

VIDEO_ Diet Doctor Podcast with Robert Lustig (Episode 14)

Dr. Bret Scher: Welcome to the DietDoctor podcast with Dr. Bret Scher. Today is my pleasure to be joined by Dr. Robert Lustig. Dr. Lustig is a pediatric endocrinologist recently retired from clinical practice at UCSF but still very active in research and now even having gone to get a Masters of law from the Hastings College so that he can get more involved into the public policy side of things.

Because his whole life he's been fighting childhood obesity and he's been studying the CNS regulation of energy balance. But he knows it's more than science that is affecting this because this is blown up in front of his eyes. He has seen this epidemic of obesity and diabetes take place as he's been practicing. And he's realized that it's going to take more than science; it's going to take public policy to halt this and reverse it.

And that's what makes it such an interesting discussion, he has such a great depth of knowledge of the history of public policies, of analogous scenarios of public policy and how we can use that information to try and help us stem this this epidemic that we're in the middle of and what can we define as the possible causes: fructose, glucose, sucrose, sugar, all these terms get thrown around as if they were one thing.

We'll we talk a little bit about that to identify the specifics of it and also just the processed food and how that plays into it as well, the so-called healthy natural fruit juices. So I really enjoyed this discussion with Robert because he has such a great grasp on both the science and the public policy and how to help us draw a roadmap on how to get out of this and reverse it.

So I really hope you'll enjoy this discussion and in the end he'll list the different ways to get in touch with him. He's involved in for-profits and nonprofits, he's written a number of books, so definitely stay tuned to the end so you can learn all the things he's involved in and if you want to hear more because there's a lot more that he has to say and has produced that is very worthwhile to read and listen to. So enjoy this interview with Dr. Robert Lustig.

Dr. Lustig thank you so much for joining me on the DietDoctor podcast today.

Dr. Robert Lustig: My pleasure, but it's Rob to you.

Bret: Rob, you got it, thank you. Now in your career you have seen this epidemic rise in front of your face as a pediatric endocrinologist. I mean it's one thing, I've said this before, it's one thing for me to see diabetes in adults and the consequences that happen in their 50s, 60s and 70s. But to see it in a pediatric population with type 2 diabetes and now nonalcoholic fatty liver disease, I mean this must be heartbreaking to see in kids and you've seen it just exploding.

Robert: Yeah, I mean I went into pediatrics to stay away from chronic disease and now that's all I do. I went into pediatric endocrinology to take care of short kids and they got fat on me. They grew horizontally rather than vertically. And that happened on my watch. And, you know, they're coming in and for every patient I take care of, 10 more show up on the doorstep. Something is wrong.

And of course everybody knows that something's wrong, but everyone seems to have a different answer for what's wrong and we can't tie it together.

Bret: And that's what has really halted any progress. All these different voices, different theories, without a unifying approach has just really made it so we can't make any progress.

Robert: Plus unfortunately some of the stakeholders in this discussion have money associated with it. So there are dark forces actually trying to maintain the status quo.

Bret: Tell me some more about that.

Robert: We can go on for hours but the fact of the matter is that the food industry has a vested interest and have pulled out all the stops in the same way that tobacco did. Marion Nestle just released this week a book called *Unsavory Truth*.

My colleagues, Aseem Malhotra and Grant Schofield and I published an article earlier this year that the science against sugar alone is not enough to win the battle against obesity and type 2 diabetes. Opposition from vested interests must be taken first. So we know who's on the other side. And the problem is that the other side has a very large mouthpiece and a whole bunch of money.

Bret: Right, a lot more money than scientists and universities and physicians, certainly as individuals and even trying to group together can't come close.

Robert: So we're doing our best. The good news is we've got the science and the science is very potent, but, you know, not everyone's a scientist. Sometimes not even scientists are scientists.

Bret: Your own record is basically saying that fructose is probably the number one concern.

Robert: I'm not going to say that, I won't say it's the number one concern. Trans fats used to be the number one concern. But we figured that out, it took 25 years to figure it out and finally get rid of it.

Bret: Which shows how slow the needle moves on these.

