

## THE BEST AND WORST FOODS FOR YOUR METABOLIC SYSTEM – DR. CASEY MEANS – #876

Dave Asprey:

You are listening to The Human Upgrade with Dave Asprey, formerly called Bulletproof Radio back when I worked with Bulletproof. Now, we have a live studio audience, which is from The Upgrade Collective, my mentorship and membership group, where we meet every week and have really cool conversations about the latest biohacking stuff and learn all my books, and learn all the latest toys. Many members of The Upgrade Collective have this cool thing on their arm kind of like I do. And it's called the Levels patch for metabolic health and you just wave your phone over it and it tells you your blood sugar levels.

Dave:

Our guest today is Dr. Casey Means, and she looks at human potential. She's a co-founder of Levels, and she's the chief medical officer. So this is someone who has gone deep, both on the medical side, but very specifically on the, what the heck is our blood sugar doing to tell us our metabolism and our performance as human beings. And full disclosure, I am an early advisor and investor in Levels, because I think this is so cool. I was CGM co-founder, the first company to get heart rate from the wrist back in the day, more than 10 years ago, the stuff that's on your Apple watch right now and all the other watches is like grandchildren of that stuff. So I care about this space greatly.

Dave:

And this is one of the things I am most excited about, because anytime time I want I can know how my body's doing at turning air and food into energy, oh my God. So we've got an expert and co-founder of the company. Dr. Casey, or Casey, welcome to the show.

Dr. Casey Means:

Thank you, Dave. It is such a thrill to be here with you.

Dave:

So what did it feel like as a graduate of Stanford the first time you got invited to guest lecture on campus?

Casey:

It was an incredible experience to go back in that teaching role, because I really got to go back and talk about and synthesize some of the things I'd learned over the five to seven years since medical school. And so much of that was really about shifting my thinking from being really indoctrinated into in a reactive medical system where we wait until diseases emerge, and then we heroically treat them with drugs and surgery to really coming to realize during my surgical training that that leaves a lot to be desired in terms of actually maximizing health. And to really get to go back and share that with the students and share how powerful a data-informed dietary and lifestyle approach to health can be. How powerful that can be was really, really thrilling.

Dave:

There's something surreal when you first you go back to somewhere where you've been a student and you're like, "Wow. So wait, I'm at the other end of the microphone." So it's always, it's just a bit of a wow, the world just expanded a little bit. I imagine that's kind of cool, and Stanford's a school with a

little bit of a reputation. It's not like it's a Wharton or anything, but it's a pretty good school. I'm just, no guessing where I went to school. Now, you mentioned surgical training, but you started a metabolic health company. How did you go from surgery to metabolism? Because surgeons are usually the ones with the convertibles and the big egos, but they don't really do metabolism. So what happened there?

Casey:

I was on that track and I had done my undergrad in medical school training at Stanford. And then I went on to head and neck surgery residency. And in my surgical training I was treating and operating on diseases of the ear, nose and throat. And I was really struck by how so many conditions that I was treating were fundamentally rooted in chronic inflammation. It was sinusitis, laryngitis, thyroiditis, and all of these itises. That is the suffix in medicine that means inflammation. And it really caused me to step back and say, "Why is there so much chronic inflammation at play? And why are we just reaching for our prescription pads for all sorts of heavy duty steroids to quell the immune system, instead of asking what is causing the inflammation? What is the root cause of that?" Because certainly we can go to the operating room and we can bust a hole in the sinus and suck puss out, but that does not do anything to change the core underlying physiology that led to inflammation, because you cannot operate on the immune system.

Casey:

And so I became really sort of obsessively interested in understanding what are the root causes of inflammation and how to mitigate those in hopes of truly helping people change their physiology and keep them out of the operating room. And in that deep dive it became very clear to me, abundantly clear with hordes of research to support it that one of the key fundamental triggers of chronic inflammation in the body is dysregulated blood sugar and metabolic dysfunction. And so this means dysfunction in the way that our bodies make and store energy. And like you said, take food and water and air and turn it into energy that we can use. And unfortunately, as you know better than anyone, our modern lifestyles make it extremely difficult to escape metabolic dysfunction.

Casey:

A recent UNC study estimated that 88% of American adults have at least one biomarker of poor metabolism. And this is likely part of the reason why nine and 10 of the leading causes of death in the U.S. are related to, or worsened by dysregulated blood sugar levels, and it's mostly preventable. But it means moving away from the factors of our Western lifestyle that hijack our core physiologic processes that are required for every cell in our body to function, and that's our metabolic processes.

Casey:

And so I really refocused my clinical energy into thinking about how to help patients make better choices, healthier decisions that would ultimately lead the foundational metabolic health and how to do it at scale. And I mean, I think it was sort of those days in the operating room where I'd be, like I said, sucking puss out of the sinus, or cutting a cancer out and there it's this very brute force thing and you kind of are, feel like a, you're supposed to feel a hero for doing this, but I feel like what is more heroic in medicine is actually truly changing a patient's physiology to make them fundamentally healthier. And so healthcare costs are going up, we're spending \$4 trillion on healthcare per year. It's-

Dave:

Well, that doesn't matter though, because we just print more dollars. It's totally easy.

Casey:

Yeah, although the [crosstalk 00:08:22] costs are going up each year, so we're going to have to be printing a lot of dollars and we're getting sicker, fatter and more depressed. And I thought, "I'm a doctor, I'm a leader in this healthcare system and it is not working."

