich meal, there's a significant quantity of fatty acids inside of that, those Kyle omicron particles, those kyla microns put some into your adipose tissue, which is your fat tissue, which is actually a very safe place to store them.

That's the place that the majority of them should go because your adipose tissue is perfectly designed to uptake those fatty acids and store them and keep them for a long period of time. But what is happening is that a lot of those fatty acids go to your adipose tissue. But then there's a spillover and the spillover is the excess fatty acids that you consumed in that meal.

And those excess fatty acids go to your liver and your muscle to tissues that are capable of taking up fatty acids but only in small quantities. And that's the trick.

Your liver and muscle have the capacity to be able to absorb fatty acids and store them as triglyceride once again, but only in small quantities. So when you're consuming fat rich meals, especially if you're doing it over and over and over again. But it's happening is that you end up partitioning and you end up sort of directing more fatty acids into your liver and muscle and the spillover into your liver and muscle ends up accumulating more lipid inside of both of

those two tissues. The real reason why that's problematic is because when lipid accumulates inside of liver tissue and when lipid accumulates inside of muscle tissue, both of those tissues become less insulin responsive, they blew, they decrease their insulin action.

And this is very, very, very important. This is what most people don't understand. The more lipid you put inside of your liver, the less it can respond to insulin, the more lipid you put inside of your muscle, the less it can respond to insulin and the reason for that is actually brilliant. Your your whoever designed the human body is a is a master.

The reason for that is because excess lipid that is stored inside of your liver and excess lipids stored inside of your muscle sends a signal to both of those tissues that there's a lot of stuff coming inside, there's a lot of energy that's in excess, that's not supposed to be there. And so cells go into a self protective mode and they go into a sort of a mode where they're like, hey listen, we want to protect these, the cell from accumulating more and more and more and more energy because we're already overloaded with energy, how do we accomplish that?

So what your liver and muscle actually do is they say, oh I know there's this thing called insulin and insulin when it comes around and knocks on the door is a very, very powerful signal that I um that that tells me that there's stuff in the blood that I should take up, that I should open my doors to and take up.

So if I decrease my responsiveness to insulin then I can block more stuff from coming inside this tissue. So it's literally a self defense mechanism. So what the what the cells inside of your liver and muscle do is they actually they pull the insulin receptors back inside and they make them a little bit more dysfunctional.

And as a result of that the next time insulin knocks on the door goes, hey, knock, knock, I have some glucose in the blood. I have some amino acids, I have some fatty acids in the blood.

Do you want to take it up? The cells? Can say no, no, no, no, no. I'm not listening to you right now. I'm not playing this insulin responsive game. I'm playing the insulin resistance game.

I'm going to resist your signal. I'm going to block your signal. And as a result of that, I can protect myself from accumulating more energy. So what ends up happening is that people who consume a fat rich diet end up developing insulin resistance inside of their muscle and liver without even knowing it.

And what happens is that the next time they go eat something that's carbohydrate rich, like a banana or maybe a potato. Okay, contains 20 g of carbohydrate, 30 g of carbohydrate from a plant based source from a whole food.

The glucose inside of those carbohydrate molecules tries to get inside of your liver and muscle tissue. Insulin goes knock knock. There's glucose in the blood. Would you like to take it up and both of those tissues say sorry, I'm not playing this game right now.

I got a bunch of lipid that I have to first deal with here, let me deal with this lipid as a result the glucose from that carbohydrate rich food gets trapped, the glucose is trapped inside of your blood and it has a difficult time exiting your blood. And as a result of that, when you go check your blood glucose using a blood glucose meter or continuous glucose monitor an hour after that meal, or two hours after that meal, you look at the meter and you go, huh? I had one banana and now my glucose is at a 200.

I had one potato and now my glucose is at 100 and 80. Huh? I guess bananas are bad for me. I guess potatoes are bad for me. I remember I saw that magazine in the grocery store that told me I should eat a low carb diet and they were right because when I do eat, quote unquote carbs now my blood glucose goes high, Right?