Robert: Well because there were dark forces there as well. Now I think that sugar is not the cause of obesity, diabetes, fatty liver disease etc. but it's the most malleable, is the one that is the low hanging fruit, it is the one that's added to other foods specifically for the food industry's purposes, therefore it is the easiest one to attack and target upfront.

Bret: Now do you think it's most important to target sugar or to differentiate it between fructose, glucose, sucrose and sort of break it down?

Robert: To be honest with you, they're the same thing. Once you understand what these different chemicals do in the body that is glucose and fructose, they are not the same, the food industry will tell you 11 ways from Sunday, a sugar is a sugar. It is absolutely completely fallacious and it's disingenuous to boot.

They are not handled the same, glucose and fructose. As it turns out sucrose, high fructose corn syrup, agave, maple syrup, honey, are all basically equivalent, they're all half glucose, half fructose. Now glucose is the energy of life, every cell on the planet burns glucose for energy. Glucose is so important that if you don't consume it, your body makes it.

And we know that because the Inuit who ate whale blubber, who didn't ever see a piece of bread or grow a strand of wheat still had a serum glucose level. Vilhjalmur Stefansson and his assistant, the famous Arctic explorer, checked himself into Bellevue in 1928 and they ate nothing but meat for one year on their clinical research Center. They still had a serum glucose level and they were a hell of a lot healthier than everybody else.

Bret: Yeah.

Robert: So the notion that you need sugar to live or that you even need glucose to live is disingenuous. You need a blood glucose to live, that is true, you don't need dietary glucose to live. Because it's so important that your liver will make it. It will make it out of amino acids or fatty acids as needed. So glucose is essential... it is just not essential to eat.

Fructose on the other hand... there is no biochemical reaction in any eukaryotic organism that requires it. It's completely vestigial and when consumed in excess,

because of its unique metabolism does three things that glucose does not do. One, it drives liver fat accumulation faster than virtually any other item on the planet. Number two, it engages in the Maillard or the agent reaction.

Now glucose does it too, but fructose does it seven times faster and it turns out there is a metabolite of fructose that does it 250 times faster and we're working on that. And number three, fructose rather than glucose stimulates the reward center of the brain and therefore we have the data that shows that the fructose molecule of sugar is what it makes it addictive.

Bret: So is it addictive? Does it meet classification of addiction and therefore should it be regulated as an addictive component?

Robert: So, first of all, addictive substances are not regulated all by themselves, otherwise Starbucks would be out of business. And if you take my Starbucks away from me I will kill you, okay? That's my addiction. I'm not proud of it, but at least it's socially acceptable this week.

Bret: How many have you had this morning?

Robert: Three and I need my fourth. So the fact that is addictive is not the reason for regulation. However when something is both toxic and addictive and ubiquitous and has detrimental effects on society then it meets the public health criteria for regulation. In fact sugar does meet those criteria. So how is sugar addictive? In 2012 sugar was not addictive. In 2013 sugar was addictive.

Bret: What's the difference?

Robert: So what changed? Sugar changed? No, the definition changed. The American Psychiatric Association, they are the umpire, they call the balls and strikes on things like addiction. And they had to add gambling as an addiction. It became very clear that behavioral addictions went through the same CNS process, caused the same problems and had to be dealt with in the same ways as chemical addictions.

Now up till 2013 the DSM-4 said you needed two things for addiction. You needed tolerance and withdrawal. Tolerance is the effect of these substances on down regulation of dopamine receptors.

Bret: That's why you need more and more over time--

Robert: More and more to get less and less, that's this phenomenon called tolerance. Now the second criterion that the APA said you had to have for addiction was withdrawal. Now turns out withdrawal, which is true for all the chemical addictive substances, those are all effects that occur systemically on the body, not on the

brain. Caffeine withdrawal has effects on the heart, on the vasculature, on sweat glands, etc. Opioids have effects on the G.I. tract, have effects on the heart etc.

They all have these effects that you can feel and they cause withdrawal. Now gambling is not a chemical, gambling does not affect the body, but it sure does affect the brain. And in order to be able to provide clinical services under an addiction paradigm, the American Psychiatric Association had to change the definition.