Casey:

And in face of that, if you're not stepping back and asking why, then what are you doing? So I moved away from the operating room. I started my own functional medicine private practice. I started a company, I co-founded a company called Levels with four incredible co-founders. And what Levels does is help people optimize their blood sugar and personalize their diet through a bio-wearable called a continuous glucose monitor and really get a sense of where they stand on the metabolic health spectrum and learn to eat and live in a way that does not push them down the spectrum of blood sugar dysregulation, metabolic dysfunction, and long term my hope is that by empowering people with personal data and the ability to understand in real time with closed loop biofeedback how their food and lifestyle choices are affecting their health, we will ultimately help move towards a healthier population, keep out of the operating room.

Casey:

And as a secondary effect, totally change the way in which we're able to be influenced and I would say manipulated by the food industry, because objective data just rapidly cuts through food marketing. So that's my journey from surgery to metabolic health and fundamentally comes down to how to be more proactive in healthcare, create healthy bodies in the United States, and to empower people with agency to make better decisions.

Dave:

I don't think most people would really make that connection between inflammation and metabolic health and ENT, but maybe I'm a little wrong about that. About 20 years ago I saw a doctor who isn't practicing anymore, who was a former John's Hopkins ENT surgeon who noticed the same thing you did. "Hmm, my patients don't get better after I clean out their sinuses. They just come back in two years." And I was days away from sinus surgery, because I'd had 15 years of chronic sinusitis that was inflammation based. And I saw this guy and he said, "Well, I don't do surgery anymore. It didn't work. So I did this, I did this." And he had just launched the world's first Liposomal glutathione, because he was looking at metabolic activities, it's 20 years ago, saying, "Well, I think toxins are a big part of this, so we've got to get inflammation down by getting some of the toxins out. So people use this and know it doesn't taste good, but it works."

Dave:

And so you're kind of following in a rich tradition of saying, "I wanted my patients to get and stay better. It wasn't working, so let's do something different." But it takes guts, Casey, to do that, because surgeons are highly paid and your colleagues probably don't like it when you say, "Hey, let's fix it at the root cause." Not because they're bad people just because like, "This is how you fix it. What do you mean that's not how you fix it?" Did you get a lot of [inaudible 00:11:19] from your classmates in med school for doing this?

Casey:

I got a lot of quizzical looks I would say. I definitely had people ask me if I was going crazy. Nine years of postgraduate training, tens of thousands of hours with a knife in my hand, staring down the barrel of a long career of steady income, et cetera, et cetera. But it comes down to the fact that you have one life to live and it's all about impact. You can go by the book, but frankly practicing just guidelines-based medicine, it wasn't simulating and it wasn't really fulfilling to me. And nothing gets me more excited than critical thinking, independent thought, looking at systems issues. And often that means you're a contrarian. But the fun thing is that when you join the contrarian community, you join a community of really amazing people.

Casey:

People like yourself and many other trailblazers, which I'm proud to say most of the Levels advisory board is people who have had a very similar path to me. People like Mark Hyman, Sarah Gottfried, Molly Maloof, David Perlmutter, Ben Bikman, Dom D'Agostino, Rob Lustig, who have taken on the system and challenged things. And to be able to call these people colleagues now is the greatest joy of my life, because you're pushing the system forward and to really have the best possible impact. And it actually, it was pretty simple and straightforward for me, because I think once you start going into the root cause world, which I would call also in the fancier science lingo, it's like the systems and network biology world.

Dave:

Yep, that's all it is.

Casey:

If you say functional medicine, everyone's going to roll their eyes and say, "It's pseudoscience." If you say systems and network biology, all of a sudden it's like it's fine to say.

Casey:

And the reality is they're the same thing. Systems and network biology being, right now in regular practice we look at someone who has obesity, early dementia, arthritis, benign prostatic hypertrophy, all these different. And we say, "Oh, these are all different things. We're going to prescribe a different pill for each of this. They're IBS, something different, they're depression, something different," and we play Whack-A-Mole medicine.

Casey:

Systems and network biology looks at what are the physiologic links between each of these diseases on the cellular level. And what if that were, we then put that up on a whiteboard and drew these links between these different diseases of that physiology. And then what if we treated at that level? At the link? And that's what happened to me. And it literally was on a whiteboard. I remember looking at a paper, I think it was in JAMA, of all the cytokines that were upregulated in the nasal mucosa, the sinus station.

Dave:

Right.

Casey:

Yeah. And it was TNF alpha, Interleukin 6. And I'm like, "Hah, all of these cytokines are the exact same ones that are upregulated in obesity and heart disease and diabetes. And that Venn diagram is the connection between these diseases. And we know that dietary and lifestyle choices change the Levels of these cytokines. Also, this was many years ago, but now we've learned with (beep) that it's the same cytokines that are upregulated that worsen the cytokine storm.

Dave:

Attention, attention. We must bleep out the C-word that was mentioned here. It's okay, you can say it. We'll just make sure we bleep it out, because it is not okay to mention that which shall not be named, because they are now blocking shows. They have now taken, they've deleted videos with more than a million views from my channel without telling me because they had the C-word and that's not the one with the NT at the end of it, it was the other one. So what we do, you can say it, but just so you know, there'll be bleep every time you say it on the show. And Chris, make sure that this part is actually left in the show obviously so that others know why there's a bleep. It's not that Casey's swearing, it's that she's speaking the truth, which shall not be spoken. I was going to say, what about the most popular virus?