So carbs are bad for me. And so this fuels this low carbohydrate mentality. And it and it makes people believe that anything that's carbohydrate rich actually is bad for them because it causes their blood glucose to go high.

So what they do in response is they say, okay, potatoes are bad for me, bananas are bad for me. I should lower my fruit intake. I shouldn't eat anything that's starchy. I'm gonna go eat more eggs.

I'm gonna go eat more chicken fish, dairy products, low carbohydrate things. And as a result of that, they actually make themselves more insulin resistant over the course of time. So the problem gets worse because they're intentionally trying to play the carbohydrate avoidance game.

So the most important thing that I want people to understand here is that if you are consuming carbohydrate rich, anything and your blood glucose goes high in the 1 to 2 hours following that meal, that's not because the carbohydrate rich food was bad for you.

It's not because you are that you were designed to eat a low carbohydrate diet.

Saturated vs Unsaturated Fats

The reason is because your liver and muscle have developed what's called carbohydrate intolerance A. K. A. Insulin resistance over the course of time and there is a metabolic traffic jam which exists inside of both of those tissues.

And if you want to be able to increase your carbohydrate intake, which I strongly recommend, then you first have to fix that traffic jam. And the way that you can fix that traffic jam is by lowering your fat intake and lowering your total lipid accumulation, which over the course of time decreases the lipid content of your liver and decreases the lipid content of your muscle.

And the combination of that turns the insulin signaling pathway back on inside of your liver and muscle, which means that the traffic jam went from being very bad to significantly better. And now every time you eat anything that's carbohydrate rich, the glucose from the carbohydrates can get inside of your liver and muscles exactly where it's designed to go and your blood glucose comes down because glucose is no longer trapped inside of your blood.

Does that make any sense? – I love that. That was awesome. Yes. You painted an awesome picture. A few, a few questions. So tell me then the difference how saturated fats function differently than unsafe saturated fats.

You said that's that unsaturated because you would think that both of them are lipid, you know, both of them have high energy Yeah. Within themselves.

And when they both you know accumulate within the cell to then cause the insulin resistance when the body is trying to kind of move glucose into the cells when unsaturated fat have the same function. – Great question.

I spent a lot of time trying to understand the answer to that question and um I started to recognize something very important which is that unsaturated fat and saturated fat are two distinctly different molecules that even though they're both considered lipids have different biological functions, completely different biological functions. Okay, so if we look at the actual biochemistry of the saturated fat molecule, okay, here's a pen, this is a line.

This is linear. Okay, a saturated fat molecule looks exactly like this. It is a linear molecule and the reason it's referred to as a saturated fat molecule is because it is a carbon chain that is in a linear structure and there are hydrogen molecules that are littered all around the outside. Okay, so it has basically one oxygen at one end.

Okay. And then other than that it basically has nothing but hydrogen all around it. So this is a linear molecule because it the term saturated refers to the fact that every single parking spot if you will, that is available has been taken up by a hydrogen molecule.

And as a result of that it's now a linear molecule. Okay, linear molecules in the lipid world are used for energy saturated fat is when it becomes present inside of your diet and then it goes inside your small test and it gets inside of a kylo micron particle. It's in circulation.

It's then delivered to your adipose tissue or your muscle, your liver. The saturated fat molecule is then absorbed into that tissue and it is then put back into a triglyceride.

Okay, so the fatty acid itself doesn't just exist by itself. There's actually a component of the cell called the lipid droplet. And the lipid droplet is where all the lipids accumulate and they hang out with one another.

So the lipid droplet doesn't hold individual saturated fatty acids. It then takes the multiple saturated fatty acids, it takes three of them and it attaches it to another glycerol molecule and goes boop boop boop.

Here's a triglyceride, put it in the lipid droplet and it stores it for long periods of time. Okay, the lipid droplet is an energy reservoir. It is what is used when you begin exercising as an example if you go exercise and you start riding a bicycle. And then what ends up happening is that you have an increased need for energy production. So where can you get some energy from?