So when they broke out the DSM-5 in 2013, and they do this every 20 years, now the definition could be tolerance and withdrawal or tolerance and dependence. There is nine criteria for dependence, we don't have time for each one... You can look them up, they're online.

And gambling meets all of them, gaming disorder meets all of them, social media meets all of them, shopping meets all of them, pornography meets all of them and guess what? Sugar meets all of them too. So we have substance addictions and we also have behavioral addictions. And sugar happens to be a substance that induces both tolerance and dependence. Anyone who says, "Oh, I have a horrible sweet tooth"... They're sugar addict.

Bret: But is knowing that enough to change public policy or to change people? Certainly not enough to change people's activities on their own and change their decisions. So what else has to be in place for us to be able to say, "This is a public health crisis that we need intervene upon?"

Robert: We have two templates to look at. Tobacco and alcohol. So for years smoking was a liberty interest. You had a liberty interest to smoke. *Boreali v. Axelrod*, a famous New York State Supreme Court case said you have a liberty interest to smoke and you know what?

The New York state legislature understanding what the problem was and understanding that the tobacco industry was disingenuous started passing laws that said you can't smoke in bars, you can't smoke in atria, you can't smoke in restaurants, you can't smoke in schools, you can't smoke in hospitals and now you can't even smoke in your car if there's a kid in it.

And the thing is when it first started coming out people were yelling, "Nanny state, nanny state". They're not doing that anymore.

Bret: Part of that though is because of, "I'm smoking here, I'm going to affect you".

Robert: Exactly.

Bret: I'm drinking my Coca-Cola here, that's not going to affect you.

Robert: Oh, yes it is.

Bret: How?

Robert: Monetarily. Because if I have to go to the emergency room I won't be able to get in because there will be gurneys filled with people with sugar beverage associated heart disease waiting for their coronary bypasses or their TPA. And there won't be any money in the system for me to be able to access that health care in the first place.

Medicare will be broke by the year 2026, Social Security will be broke by 2034 because of this. So while it is not an assault on your person like tobacco is or like alcohol is in terms of car accidents, it is an assault on your person in terms of your economy. Now you could argue that's not the same but the fact of the matter is we still have to deal with it the same.

Bret: Right, our society is not good at seeing that next step. We're very good at seeing the immediate--

Robert: And the reason is because we're all addicted. Addiction is about now and happiness is about the future. It's about basically making life better for later. We are into reward, we are not into happiness, we are into instant gratification, we are not into delayed gratification.

Now, we doctors, know everything about delayed gratification, because we went through med school, residency, fellowship, etc. and we delayed, you know, being able to see any money or, you know, even patient care on our own for 10, 15 sometimes even 20 years. We know everything there is to know about delayed gratification. The fact of the matter is the American public does not.

Bret: And a lot of that has to do with industry and what has been put in front of us in terms of choices we can make. And we are in an on-demand society, we are in an instant gratification society and that's not something that's going to be easy to fix.

Robert: We are a dopamine society... that is what it is. It is dopamine, call it what it is. So this is why I wrote this book, *The Hacking of the American Mind*; is to differentiate these two phenomena, one called pleasure, one called happiness. Washington DC, Las Vegas, Madison Avenue, Wall Street, Silicon Valley have confused and conflated these two terms on purpose. Because then they can "sell" you happiness.

They can sell you pleasure, no argument there, they can sell your reward, they can sell you immediate gratification, I have no problem saying that. The question is, "Are they selling you happiness"? And the fact of the matter is they're actually taking away

your happiness. So what is the difference between these two terms, pleasure and happiness?

Number one, pleasure is short-lived, happiness is long. Two, pleasure is visceral, you feel it in your body, like all of those substances having those systemic effects. Happiness is ethereal, you feel it above the neck. Pleasure is taking, happiness is giving. Pleasure is experienced alone, happiness is usually experienced in social groups.

Pleasure can be achieved with substances, happiness cannot be achieved with substances. The extremes of pleasure whether they'd be substances or behaviors... So substances like cocaine, alcohol, nicotine, opioids, heroin, sugar or behaviors - shopping, gambling, Internet, social media, porn. In the extreme all lead to addiction. There's an "-aholic" next to every one of those. Shopaholic, sexaholic, alcoholic, chocoholic you know, down the list.