Casey:

Right, and so, this is what you, I mean, you really have to just get the marker out for yourself, create the Venn diagrams and then realize there's something missing in the way we're treating things here. And once that cat's out of the bag, two metaphors here, but the genie's not going back in the bottle. And so it actually was a fairly simple choice for me. And I tend to have an abundance mindset and not really worry about, if you're following your North Star, I believe things will work out. And they have, which has been great.

Dave:

Well, I appreciate that you're doing that. And especially in a world where people are looking for ways to be hard to kill and more resilient, it's funny that if you reduce inflammatory markers, like IL-6, this is my personal favorite, inflammatory cytokine. And I wrote a well-referenced paper two weeks into the government response to a popular virus. There, I didn't say anything I shouldn't say, about IL-6, and I was actually ordered by the government to take it down. So yes, we live in that world.

Dave:

But your point there that, "Hah, the sinuses have this, it's inflammation. Obesity has this, it's inflammation. But isn't that because we're breathing stuff we're allergic to? Or is there a metabolic connection between these cytokines, kind of leaking question, know the answer, but tell me what you think?

Casey:

Yeah, I think it's both of them, to be honest.

Dave:

Is there a metabolic connection between these cytokines, kind of leaking question, know the answer. But tell me what you think?

Casey:

Yeah, I think it's both of them to be honest. I mean there's, the way I really think about it is that the metabolic pathways are sort of like a centralizing factor that take in a lot of different multivariate inputs and can become dysfunctional via lots of different things. And so some of the things we have to think about that are hijacking our core metabolic processes are things like the Standard American Diet and processed carbohydrate and sugar, which I would lump under the term chronic over nutrition, causing mitochondrial oxidative stress, essentially too much work for our energy factories leading to us not being able to produce energy properly and storing more fat. But it's also, I would say six other things. It's chronic stress and the impact of cortisol on our cellular biology. It's getting poor quality sleep, both less sleep than we should be getting, but also interrupted sleep.

Casey:

It's sedentary behavior and lack of physical activity, which puts strain on the body. It is environmental toxins like persistent organic pollutants in our food, water, and air, all of which can be mitochondrial disruptors, and it's a nutrient poor diet. And we know that aside from the chronic over nutrition, it's the dearth of micro nutrients in our diet, which serve as locks and keys for all those little enzymes in the electron transport chain of the mitochondria. All of these things essentially features of our Western lifestyle gum up the metabolic system and make it not work properly. So it's not that it's just about food, it's that it's the metabolism, because it's such a core pathway.

Casey:

We have 37 trillion cells in the body, 37 trillion human cells, many, many more bacterial cells. And each one of those 37 trillion cells needs energy to function properly. And so by hijacking these processes with those things that I just mentioned, you can see dysfunction in any cell type, depending on where that shows up. And so that's why metabolic dysfunction can sometimes be really sneaky because it has so many faces based on where this core dysfunction is sort of showing up most prominently in the body. If it's showing up in the vessels of the penis, it could look like erectile dysfunction. If it's showing up in the ovaries, it could be polycystic ovarian syndrome. If it's showing up in the brain it could be depression, anxiety, Alzheimer's, fibromyalgia, brain fog, chronic pain, all things that have been linked to metabolic dysfunction. Of course, if it's happening in the bigger blood vessel of the body, it could be stroke or heart disease. If it's in the skin, it could be psoriasis or acne.

Casey:

It's incredible. And it's again, it's just there's so many factors that go into this, but the beauty of all those factors that affect metabolism is that we have so many levers to pull in terms of riding the ship, and the body is so resilient and adaptable that it can generally always move in the right direction when conditions are different. So the onus is on us as the individual to change those levers, to pull those levers under the guidance perhaps of a doctor or an app, but fundamentally health does not come from a doctor's appointment. And it also doesn't come from an app, it comes from the actual choice you're making. It comes from what's on the tip of your fork. It's what the time is when you go to bed. And so, what my passion really is, is to help people understand their bodies well enough and be inspired with good information from their bodies to be able to make those decisions consistently and feel excited and motivated to do that.

Dave:

It's been my dream that we would get large numbers of biohackers, and that's kind of the early adopters of Levels, but you've got tons of people who aren't biohackers now, just some people who are

interested in improving their metabolic function for a whole bunch of different reasons. But it's been my dream that we get that, first we would get it from movement and sleep sensors and things like that, unlike the Oura ring. But to be able to say, "What are the behaviors that cause desired results?" Because we have all these myths we've believed in society. Like, "Oh, exercise a lot and eat a low calorie diet." Well, I sure believed in that myth enough to work out six days a week an hour and a half a day for a year and a half on a low calorie diet. And I still weighed 300 pounds and had a 46-inch waist and I was strong. But it didn't do it. So, how many myths is every person listening to the show believing? And some of them are media myths, control and manipulation from big tobacco, I mean, big food. Sorry again, confusing-

Casey:

Shouldn't we talk about the heart on the [inaudible 00:21:48] box?

Dave:

Oh my God. So we go down that path, right? And one of my goals was, "Hey, I would like to disrupt big food." That was the whole message was how you feel after you eat is most important. And now I'm going after some of our exercise myths and our recovery myths with upgrade labs. And what I'm looking at here is it's always at the core is about metabolism. It's about inflammation. And so we can fix those, but I have things that I believe work because I've seen a bunch of studies, but I don't have a 100,000 people telling me what they're eating every single day and then showing me as a result their blood sugar levels so that you can do two things. And I'm hoping you've done the second one here. And this is what I want to dig into with you.