Well, you can go to the lipid droplet, you can pull out one of the triglyceride molecules. You can break apart the fatty acids, you can take those individual uh you can take those individual fatty acids and then you can put them into the mitochondrial network and inside of the mitochondrial network you're gonna take a fatty acid, a saturated fatty acid. And you're going to extract this thing called A T. P. And A T. P.

Is useful energy that the cell can use to perform work. And that's a good thing. Right? So long story short, linear saturated molecules and used for energy.

Those are the types of molecules that actually have a negative effect on the insulin receptor. So if you look in the research, you'll find some research from a particular researcher known as Dr. Jared Shulman over at Yale University.

Him and his research team were one of the first people to elucidate the actual mechanism by which saturated fatty acids can impair the insulin receptor.

And since that time there have been a number of research groups around the world that have confirmed exactly what they found and gone on to describe even more.

And the long story short is very complicated about chemistry. But the idea is that when the saturated fat molecule comes inside of the cell, the saturated fat mom. Well as it accumulates, ends up giving rise to many different other derivatives of that molecule.

So there's one derivative called the D A G A DSL glycerol. Then there's another one called ceramic. And as a result of that, the accumulation of these different types of lipid compounds end up going up to the insulin receptor on the inside and it basically puts handcuffs on the insulin receptor on the inside.

So the insulin receptor itself is literally like still waving out to the outside world saying, hey, I'm waiting for insulin. But as soon as insulin docks on side of it, it then tries to relay that signal to the inside of the cell.

But the handcuffs on in on the insulin receptor on the inside, prevent the signal from getting transmitted down into the cell. So as a result of that, the saturated fatty acid molecule has a negative feedback loop with the insulin receptor which decreases insulin action, – Which will then decrease.

Like you're saying, the ability to have glucose enter into the cell, which will then raise the glucose in the bloodstream just circulating around, not knowing where to go. – That's exactly right?

You nailed it. So what happens to just finish the last piece of the puzzle like you just described if the insulin receptor can recognize the insulin and relay the insulin signal inside of the cell where it's supposed to go, insulin is the single most powerful anabolic hormone inside of the human body.

There isn't a single other molecule which stimulates more what are called anabolic reactions, meaning synthetic reactions. To make things to make carbohydrate, to make fatty acids to make cholesterol, to make protein, to make RNA. To make D. N. A.

To manufacture to replicate cells. The list goes on. So insulin is an incredibly powerful signal. And one of the things that insulin does inside of the liver and muscle is that when it's recognized and when it can relay the signal internally it stimulates what are called what are called glute transport vesicles, G L. U. T glucose transport vesicles that are already inside of the cell. They're just kind of like buried, it tells those glucose glucose transporter vesicles to go to the surface.

And when they get to the surface that means that they can open up and they can allow glucose to come inside. So glucose gets inside of the transport vesicles and then it comes back down literally like a little elevator that goes to the surface, get some stuff and comes back down and then it can put that glucose and it can start to oxidize it or put it through some other metabolic process right?

So if insulin does not relay that signal properly, then those glute transport vesicles on the inside of the cell, they don't go to the surface, they just hang out and as a result of that glucose can't get inside of the cell because glucose is looking for that glucose transport vesicles, it can't find it and then glucose gets trapped in the blood causing high blood glucose. So to answer your question, that's what saturated fat does. Unsaturated fat doesn't do that same thing.

Unsaturated has a completely different biological function. Unsaturated fat predominantly gets put into the membrane of the cell itself. Now, if we look at the structure of unsaturated fat, what you find is that it is not a line, it is not even close to a line, it is actually a bent molecule.

So I don't have another pen on me right now but I'm gonna do it with my hands. Okay, so here is one part of the unsaturated fat molecule. Here is the other part of the saturated fat molecule.