Bret: There's no "happyaholic".

Robert: There's no "happyaholic". You can't be overdosed on too much happiness, don't exist. And then finally number seven, pleasure's dopamine happiness is serotonin. Now why do we care? What does it matter? Here's why. Dopamine is an excitatory neurotransmitter. Every time dopamine is released, it crosses the synapse, binds to its receptors on the next neuron, the neuron fires, it excites the next neuron.

Now neurons like to be excited, that's why they have receptors. But they like to be tickled, not bludgeoned. Chronic overstimulation of any neuron anywhere in the body will lead to neuronal cell death. And we know this because kids who have chronic long-term seizure disorders and status epilepticus have to be rushed to the ICU and we have to stop their seizures. Because the longer the seizures go on, the more brain damage occurs. So we notice.

That second neuron that's receiving the dopamine signal, it doesn't want to die, it wants to protect itself. So it has a failsafe, it has a plan B. What it does is it down regulates the number of receptors so that there is less chance, statistically, through the law of mass action that any given molecule of dopamine will find a receptor.

Bret: It makes sense.

Robert: Thereby reducing the game. So what does this mean in human terms? You get a hit, you get a rush, receptors go down. Next time you need a bigger hit to get the same rush, receptors go down, then a bigger hit, bigger hit. Until finally you need a huge hit to get nothing.

That's called tolerance. And then when the neurons actually do start to die, that's called addiction. And guess what? When those neurons die, they ain't coming back. Which is why addiction is so hard to treat.

Bret: And now when we talk about sugar, you mentioned that fructose specifically has this addictive property more so than glucose itself.

Robert: So fructose when you do the fMRI studies and one of those studies was done by your previous guest, David Ludwig, and Cara Ebbeling, specifically stimulates the reward center, the nucleus accumbens, that part of the limbic system, and it turns out that glucose does not. Now glucose is a little sweet.

Glucose has a sweetness index of 74 compared to sucrose of 100 or fructose of 173. Glucose activates the cortex, the basal ganglia, certain other parts, but not the limbic system. Fructose stimulates the limbic system so they act at two completely different places in the brain.

And anything, anything that acts at the nucleus accumbens leads to dopamine release and anything that does has, in its extreme, addiction. Pick your substance, pick your behavior. Fructose does it too. And we have the empiric data to show that this occurs in humans.

Bret: Now, is there a threshold level though because fruit has fructose in it? You know if you eat an apple you're not stimulating the reward system. So, that comes into absorption, it comes into fiber, but also even if you're getting straight fructose, is there still some threshold level below which you're okay?

Robert: Almost assuredly yes, and probably depends on who you are, probably depends on your hepatic metabolism, probably depends on various phenomena that are going on, probably depends on how insulin resistant you are as well. For instance, let me give you an example; Latinos have a very specific two sets of polymorphisms, not 1, 2 in their liver fat transcription machinery, in their liver.

First one is called PNPLA3 Patatin-like Phospholipase Protein domain A3, and the other one is called SLC16A11, both of these are involved in how the liver turns sugar into fat. And, if you have the bad genotype for each of these and Latinos for whatever reason seemed to have the more frequency of those problem alleles in the Latino population. If you have those, a little sugar makes a lot of liver fat, and if that's the case then the more sugar you eat, the sicker you get, the quicker you get if you understand.

Bret: Sure.

Robert: Another thing that we know there is an allele in the brain, called type 1A allele. And if you have this allelic variation you make 30% fewer dopamine receptors to start.

Bret: Oh interesting.

Robert: In which case that means you need more substrate more dopamine in order to occupy fewer receptors at baseline. Which means you got to eat a whole a lot more sugar to get any sort of pleasure out of it. And those people have been shown to increase their rate of weight gain and increase their insulin resistance faster than even the general population.

So without doubt there are probably predisposing factors that some of them being genetic, some being epigenetic, some being very specifically environmental. Also depends on how much sugar and how much bad food is around you. You know you have food desserts in lower SCS neighborhoods, and clearly they are the most susceptible and they're also the ones driving health care through the roof.