Dave:

The first thing you do is say, "Well, okay, if the average person eats ice cream, their blood sugar goes up this much." And you go, "Oh, that's weird. Most people it goes up this much, but some people it goes up crazy and some people can eat ice cream like no one's business." Now, you don't have data to know why there's a difference in those people. But what you can also do is you can say, "Over the course of one year people who eat these types of things tend to have an average decline or increase in blood sugar." So long-term inflammation and metabolic stuff you're getting from your dataset. Even if an individual has a hard time being able to use that for their own data, but the feedback loop that goes to everyone goes to the learning of the world from Levels is really big. So you guys have been running long enough, I think to get some trends that are from all of us, not just from one person, what have you picked up? What do you know? What did you learn that we didn't know before?

Casey:

Hmm, well, I think, so the answer is yes, it's been since you last talked to Josh, my co-founder, on the last podcast, we have a lot more data and it is pretty exciting to think about the impact of this enormous dataset. And so just to kind of give an overview of what the data we're looking at. So amongst our Levels beta members we have 1.3 million food logs, 51 million glucose data points and 128 million health data points at any time. So this is a gigantic, gigantic dataset of what's happening in response to these 1.3 million food logs across a large population. And this is actually just 16,000 people who have experienced Levels so far in our closed beta program. Doesn't account for the 155,000 people on our wait list, so you can just imagine how enormous these numbers are going to be.

Dave:

Tell me about the wait list. I know, because people listen to the show, if you use [levels.link/dave](#), you go there, you get to the front of the line, but that was a hell of a big line. When do you shorten the line?

Casey:

Yeah, you know, we are working hard towards that, but to be able to really open up those floodgates they're a couple things that need to be true. I mean, certainly we want, we have been working tirelessly to refine the product experience that it's going to be the most useful and valuable product experience for people when they actually do get access to Levels, and we have released over a 1,000 versions of our app in the past year and a half to accommodate that feedback. And then also, the supply chain of getting the sensors to people, this is still a new field of people without diabetes using continuous glucose monitors. There's sort of this ramp up period in terms of getting these sensors to people. So I think very soon we'll be able to open those doors to everyone, and we're very excited for that. But in terms of getting to your question, which is, what have we learned? Something that I find really fun is to look at the top 50 worst and the top 50 best foods in the entire Levels dataset.

Dave:

Good. I wanted to get to the worst foods. I love this.

Casey:

Oh my gosh.

Dave:

What are the ones you found?

Casey:

A lot of the worst scoring foods are things you would probably expect. So things like, I'll start with sort of the obvious one. So Chick-fil-A. When people log the word Chick-fil-A, they have a huge glucose spike. Pad Thai, McDonald's, donuts, dim sum, fried rice, apple pie, Coca-Cola. None of that is really surprising. These are processed foods or-

Dave:

There's cinnamon in apple pie and cinnamon fixes your blood sugar. What?

Casey:

A 100%, it totally offsets that. A cup and a half of sugar and the refined flour and the apples. Just that eight teaspoons of cinnamon.

Dave:

I'm sorry, I accidentally put on my Instagram influencer hat there. Cinnamon extract in relatively large amounts may lower blood sugar a little bit. I've seen it on my things, but it needs to be an extract of cinnamon, or so much cinnamon that it's probably kidney or liver stressful. And you should pair it with some other things like chromium and vanadium if you really want to smack yourself in the face with sugar without paying for it.

Casey:

Yeah. I mean, there's no question that physiology is real of cinnamon. And I think it's Ceylon cinnamon that it's the one that's best for.

Dave:

Yeah.

Casey:

Yeah, yeah. And capsule form is sometimes good, but I always dump two teaspoons of cinnamon in a smoothie to get a little bit of that.

Dave:

I thought you had to do lines of it. I've been doing it wrong? I'm a bad person.

Casey:

No comment.

Dave:

I have no idea what that means.

Casey:

So one of the, speaking of cinnamon, other cinnamony foods. So we, one really common thing we saw was that breakfast foods often, which sometimes you have cinnamon, like pastries, were a huge amount of the 50 worst scoring foods.

Dave:

Oh yeah.

Casey:

So these are words that are on the top 50 list, which is of course all the things that people are getting at brunch and are probably being served in school cafeterias. But it was pancakes, French toast, waffle, bagel and cream cheese, bagel, scone, pastry, overnight oats and Cheerios. So that's a large percentage of top 50 worst foods.

Dave:

Oatmeal. Can we talk about oatmeal?

Casey:

Oatmeal, yes.

Dave:

It's the stupidest thing on the planet. "Oh, I'm having my oatmeal to be healthy." Eat the pancakes, they're equally bad for you. Oatmeal isn't even that good. Or at least make oatmeal cookies. It's stupid and it has gluten in it anyway. So I've always been anti-oatmeal and it makes all the crunchy unshowered plant-based people who are very weak, it makes them very angry. And a few of them have

broken their wrist trying to punch me in the arm, just because of their lack of bone density that came from their oatmeal.

Casey:

This is the beauty of objective data. You can't fight with it. That box, that Quaker Oats box says, "Great source of whole grains, high in fiber, heart healthy."