Okay, it ends up having a kink in it and it ends up kind of looking like a V. Okay, and the reason for that is because the unsaturated nature of the molecule means that there is one carbon actually there are two carbons for which instead of having a single bond between them now, they have a carbon carbon double bond and the carbon carbon double bond basically means that you can eliminate some of the hydrogen surrounding it.

And as a result of that, a linear molecule, when you replace the single bond with a double bond now becomes a bent molecule. And just that one structural change changes everything about how that molecule functions.

That's that's why biology is just plain fascinating. You put a tiny little kink inside of a molecule and all of a sudden the molecule has a completely different personality. So the unsaturated fatty acids.

Now when they get recognized by a cell, the cell recognizes that it's unsaturated carbon carbon double bond, it doesn't look like a saturated fat. I'm not gonna put it in a limpid drop it, I'm gonna do something else with this thing and it takes that carbon carbon double bond molecule and it puts it into the membrane and inside of the membrane. It's actually positioned there because one of the things that the membrane of the cell requires is unsaturated fatty acids so that the membrane can stay nice and flexible and having a flexible membrane is actually really important because it enables salutes to get transferred into the cell and out of the cell like glucose.

It also allows other things like sodium and potassium to enter and leave. It also allows fatty acids to come in and amino acids and beyond. So the membrane fluidity is governed by the amount of unsaturated fatty acids that are put inside of that membrane. And that's actually a good thing cholesterol also sometimes get put inside of the membrane because cholesterol can help regulate that membrane fluidity as well. And again, that's really important.

Another fate of unsaturated fatty acids depending on their exact personality. They can either be considered an omega three unsaturated fatty acid or omega six unsaturated fatty acid? They also can function in inflammatory and anti inflammatory pathways.

So the biochemistry here is also gets pretty complex. But the idea here is that the omega six and omega three unsaturated fatty acid. What the term omega means is you start at the omega end of the fatty acid, which is the end the like the very end of the that you have like the alpha and and then you have the omega and the omega. And you count the number of carbons backwards and you say, okay, I'm gonna go for carbon number one carbon, number

two carbon, number three.

If there is a double bond at the third carbon from the omega and that means it's an omega three fatty acid. If there's a double bond at the sixth position from the omega and that means it's an omega six fatty acid.

Both of them are bent molecules. But the omega six fatty acid actually tends to become a more inflammatory fatty acid that is involved in inflammatory pathways that can then increase global inflammation and also local inflammation inside of tissues.

The omega three fatty acids are actually considered much more healthful fatty acids and those are considered anti inflammatory molecules. That can be used to limit global inflammation and limit uh local inflammation inside of tissues. So you'll see this huge emphasis on, where are you getting your omega threes from how much omega threes are you getting are you omega three deficient? And again, the reason for that is because omega three fatty acids are considered anti inflammatory.

They are absolutely required. They're required for brain health. They're required for eye health. They required for membrane fluidity. They're required for decreasing global information.

Omega-3s, Omega-6s, and Seed Oils

And as a result of that, people are trying to make sure that they are not omega three deficient. There's some research that actually doctor Joel Fuhrman has given me insight into which is that people who have a reduced omega three content over the course of time actually are at an increased risk for cognitive decline, which is which is a serious problem that you want to try and avoid.

So people who have a lower omega three status, not only could they become more inflamed now, but in the future 5, 10 15 2030 years into the future, you can actually experience worsened brain health and as a result of that, you want to do everything you can in your power to make sure you're consuming enough omega three's number one and also limiting your omega six intake. And if you can do both of those simultaneously lower omega six intake and just get a little bit more omega threes on a daily basis, then you will have what's considered an optimal omega six to omega three ratio.

And just to make sure the last thing I'll stay here without getting too complicated is that in an ideal setting? An optimal omega six to omega three ratio is somewhere around 3 to 14 to 15 to 1. Somewhere in that setting, researchers have demonstrated that if you if you can control your omega six to omega three ratio to be somewhere you know, 2 to 3 to 2 to 13 to 14 to 15 to one.