So, you know we've got a problem. You've got to deal with the environment. So this isn't just genetic, although genetics play a role, and we can't fix genetics anyway. So you know let's fix what we can. Let's fix the environment.

Bret: Yes, there's clearly the volume that people are ingesting, it wouldn't matter what your genetics are, still causing significant disease.

Robert: The data from the American Heart Association, and I signed on to this statement, said that the adult women should be consuming no more than 60 spoons of added sugar per day, that's 25 grams, and adult men 9 teaspoons, that's 37 and a half grams. The median for the United States today is 94 grams. So even if we cut our consumption by two thirds we would still be over our limit.

Bret: Wow, and for reference how much is in one can of coke?

Robert: 39.

Bret: 39, so that's....

Robert: You're over.

Bret: You're over.

Robert: One can of coke you're over. You're done.

Bret: Yes, and also the size of the cans of coke have changed dramatically. So that goes into the volume and the threshold effect as well?

Robert: Well so now we have the 20 ounce bottle. Actually because of this problem in an attempt to try to, you know, have a marketing ploy Coke as you know has come out with its 8 ounce can. You know have a little coke. You know, they actually use Antman to pedal little coke. You know, look... anything that reduces consumption is good.

The question is how do you do that on mass? How do you do that for everyone? Ultimately the only way is to decrease availability. This is the iron law of public health. You decrease availability which decreases consumption, which decreases health harms. The Iron Law of public health, true for tobacco, true for alcohol, decrease availability.

Now you don't want to ban it. You know, banning doesn't work. We tried that with alcohol and you saw what happened. That was called the 18th amendment and the 21st amendment. We're not doing that again. What you have to do is you have to make it hurt. You make it available you make it hurt. You make it harder to get effectively.

So that's this notion of soda taxes. I'll be very honest with you. I am for reduction and consumption however it can be done. I think there's a way better, easier, much more effective way of dealing with this issue of effective availability. Get rid of the subsidies.

Bret: So going back to Nixon era and with his secretary Butz and how they sort of started this whole process to try and increase productivity and decrease cost, which maybe at that time made sense, but now in a whole different environment we're stuck with the same subsidies with a completely different connotation of what it means for our society.

Robert: It didn't even make sense for Nixon.

Bret: It didn't.

Robert: It made sense for Roosevelt. So for Franklin, it made sense because we had 2 things going on at the same time. We had the Depression and the Dust Bowl in 1933. So we had a destitute population in the American southwest. They were dying of famine. And the problem was all the food and all the food companies were in the Northeast.

So if you just dump the food in a railroad car and sent it to the southwest, by the time it got there, it would be rancid. So they had to process it. They had to basically take the wheat, and process it, get rid of the fiber, put in a 5 pound bags and then

bake it up locally. And subsidize it to make it worth the while of the American food industry to do so.

And in 1933 that made sense, and even made sense through World War 2 but after that it stopped making sense, but people realized, "Hey I can make money with this". So we doubled down, and then Nixon came along and he had to deal with political unrest, a lot of it. And he knew that fluctuating food prices caused political unrest. And so he told his agriculture secretarial Rusty Butz, to make food cheap.

Whatever it took, to make food cheap, and so Butz said 3 things, row to row, furrow to furrow, get big or get out. That's what he said. Up to that point we had paid the farmers not to grow certain crops to artificially inflate prices, to benefit the farmer. That went by the boards. That was the end of that. What he now said was "We're going to make it up in volume, and we're going to subsidize those foods in order to make them cheap".

And we did, but that also led to monoculture. So all the corn is now in Iowa and all the cattle are now in Kansas, and so because there's no manure in Iowa you got to spray them with petroleum products which poisoned the water, and because there's no grain or grass in Kansas, they're all on feedlots, you have to give them antibiotics which is changing our microbiome to make things even worse. In other words we dissembled a food paradigm that actually worked. For one that was cheaper but way more dangerous, and we have to un-dissemble that and the only way to do that is with policy.

Bret: Right and so many livelihoods depend on these subsidies now, and so much of our economy depends on these subsidies and it seems it's too big of a problem to tackle but if we think that way then this will just keep perpetuating.