Dave:

I feel so good about that.

Casey:

Yeah. So, oh my doctor said to eat this. And I will tell you my own personal data. We do a lot of experiments at Levels. I took two of those little packets of plain unsweetened, not the apple pie version, plain unsweetened rolled oats, put them in a mug, put them in the microwave. It ends up making eight spoons worth of oatmeal. It's so tiny. My glucose went up 80 points, which for reference, I really never want my glucose to go above about 20 or 30 points after a meal. And when it went up 80 points, it came crashing down and of course led to that sort of reactive hypoglycemia dip after the meal when I felt totally crummy and fatigued and had cravings. And because we know that glucose swings, otherwise known as glycemic variability, is an independent predictor of developing diabetes, heart disease, and stroke.

Casey:

For me, there is no way that those oats are heart healthy. And so what's on the box is not true for me, and that data shows me that. So, that is not to say no one should eat oats. To be honest, some people respond differently, but there's a couple things that you can keep in mind here. One is that groats or Steel Cut Oats are likely going to do better than overnight instant oats or rolled oats or something like that. The second thing is, you can add additional fiber, fat and protein to the oats to make them have less of an impact. If I were going to eat oatmeal, I would literally dump chia seeds and flax seeds on top of it, put some walnuts on it.

Dave:

You like Omega-6 oil for your metabolism and phytic acid to remove micronutrients?

Casey:

Oh gosh.

Dave:

And you like lectins?

Casey:

Oh gosh.

Dave:

Hold on. Where'd you go to med school? Oh, Stanford, oh.

Casey:

I'm a chia. I'm a chia fanatic. I hate to say it.

Dave:

Do you use [inaudible 00:30:35] first?

Casey:

I do. When you put them in the oatmeal, they'll bulk up a little bit because of the moisture.

Dave:

Those are the ones that are hydrated. I can see chia of all the stuff on that list, but you are looking at omega-6s through the nose and the walnuts. There are longevity studies supporting walnuts, but I kind of go back and forth on that one.

Casey:

And you know, chia seeds are, from what I understand the dominant thing you're going to get in that is alpha-lipoic acid, so an upstream omega-3. And I think, certainly of course the plant-based omega-3s are not going to be effective for the anti-inflammatory or the structural properties as the downstream omega-3s like EPA and DHA, no question. But something that I found really interesting, actually the Genova NutrEva test has helped me really appreciate this, is that, so you get to EPA and DHA from ALA, this upstream omega-3 converting-

Dave:

45 to one ratio. It takes a lot of work to make that.

Casey:

But it takes five to 10 micronutrients in each of the enzymes to get from ALA to EPA. And I think a lot of people are deficient in those micronutrients.

Dave:

Well said. There you go. That's the vegan problem is that all the plants with their oxalic acid and their phytates inhibit the micronutrients that you needed to make EP and DHA, if you could, which is really cool. So I was just teasing you about putting that in there, but I have to ask you, what if instead you just said, "You know what? I'm going to put a half a stick of butter in my oats."

Casey:

Yeah. And I mean, that's an option too. There's different, definitely different ways to get fat, protein and fiber.

Dave:

It would lower the glycemic index though, right?

Casey:

It would lower the impact of the oats on your glucose, for sure. There's so many other things you could do. You could eat protein before the oats. You could take a 30 minute walk after the oats. And we have a great experiment that we did with our members about taking walks after meals. And we can talk about that as well, but it's basically them by themselves, not hearth healthy. I would greatly recommend a savory non-oat breakfast. And actually when we get to the best scoring foods, some of the breakfast in that list are really what I think we should be focusing on, not just hacking oats, but actually moving towards a nutrient-rich breakfast that isn't spiking glucose. But there's ways you can modulate it with some additions and walking. And I mean, people could take an apple cider vinegar shot beforehand, but why not eat the free range eggs and avocado or the frittata or the chia, well we can maybe disagree about you putting-

Dave:

You can say chia, it's another one of the C-words that we're allowed to say.

Casey:

But those were types of breakfast that were on the top 10 best foods for glucose spike, so.

Dave:

Okay. Before we move into the really good breakfast foods, you talked about French toast.

Casey:

Yes.

Dave:

Now there's a company that I'm working with called Uprising Foods that makes zero carb bread. And I've always thought French toast is going to be better than regular toast, because it's got an egg on there. And if you cook it in butter, now it's got enough fat and enough protein that as long as you don't put a bunch of syrup or you use a syrup with all oligos or something in it that you can actually have French toast that is far better for you than oatmeal and still tastes like French toast. So I guess there's a variety of stuff you can do in there, but is French toast better than pancakes and better than oatmeal, or is it worse? Because I'm just hoping the egg would help.

Casey:

Yeah, I imagine the egg would help because it has protein and fat and there's actually been studies showing that if you eat an egg before you eat carb rich foods you have a lower glycemic response. But at the end of the day, it's not just about getting a flat glucose line. That is not the definition of optimal health. We're trying to push people towards with this type of metabolic awareness that Levels provides is not how to gain the glucose curve, but how to build a body that is metabolically healthy. And those are two different things. Because just gaming the glucose curve. I mean, you could chug canola oil and get a flat glucose line, but to build a metabolically healthy body, it means tapping into nutrient rich foods, avoiding things with refined carbohydrates and sugars. Getting rid of the environmental toxins, that person's getting pollutants, getting the sleep, managing the stress, doing the exercise, et cetera, et cetera.