Somewhere in that low range, then you actually set yourself up for success in the long term. What ends up happening is that when people consume the standard American diet, they're consuming oils, they're consuming seed oils, they're consuming hydrogenated foods, they're consuming a significant increase in the omega six content.

And as a result of that there, omega six to omega three ratio is not 2 to 1 or 3 to 1 to 4 to 1, it's 15 to 1, 20 to 1. Sometimes I've seen as high as 30 to 1.

So the higher that ratio goes, the more problematic it becomes in the long term and most people think, okay, cool, well if my omega six to omega three ratio is so high, I'm just gonna eat more omega threes and the answer is yes that might help, but it's not really gonna solve the problem. The problem is that you're actually consuming too many omega sixes. So let's limit your omega six intake slightly increase the omega three intake and then you can restore that balance to having like a 2 to 13 to 14 to 1 ratio. And by doing that, that's gonna help lower global information and prolong brain health and I health and beyond.

– So you you used the word seed oil and relationship to omega six, you know, So then I'm thinking like flax seed oil, sesame seed oil, all sunflower seeds are all these omega six rich.

– Yeah. You know what? There's actually a list of them. I'm gonna pull up the list in front of me right now because this is actually really important information. Let me just dig it up for you here.

There's a very specific list of exactly which foods are omega six rich that I don't have in front of me. So let me give me a couple of minutes here and I'll pull it up for you and then we can like go over each one of those foods because even if you understand the biochemistry, you just don't understand.

Well, okay, fine, what am I supposed to eat, Cyrus? Like what am I supposed to eat? Dr. Karlfeldt like, you know, tell me what I should and shouldn't eat and then that will actually help people in the grocery store when they're trying to choose what foods to buy.

– Yeah. So and and another question while you're pulling out the list um hopefully you're not like me that that can chew and and talk at the same or can chew and and walk it. So omega three then you I think fish oil, you know, and, and from what I'm gleaning from what you're saying, fish oil is not something that you are that excited about.

– Yeah, that's exactly right. Fish oil is not something that I'm excited about and I'll say that for a couple of reasons. 1st and 1st and foremost, there's been sort of like this craze over the past 20 years or so.

I remember when it started back in the early two thousand's to like fish oil is going to save your health, get fish oil capsules, make sure you're consuming some kind of fish oil.

And then it kind of got even more into using like chris krill oil and then it was into what is it cod oil? Black, black liver cod oil. And then, it's gotten to a point now where people believe that the only effective form of omega three comes from marine sources.

Okay, that's what the marketing will tell you. The only way to get a sufficient omega three intake on a daily basis is to get it from a marine source.

But what the research shows is actually something slightly different, which is that number one omega three supplementation is definitely important and it is definitely uh, recommended for the majority of the population right.

However, rather than just listening to this or listening to a podcast that you heard about omega three's, I would hesitate to just go to the grocery store and get an omega three supplement. Start taking it right off the bat because number one the source definitely matters. But number two you may not be omega three deficient. So what I recommend doing for all individuals is before you make any changes to your actual Omega three intake number one first, go get it measured and go get it measured by a reliable laboratory that can give you very high quality information. The laboratory that we recommend using is one called omega quant.

Omega quant is we have no affiliation with them in any way, shape or form. We use their tests for not only ourselves but also for our population and they give you a lot of very helpful information.

The most important thing that you can learn is number three. What is your omega three status? It's gonna come back as a percentage. Okay, the ideal percentage that you're looking for is greater than 4% you want somewhere between 4% and 8% is considered ideal. And that's basically measuring effectively the the the amount of omega three present inside of red blood cells.

That's how they actually get the information. And again, the percentage is somewhere between 4% and 8%. If you are lower than 4% what that means is that number one supplementation could help.