So we have to find a way to make the right foods less expensive, instead of the wrong food so to speak less expensive and to get rid of this mono cropping culture to get back to grasslands and rotational grazing, because we're destroying our environment at the same time. And I guess that's part of what's spurred you to go get your masters in law, and start getting into the policy side of things and the advocacy side of things.

Robert: Right, I had 2 questions. I went to UC Hastings College of Law for a masters in law. I wasn't trying to get a JD, and I don't want to be a lawyer but I want to be able to talk to them. So I had to learn their vocabulary. And I had 2 questions when I entered in 2012. When does a personal health issue become a public health crisis, and what are the legal doctrines that either support or refute that? Especially, at the Supreme Court.

And number two - How did tobacco get away with it for 40 years? What was their playbook? Because ultimately the food industry is using the same playbook. So if we study tobacco we can actually figure what we ought to be doing here, and in fact we're doing it. I'm very pleased and proud of how things have gone and there have been movements. And, you can see the movements, it takes a while.

You know, cultural tectonic shifts do not happen overnight. I'll give you an example: There have been 4 cultural tectonic shifts in the United States in the last 30 years. I'll name them: Bicycle helmets and seatbelts, smoking in public places, drunk driving, and condoms in bathrooms. 30 years ago, if a legislator had stood up in a statehouse or in congress to propose any of those, would've been laughed right out of town.

All those were anathema... "Nanny State", every single one of them; nanny state. Today they're all facts of life. We accept all of them. In fact, it's click it or tick it and God forbid, you see a kid riding his bike without a helmet you call the cops. That's what you should be calling cops for. Not you know, "gardening while black". Call the cops for the kid who's riding without a helmet.

The point is every single one of these required public education first, and then that softened the playing field and allowed for changes in legislation and litigation. This is going on now with food. And we're probably out of the 30 years, we're probably about 7 years.

You know, but it's going to take a while, it's still going to take a good 20 years before we're going to see the real change. And I'll tell you, you know what it takes? It takes a generation. And you know why it takes a generation?

Bret: People need to die, unfortunately.

Robert: That's part A. The old people who won't accept need to die, and B, you have to teach the children because then when they get over 18 they vote.

Robert: That's what happens.

Bret: Right.

Robert: So we're doing it.

Bret: Yes, one of the interesting questions to say, as that's happenings where are the lines being drawn? Because I've used Coca Cola as an example, they're an easy example, but what about the fresh squeezed orange juice and the all-natural fruit juice and you know are those going to be protected more than some of the other sugary beverages?

Yet they can all cause the same problem. So part of it is, where are we going to draw the line? And someone say we have to go after meat, because poor epidemiological studies say meat, so, we need science to inform those decisions.

Robert: Indeed. I couldn't agree more. We need science to inform those decisions. The citrus growers are ballistic. They're absolutely ballistic. You know, they're saying, "We didn't add any sugar to our orange juice". That's true, they didn't. What they do is they took out the fiber. Now, when you take the fiber out of the fruit basically what your left is with, is a soda.

Here's why, the fiber in the fruit and there're two kinds, they're soluble and insoluble. So soluble like pectin or inulin, would hold jelly together, insoluble fiber like cellulose, the stringy stuff in celery. So fruit has both. Now when you consume the whole fruit, you're consuming both fibers, soluble and insoluble, and they work together. What they do is they form a gel on the inside of your duodenum.

After they pass the stomach they set up the latticework of the cellulose. Coats the inside of the intestine and then the soluble fiber which are globular plug the holes in that latticework. And you end up a secondary impenetrable barrier which limits the rate and the amount of monosaccharides that are absorbed from the duodenum into the portal vein which go to the liver. So what you're doing is you're saving your liver.

You're preventing from having to deal with the onslaught, the tsunami of monosaccharides that come with an orange juice when you eat an orange. So the orange is okay. What happens if you reduce the rate of absorption of monosaccharides in the duodenum? Where do they go? Well, they keep going, they go to the jejunum.