Casey:

So, it's not just about, "Okay, well the French toast with the egg is better," because really the question is, what is that French toast doing for your cellular biology? And that's the question that I'm asking with any type of food is, "How is it supporting my pathways that lead to health?" Because symptoms and diseases are a manifestation of dysfunctional cellular biology, and food is what in large part determines that. So with that French toast, I mean, you're getting refined grains, minimal nutrients, some water, some egg, it's not exactly like the optimal breakfast, so yeah.

Dave:

So there are a few, I'm just going to call them online, angry calorie bullies, who will still tell you that having a diet soda and a Snickers bar is the same thing as eating a snake. In fact, it's better, or steak or a snake, because it's better for you because that's less calories, right? What do you have from a data perspective that makes those people look like douche bags? Because they actually are.

Casey:

I mean, I think-

Dave:

Not a loaded question or anything.

Casey:

Not at all, no. And I would push them to David Ludwig's most recent paper from Harvard out a month ago.

Dave:

I love him.

Casey:

Yeah. I mean, he's incredible, The Carbohydrate-Insulin Model of Obesity moving away. Yeah just, if we want to follow the science, go to this paper and take a look. And man, that paper was great because what it highlighted was the key point of why the calorie in calorie out model is flawed, which is that different, and I know I'm just preaching to the choir here with everyone listening, but calories affect hormones, and hormones are what really dictate the results of what's going on inside at our bodies. And so, a calorie that stimulates insulin release or causes oxidative stress is very different from a calorie that does neither of those things. A calorie that stimulates the NF kappa B inflammatory pathway, genetic pathway, or a calorie that doesn't, has a very different effect on our overall health.

Casey:

And so, it's not just the carbohydrate insulin model. It's also like, what's it actually doing to our genetic expression? What's it doing to the structural composition of our body? I mean, omega-6 fat and omega-3 fat probably has the same calorie, but which one is actually going to build cell membranes that help us think and feel better and thrive? So, that's how I would think about that.

Dave:

Yeah, I think you're right. It takes a special kind of arrogance in order to just continue saying these things that just aren't true at all. And so maybe one day the guys who are still out there harming people with

poor nutritional advice, maybe they'll get therapy or something. Do you have hope for those people? Maybe if they got blood glucose monitors, would they start eating more calories and feeling better?

Casey:

You know, I think, I do feel that that most people out there doing this stuff are good intentioned and are sharing what they know or what their personal experience is. The reality is, is that there's people out there who have done calorie restriction and who have lost weight and felt better. And that's great for them. It's not the answer to our public health crisis that is ravaging our country of metabolic disease, because really the science shows that calorie restriction does not work over the long term. And the mechanism of that is, it doesn't actually fundamentally impact the hormones that are related to weight, so.

Dave:

You would see it on a Levels monitor, right? Someone who's restricting calories when they do eat, they're going to get a big glucose spike because they haven't figured out that it's what they eat that's changing the metabolism, right?

Casey:

Yeah. I mean, and you could also be on a calorie restricted diet and if you're spiking ... So there's two different ways to approach a calorie restricted diet. One that I think would work well for weight loss and one that wouldn't. If your calorie restricted diet is spiking your glucose each meal that you eat, it's going to be much harder to lose weight.

Dave:

Yes.

Casey:

And this is what's so beautiful about monitoring is that you can really take almost any dietary strategy. And if you want that to be calorie restriction, go right ahead. Actually in a lot of ways I feel like calorie restriction with a continuous glucose monitor, an eye for insulin and glucose would be a lot easier, because what you'd probably be leaning on more is higher fat, higher protein foods. So you'd actually be more satiated.

Dave:

Yeah, you'd be less miserable and you'd be less likely to go on Twitter when your brain is out of control and just be a douche. I totally get it.

Casey:

And we know, after the glucose spike the reactive dip is exactly when we feel cravings. That has been studied. So it kind of sounds like hell to me to be on a calorie restricted diet with high glucose spikes because you're basically hungry. Not only because you're calorie restricted, but also because you're crashing and you're hungrier, so.

Dave:

You look hangry all the time. Do Levels users report in on stuff like hangriness and hypogly-bitchiness? Like the quality of their mood. Because I've noticed massive shifts in myself when I learned how to eat and I have blood sugar going all over the place.

Dave:

You're listening to The Human Upgrade with Dave Asprey. Because I've noticed massive shifts in myself when I learned how to eat and I have blood sugar going all over the place.

Casey:

There's no question. And we are not collecting that data in sort of an empirical way right now. But if people go to our [levelshealth.com/blog](https://levelshealth.com/blog) and look at our member stories, it's all over. We publish at least-

Dave:

It's life changing.

Casey:

... one member story a week. The way I think about it is that glycemic variability, ups and down swings in glucose translates to ups and down swings in the subjective experience of our day, whether that's energy, mood liability, anxiety, brain fog, mental clarity, I think one of the biggest life hacks. It sounds like you've had this experience as well, is when you, like you said, learn to eat and in doing so are keeping to these more gentle rolling hills of glucose, not these huge spikes and crashes, it totally stabilizes your experience of the world in many ways. And I mean, it's not the cure for low energy or anxiety, but it certainly takes away one variable.