But the other thing that you want to pay attention to is again that omega six to omega three ratio because if you got a low omega three status, like let's say you you did the test and you came back in, the omega three status was 3.6%. You might be like wow, I should go eat some omega three, but if you also want to take a look at that omega six to omega three status and the omega six to omega three status shows you that your omega six to omega three ratio is a 16 to 1. Then that right there tells you that you want to do two things simultaneously. Number one, slightly, slightly increase your intake of omega three's.

Do not go crazy, do not start you know, having official supplements all day long every day. A small amount of omega three is gonna help but drastically reduce your omega six intake.

That is the key to success. And that's what I really want to like drill home here is that omega three is helpful reducing omega six is more helpful period.

End of story. So to go back to the question that you asked earlier, which is, what are the foods that are high in omega six. And what are the ones that that we generally recommend?

People avoid number one? Number one? Safflower oil, number two hemp seeds, number three, sunflower seeds, number four avocado oil, number five eggs. So these are these are omega six rich, correct? correct and that doesn't mean that you have to eliminate all these foods 100%.

I'm not saying that, I'm just saying that you want to limit your intake of them because they tend to be more omega six rich. There's actually a better list that I don't have access to at this very moment. It's somewhere deep inside of my computer which shows you exactly the types of oils in particular seed oils in particular that that are omega six rich. So let me try and dig that up one more time and get that to you. But those are the types of foods that I would try and limit your intake of. Now. The question you asked is what about omega three's? Can I get them from fish oil?

And there's actually resources shows that fish oil may not be the best source of omega threes. So you could get them from fish oil. I'm not gonna say don't do that 100% but I'm gonna tell you a better place to get them and a better place to get them is number one this stuff called flax seeds.

Number two. This stuff called chia seeds and number three. Another thing called blue green algae. Okay so flax seeds and chia seeds, the most important thing that you can do is go to the grocery store and you can buy a bag of chia seeds for like $10. It's really not that expensive.

You can buy a bag of tea of flax seeds for $10 and that can last you a very long time because you need a very small amount of them on a daily basis you take one tablespoon of chia seeds or one tablespoon of flax seeds. And what I recommend doing is you buy the whole seed, you put it into a spice grinder, you hit the grind button and you wait for like 5 to 10 seconds. And so it grinds it up from the whole seed into a powder. Then you take that powder and you can like Sprinkle it on whatever food you're eating or you can put it into a drink if you want to and put it in your body. So what I recommend doing is grinding it up fresh rather than buying the ground powder. The reason for that is because again these are these are unsaturated fat rich foods. And the beauty is that unsaturated fats can get oxidized quickly. What that means is that if you if I were to take ground chia seeds and I were to leave them on my countertop and I were to walk away, I could come back six hours later. And the majority of those unsaturated fatty acids inside of those Gs seeds could be oxidized already and relatively ineffective because those oxidized unsaturated fatty acids can get oxidized by the presence of oxygen.

They can also get on oxidized by light. So what you want to do is grind them up quickly and try and get them into your mouth without very much time passing. And when you do it that way you can maximize the amount of unsaturated fatty acids that are not oxidized, that will actually have a biological effect inside of your body.

I see you nodding your head. Is that something that you also practice yourself? – I mean the key you have these people and buying, buying it ground up and it's not very usable. I mean because you know, like you're mentioning, you want it fresh, you want it right there and then, I mean these oils are very reactive. Yeah, so you want to make sure that you have that both that action inside the body rather than outside.

And then. Yeah, absolutely. – Yeah, absolutely. That's the right way to do it. So you can buy a spice grinder online for like $20. It's really not that expensive.

But the beauty here is that it enables you to buy the seed in its whole format and and in the whole format there's gonna be limited oxygenation. You grind it up immediately, you consume it, you put it into a drink or you put it into your food and you consume it and you just do that on a daily basis.

Like I said, one tablespoon of chia seeds or one tablespoon of ground flax seeds. Either way, if you can do that on a daily basis, you are likely to meet your omega three, uh your your omega three requirement for the day.