What's in the jejunum that's not in the duodenum? The microbiome. So the duodenum has a pH of 1 because hydrochloric acid from the stomach, the pancreatic juice is secreted through the sphincter of Oddi, which is in the middle duodenum, and then it mixes with the chime and so then by the time you hit the ligament of Treitz which is where the jejunum starts, the pH has gone from 1 to 7.4.

The bacteria can't live at pH 1, only they will go back to pyloric and live there, but at 7.4 they can all live. Well they got to eat something, you know? You got 10 trillion cells in your body, you got a hundred trillion bacteria in your intestine, they outnumber you 10 to 1. Each of us is just a big bag of bacteria with legs. They got to eat something. Question is what do they eat? Will they what you eat?

The questions, how much did you get versus how much did they get? If you ate the fruit, if you ate the orange, what you're doing is, you're feeding your bacteria. So even though you consumed it you never got it. The bacteria got it. Now, all of these

energy balance studies, all of these room calorimeter studies, all of these Kevin Hall studies, that will be lambasted in about a few minutes downstairs at this meeting.

They are all measuring a unit. It is the human bacterial unit. It is not the human. You cannot tell the carbon dioxide, if it came from cellular metabolism of humans or cellular metabolism of bacteria.

Bret: Interesting.

Robert: You cannot separate out those two. So it really doesn't matter because if you feed your bacteria then they get healthy, and you get what's known as microbial diversity. You get fewer cytokines, and you get short-chain fatty acids from the soluble fiber as it's fermented further down the colon.

So fiber basically means that you're feeding your bacteria. So when you consume an orange, that fructose wasn't for you. It was for your bacteria. So I'm not really concerned about fruit. I am concerned about fruit juice because the insoluble fiber has been removed.

Bret: So the science would say it's the same yet the public opinion seems to be markedly different. So is that going to make it a bigger hill to climb to fight that, and it would in added sugary beverage?

Robert: Yes, and it has been and will continue to be, and in part because the food industry points to that as the excuse. That's their method for swaging their culpability. This orange juice.

Bret: Right.

Robert: Okay? Orange juice is healthy. Anita Bryant said, "A day without orange juice is like a day without sunshine." You know take a frigging pill. This is the problem. But it's the science that ultimately has to win out. But it takes a while.

You know, when we're talking about educating the public, particularly a public that has been, shall we say divorced from science for a long time and not taught science in schools, and not taught a scientific method, and not taught the scientific rational and scientific thinking. You know, this is a very heavy lift.

Bret: You can state all those as they apply to the public. You could probably state all those as they apply to physicians and some scientists as well.

Robert: No argument.

Bret: And you can have documentaries that have been produced recently where a physician wearing a lab coat was staring to the camera and say, "Sugar does not cause diabetes."

Robert: Yes, Dr. Neal Barnard, I want to have a duel with you. I am calling you out. I will meet you anywhere you say. We will leave our guns at home we will be armed only with the science and I am going to take you down.

Bret: I was trying to be clandestine and not come out with names, but apparently that's not going to fly here.

Robert: No it's not. I think he has poisoned America.

Bret: And that's part of the problem. I mean he's got a name, he's respected in many circles and they hear him make a comment like that is just so confusing for the American public.

Robert: Indeed.

Bret: And so we have to fight amongst ourselves in addition to fighting external influences and industry and that just makes it a--

Robert: Makes it even that much harder, exactly. And so part of my job, if you will, is to ally the medical, the dental and dietary professions to speak with one voice. The food industry loves that we fight with each other. It's how they win. If we actually were united and we can be united-- So this is Low-Carb USA.

I'll be very honest with you, I have nothing against low-carb, I also have nothing against vegan. I really don't. I don't have anything against either of them. The only thing I have something against is the dogma. That I have, a lot of against.

You know, Ornish has good data that works, and I believe it works and the data show that it works, and you know what? So does low-carb, so does keto, and so does Atkins when you do it right. And the point is there are a lot of diets that work. Mediterranean works, you know.

Bret: Right, in what lifestyle what context? Because Ornish's studies was in a comprehensive lifestyle program.

Robert: Totally.

Bret: Mediterranean diet studies where in a certain lifestyle of Mediterranean.