Dave:

It's totally the cure for anxiety. If your anxiety was coming from chronic lack of energy, and that was one of the things, I had chronic fatigue syndrome, I had the brain fog. And you get anxiety from feeling like shit all the time. And so you can fix that just by learning, "Oh look, I didn't spike and crash." Well, let me ask you this. Can you feel high blood sugar?

Casey:

Oh absolutely.

Dave:

How does it feel when your blood sugar's high? I know we can all feel low blood sugar, but what does high blood sugar feel like?

Casey:

So for me high blood sugar feels a little bit like an uncomfortable floaty sensation. Sort of like I'm a little bit out of it and I'm starting to feel anxious. And I think I would not have recognized-

Dave:

Interesting.

Casey:

... that had I not had a glucose monitor. Because one of the beauties of being able to link subjectively how you're feeling with objective data is that we cut through misattribution. We can attribute a phenomenon to this objective feeling. So instead of saying, "Am I just an anxious person or is this from the coffee I had? Or is this because I had lack of sleep or is this because the email I just got," I can say, "Oh no, it's because my glucose is 178 and it hasn't been in three weeks." And so now I can start to create a one to one relationship between how I'm feeling and what the data is, and that is power. That means that we can start to make different, select choices to start modulating our experience of the day.

Casey:

And this is a concept that we call interception, glucose interception. Interception being the ability to feel what's going on inside your body. So we often talk about interception with things like heartbeat. And it's fascinating, people who have to do a better job of feeling their heartbeat. And what this might look like is sitting still, closing your eyes, and trying to just feel your heartbeat in different parts of your body, your neck, your chest, your fingertips, your toes. People who can do that reliably have better cardiac outcomes. This is not surprising to me, because when you have awareness, when you're stopping to have really in tune with the inner working your body and that body awareness, I think there's lots of different effects of that.

Casey:

Probably better, you're more in tune with what's going on, and so therefore you can modulate your behavior. But I think this is possible with glucose as well. And we certainly, aside from glucose being high feeling that you can I think definitely feel when glucose is low, because that has some pronounced symptoms of hypoglycemia, which can be shakiness, jitteriness, fatigue, anxiety, et cetera. So being aware of that is nice, and using the objective data to really refine that awareness. Because then when you don't have the monitor on, you can start to clue in to really how food is affecting how you feel.

Dave:

It's so cool that you can describe that. And I'm with The Upgrade Collective members around a lot of them saying, "Yeah, kind of floaty, spacey, carb high. I have never felt high blood sugar. And I don't normally get up to 180 though. I probably could get up there, but I'd have to really do sugar on an empty stomach. I don't go above 150, 155 the vast majority of the time.

Casey:

That's so good.

Dave:

But I don't feel it. And it drives me nuts, because I'm really good. I mean, I do all this neurofeedback and biofeedback and I can heat up my hand. There's cool pet tricks you can do with your biology. But that one, how did I not know it was at 150? I mean, I could predict it because I ate the grapes from my grape vines or whatever, another high glycemic food, but it's so cool you can feel it. I'm curious, do you hear that from a lot of users that they learn how to feel high versus low blood sugar?

Casey:

We definitely do hear that. And I think Molly Maloof is one of the people who has actually talked a lot about this publicly, this sort of concept that you can sort of tune into this. But I think probably it's possible one of the reasons you're not feeling it is because you're not going super, super high. And we

actually did this experiment. It was the walking experiment that I was alluding to earlier where we had Levels members and employees drink a can of Coca-Cola. And then, and obviously this is a group of people who do not drink soda normally. So this is a glucose company. So they drink a can of Coca Cola and then the next day or days later, ideally under the same conditions, like same amount of sleep, same amount of exercise, drank the exact same can of soda and then walked for 30 minutes to two hours afterwards and we looked at the changes in glucose responses. But before we did this, we actually were sending people oral glucose tolerance test drinks, so 70-

Dave:

Those are horrible.

Casey:

Oh they are terrible. And it's-

Dave:

It's crap, [inaudible 00:45:51] I don't do anymore.

Casey:

It's called glucola. And it's a 75 gram of glucose drink that we give to pregnant women for the oral glucose tolerance test. And so two people in the company did the experiment first and we had shipped them to everyone in the company. We actually had to stop the experiment, this is not a joke, because the two employees could not work for the rest of the day, because-

Dave:

Yeah, it's rudeness. That's why I won't do it.

Casey:

... they felt so happy. And the direct quote was from one of our team members, "I was super shaky, sweaty hands, blurred vision, had to lay down in bed immediately, sent this out via Slack." We're like, "Did we just poison one of our team members? And we actually had to stop the experiment because the glucose had such a profound fact on how he felt and we switched to Coke, because it was kind of a little bit more gentle of a rise. But the average glucose peak in that experiment with one can of soda, one can, which I believe 65% of people under 19 are drinking at least one can of soda a day, that sent people's blood glucose on average to 162 milligrams per deciliter, just one can of Coke. And that I certainly felt, I was like, "Oh, you know?" And so, but that just goes to show, these drinks that have 75 grams of glucose are making people feel so bad that they actually couldn't work, so.

Dave:

Incredible that the same people can go to, and I'm not going to pick on Starbucks. Starbucks did make everyone pay attention to the quality of their coffee, so thank you Starbucks. But the current iteration of Starbucks that has a lot to do with 31 flavors Baskin-Robbins, there's one drink with more than 120 grams of sugar I think. But it does have some fat, it's all omega-6 fat and maybe a little bit of protein, but that is actually worse. But is it the caffeine and a little bit of fat that means people can actually function on that much sugar? Because for me, I would be disabled. I didn't even know what I would say on social media if I drank one of those and was tweeting.