We do have some people that choose one tablespoon of ground chia seeds and one tablespoon of ground flax seeds who happen to be significantly omega three defections.

So they're kind of increasing it a little bit more. So I have basically two tablespoons in total they consume that and that's totally fine if you want to do that as well. Okay and the next thing that I.

– Go ahead. – Go ahead. – Yeah. So one of the things that I've, what I've learned which may be faulty learning because I mean you've dug into this whole lot deeper than I have is that there are a number of nutrients needed in order to be able to convert flax seed oil into a usable form.

And omega the omega three from fish oil already is like a complete package in a way where you don't need those nutrients. So if an individual is nutritionally deficient then they may not have the ability to convert the flax seed to a usable form. – Yeah. Okay so what you're referring to is basically the conversion of what's called A. L. A. Which is alpha linolenic acid which is what you what you're eating into two other fatty acids that are called E.

P. A. And D. H. A. I. Costa. Pentatonic acid and the acid. So don't remember those words. But the question is if you consume food from you know the flax seeds chia seeds like I suggested can you convert the A. L. A. That you're actually putting into your mouth.

Will that get inside of cells? Will it get converted into E. P. A. And D. H. A. Because E. P. And D. H. A. R. The active fatty acids that then um go through their omega three um biochemical pathway to actually elicit the the anti inflammatory pathway.

And so this is an actual ongoing area of research that I will admit I haven't read recently but I do know that there's a significant debate in the nutritional world right now as to whether or not that is a true statement because there has been a lot of suggestion that yes, the conversion of L. A. Into E.

P. A. D. H. A. Is compromised And a lot of individuals who have a high inflammatory status inside of their their tissues. And I do believe that that is a true statement from what I've read.

But again, we want to do two things simultaneously and this is extremely important for people understand the more inflammation exists inside of your liver, kidneys, muscle, vasculature, brain heart, the more inflammation that exists inside of each one of those tissues, the harder it is going to be to utilize the Omega threes that you're consuming in your diet. So if you just consume more Omega three's, does that mean that's going to solve the problem is going to boost your Omega three status? Well the answer is no it's not going to because again you have to do two things simultaneously. Number one, you have to lower your omega six to omega three status, which is going to limit inflammation right there and then slightly increase your omega three status or your omega three intake.

The combination of the two of those is actually what's going to help, what the research demonstrates is that when you lower your omega six to omega three content from the food that you're consuming, you increase the conversion rate of L.

A. In the E. P. A. N. D. H. A. Right? So the conversion rate can be influenced by the total amount of omega six is that you're consuming as well. Right? So it's a very complex collection of interactions as you can as you can imagine. But going back to what you're saying is fish oil a better alternative than uh flax seeds or chia seeds or even blue green algae. And to the best of my knowledge, I could be wrong on the subject and I'm totally open to debate on this.

To the best of my knowledge. The answer is no it's not necessarily better.

Testing and Optimizing Fatty Acid Status

And again, I'm gonna do a little bit more reading on the actual conversion efficiency but from everything that I've read up to this point, there's nothing that that has indicated that a fish oil supplement is number one required or that it is actually better from a biological standpoint. A lot of what people have heard over the last 20 years is is um marketing from the supplement industry, which is very unregulated and it's it's challenging because it in this the supplement industry makes you believe that you are going to develop problems if you don't take their thing and it could be anything, it could be omega threes, it could be Killeen, it could be carnage seen, it could be creating, it could be anything.

It's very easy to fall into the trap thinking like, oh I read this article online and I saw this bottle in the grocery store that said I have to have more carnation and if I don't then I'm gonna end up with muscle wasting and that's gonna decrease my longevity.

I need to have carnation right? And all of a sudden you go into this like harnessing frenzy to try and get more of this stuff in your body when in reality it's just like it's a lot of it is like misleading and untruthful marketing.