Robert: Where they can do it. I totally agree. The point is that every single diet that works, and I don't care where you go. I don't care if you go to Greenland and do whale

blubber. I don't care if you go to Africa and do the Masai, I don't care if you're talking about agrarian cultures. I just don't care. It's irrelevant.

The point is every diet that works on the planet is low sugar high fiber. Low sugar so your liver doesn't get sick, high fiber so you feed your bacteria. Processed food is high sugar low fiber. High sugar for palatability and low fiber for shelf life. Makes the food cheap but turned it into consumable poison.

Bret: So there's a rising tide of a low sugar low fiber diet, the all meat carnivore which is working very well for a number of people in a number of anecdotal reports.

Robert: It will improve insulin sensitivity. It will decrease insulin secretion. I used low carb diets in my clinic for patients who had massive insulin resistance, who could not be treated any other way. I know it works. That's why I am for it. I didn't say I was against it. I'm for it. But I'm for the other too.

And you know what? People who have familial hypercholesterolemia have to eat the other way. That depends on who you are, it depends on your gene type, depends on your disease burden, depends on your family history, depends on your environment, depends on a lot of things. The point is there's no cookie cutter answer.

There is now one diet. And the goal is to bring the right diet to the right person at the right time. But you can't do that if you're all in one diet and in my clinic we parsed people instead of lumped them.

Bret: That's a great point and even in a condition like familial hypercholesterolemia you can't necessarily lump them into one category, because you get someone who's got FH and he's insulin resistant, pre diabetic, and high inflammatory markers, and now you're really stewing the pot for a bad outcome. You have to address that possibly into a low-carb situation as well.

Robert: Point is target the pathology. Always that's a physician's mantra, target the pathology. If you don't know what the pathology is then what do you target?

Bret: Right, and that comes back to your talks about metabolic syndrome, what you're talking about here at this conference. You know we define, we have our definition of the metabolic syndrome about the waist circumference and hypertension.

Robert: CARBage.

Bret: And you said, alright. So tell me about that.

Robert: They are all manifestations of the metabolic dysfunction. They're all markers for metabolic dysfunction, they're not the causes. Yes they cluster together, no argument there. Different people have different ones, different races have different predilections to different diseases.

The reason's because it's not one thing, it's 3. And I will describe that this morning. It can be from obesity. I'm not saying it can't. But I think that's actually one of the rare causes of metabolic syndrome not one of the common ones. Can be from stress because depressed people lose weight but have metabolic syndrome, and with visceral fat and finally, you can mainline it, you can basically fry your liver and you can do that at a normal weight and having metabolic syndrome.

So I think there are 3 ways to get there and I think there are different food stuffs that can end behaviors, that can contribute to them, and I think there are ways to parse those 3 path ways in order to be able to help each person deal with the problem that has caused theirs. But if it's one size fits all, it will never work.

Bret: Yes, I like that approach. And the definition doesn't define the disease, the definition is basically for billing purposes more than anything else.

Robert: Indeed. That's right. So understand this is metabolic dysfunction and I'll even give it a better name. It's mitochondrial overload. Metabolic syndrome is mitochondrial overload in whatever tissue you're looking at. That is metabolic syndrome and we have the data to prove it.

Bret: Thank you Dr. Lustig for taking the time to join me today on the DietDoctor podcast.

Robert: I told you it was Rob.

Bret: It's Rob. I quickly forget, Rob. -Thank you so much for joining me.

Robert: My pleasure.

Bret: Now for audience who wants to learn more about you and hear more about what you have to say where can we direct them?

Robert: Well, there's a website robertlustig.com. There is eatreal.org, there will shortly be a for-profit website biolumen.tech, about a for-profit venture in an attempt to bio engineer a solution to this crisis and also numerous other venues. There are YouTube videos, there's a YouTube channel with a lot of my stuff. There is the 2 books, there's *Fat Chance* and *Hacking of the American Mind*. You know, there's ways to get the information.

Bret: Absolutely.

Robert: *Sweet Revenge* is a PBS video, that teaches people how to reverse their diabetes with real food, there're lot of ways.

Bret: Well this is a obviously big problem with real consequences, and I'm glad you're in the front line, hoping to find the solution. Thank you Rob.

Robert: Thank you.