So I do believe that the fish oil uh conversation has some validity to it, but there's also a lot of hype and all I'm trying to educate people to do is that number one, it's a complicated topic. Number two from everything that I've read, I don't believe that there's any advantage to having marine based omega three from fish inside of your diet if you were to just consume them from chia seeds or flax seeds, I haven't seen a single shred of evidence from the scientific literature that demonstrates that that is inadequate and that it's not going to boost your omega three status.

So I personally would recommend people go for the plant based sources also because marine sources tend to be contaminated in today's world, there's a lot of other contaminants, these things called pops persistent organic pollutants um that are really problematic and those can can um those include things like PCBs which are carcinogenic phthalates which are carcinogenic. And then mercury.

And even if you're getting them from deep ocean sources, that doesn't exclude those animals or those fish from actually having any of those components in them.

So if you're looking for the cleanest and highly effective source of omega three fatty acids, I personally would go straight to Gs CS and flax seeds that are grown in organic situations because they are mercury free. They should be in mercury free.

They have no fallacies in them. They should have no PCBs and then they should have no carcinogenic compounds at all. And it's a safety bet that you're getting a significant amount of omega three, lowering your omega six to omega three status at the same time and not getting any of these persistent organic pollutants inside of your body, which is going to be smart and intelligent in the long term.

– Well I mean I have to say that the proof is in the gsc pudding, I mean or proof is in the pudding yeah, meaning that, you know, the amount of people that you've helped with, the directions that you've given and and I know that we we haven't even started to scratch the surface, We haven't gone into complex carbs and we haven't gone into all these subjects that that that we could, but I I want the viewers to really know that there's if you go to mastering diabetes dot com and all your master classes and all your I mean this is the kind of information that that people will get on a regular basis from you.

So I highly for people that are interested in this conversation, which I mean just me personally, I'm extremely fascinated. So I think everyone else should be as well, you know, this this is the kind that they will get from from you at, at your site. – So I appreciate that very much.

Could I could I do one thing actually, I was just thinking about it on my computer, I literally have my omega three status that I want to show people what what type of information that omega quant test will give them.

Okay, so this test was taken back in right here, 2018, so it's a couple of years old, four years old at this point. And like I said, the first thing that it tells you is your your Omega three status.

So the number is greater than 4%. That's what you're looking for. And right here I was considered 7.11%. Which is which is actually a very good score for a 100% plant based eater that takes zero supplements.

I don't take an omega three supplement at all. Do I consume Gs and flax seeds? Yes, I do for sure. But this right here basically tells you that I'm in the safe zone. Another thing that's very important right here, Omega six to omega three ratio. Mine was 3.3 to 1.

So that's considered an ideal status. You want to be right here in the green zone, anything greater than five is considered problematic. And what I was saying earlier is that there's a lot of people who are walking around with tens, twelves fifteens twenties, 20 five's and thirty's, which is a highly inflammatory state and you want to decrease that value as much as possible.

Another thing that you can get measured is this thing called A to E. P. A, which is a rock, a tannic acid to I cosa Penton OIC acid. And that's just another, you know, comparison of different types of inflammatory versus non inflammatory fatty acids.

And right here again, this is an 8 to 3 ratio which is again in the desirable range less than 14. And this test goes on to show you a whole collection of other uh indices in in terms of your trans fat intake and your trans fat status inside of cells and then it kind of goes through and quantifies a whole collection of both unsaturated, unsaturated fatty acids inside of your body. Very comprehensive report.

So again if anybody's interested this is what I recommend getting measured and start here. Absolutely start here and then if there is a problem start the supplementation regimen and start to pay attention again to this omega three to omega six ratio.

Because this is the most important of everything that you see on this entire exam. – Awesome. Well Cyrus thank you as always your wealth of information and I can tell that you are educated at both Stanford and Berkeley at very smart schools.

– Thank you. I was forced to pay attention. I had no choice. Yeah. – Yeah it looks like you had to rub your head a lot you know I know and I'm just like oh this thing is hurting now.

Well thanks so much. I really appreciate this. – Thank you. Thank you. We'll talk soon.