Casey:

I think it also maybe a bit of a tolerance thing that people kind of get used to that. It's like how, if you're not eating sugar regularly and you eat something sweet, it taste really yucky. I mean, I at this point don't really like super sweet things. I used to love milk chocolate and now if I eat milk chocolate it tastes very unnatural to me. I want the 88% or 195. And so I think it's sort of in that realm of like, if you're used to that feeling and now it's tied up in your dopamine and your dopaminergic reward pathways in a very hardwired way, that subjective feeling is going to be very different than if you're sort of naive to that.

Dave:

Okay, that makes sense. Talk to me about dark chocolate. It's been one of my go-to snacks, something I recommended forever. What do you see if it's 85% or higher from a blood sugar perspective at Levels?

Casey:

Well, I can certainly say it's not in our worst scoring foods. It's also not in our best scoring foods. So it's probably somewhere in the middle. For me personally, if I eat 88% chocolate or above, I have no glucose response. So that's going to be generally those bars have three grams of added sugar, so it is added sugar per serving. Usually the bar is three servings. So if I eat a third of the bar, nothing. So that's a great option I think for people who really do have a chocolate hankering is the 88% or 92%.

Dave:

Okay, that's pretty high. Most people will still eat that. One of the advantages of getting above 90 is that if you leave it on your desk, no one will eat it.

Casey:

I love that.

Dave:

I remember when I was doing this, a long time ago I worked for a company in the UK and I had some 85 or 90% with me and I offered it to people in the room and the CEO of the company that takes a bite and spits it out on the table. And said, "What are you doing to be trying to kill me?" I'm like, "Yeah."

Casey:

This terrible bitter object, oh.

Dave:

I got to eat all of the chocolate. I didn't feel bad. What if people go down to 72? A lot of the dark chocolates are around 72 to 78%.

Casey:

I would strongly guess, I don't know the actual data on this, but I would guess it's a linear relationship between the numbers and the glucose spike. So an inversely proportional relationship. I bet as you go down, you used to get a slightly bigger bump in the glucose response. So, definitely an experiment worth trying and maybe pushing the envelope on how low can I go with the percentages and not have really any glucose response? And maybe if I put a little almond butter on it, does it blend it a little bit more?

Dave:

Now, this is where it gets interesting. Because there are some people who actually write some interesting stuff. There's a variety of perspectives out there. And I do my best to listen to all of them and kind of pick what works and try the stuff that doesn't. But there are people say, like, "It's normal for your blood sugar to go up after a meal. As long as it comes down within two hours and it didn't go up too high to cause advanced glycation, who really cares?" What do you think about that?

Casey:

Yeah, so there's a few things here.

Dave:

Not very much I [inaudible 00:51:11], but keep going.

Casey:

I have very few thoughts on this topic. No. So, really I think the way, there's a couple frameworks to think about this. One is that a lot of that ideology is based on this false premise in the American healthcare system that health and disease are binary things. So that we are non-diabetic until our fasting blood sugar is 126, and we are diabetic when it's above 126. And that's because the diagnostic criteria say that, and so we don't have a problem before at 124, but we do have a problem at 126. That's not the way biology works. Biology is a spectrum that we are constantly moving forward and backward on, especially when it comes to metabolic health. And so really that black and white light switch thing makes us think that we don't need to worry about these things until we have fulminant disease and meet diagnostic criteria, which is one of the biggest problems of why we are just absolutely failing in our chronic disease epidemic.

Casey:

This is why a lot of you might go to the doctor and say, "Hey, I'd really love to use continuous glucose monitoring, because I want to get on top of my blood sugar." And their doctor may laugh at them and say, "You don't have diabetes. I'm not going to give you a continuous glucose monitor." But how strange is that, that we'd wait until someone has an actual disorder before we let them monitor thing when these conditions are preventable, largely preventable? And the idea is, if you could learn to eat properly 20, 30 years before you go into the doctor's office and get that bomb dropped on you and could monitor these things, then you would not reach that.

Casey:

I can say with almost a 100% certainty that if I'm monitoring my glucose over the course of my lifetime, not necessarily a sensor on every single day, but wearing a sensor maybe once a year. And if I keep my glucose, if I eat properly, keep my glucose in range, I will never-

Dave:

What does in range mean?

Casey:

Seeing that my fasting glucose isn't going up over time. Making sure that my average glucose is staying below a 100. Making sure that when I wake up my fasting glucose is in the 70s and 80s and not creeping

up towards 90 or a 100. If I can do that year after year and keep it that way through my choices, I will never walk into the doctor's office and have them drop a bomb on me about type 2 diabetes, because I've been tracking it. And that is power. I just, it's unbelievable to me to think of a patient walking in, nervously clutching their handbag, waiting for this news. When we have tools that let them know that information for themselves and impact it, it's just such a strange power dynamic.

Casey:

So getting back to sort of this, the question about what if people say this stuff? The thing I would point them to is the fact that glycemic variability, which is the ups and down swings in glucose, which are primarily driven by our dietary choices, glycemic variability is ultimately what pushes us towards metabolic dysfunction, insulin resistance. Each of those repeated spikes over and over again. Sure, our pancreas can release insulin and bring that glucose down. It's doing its job and it's doing it properly. But when you're doing that, big spikes day after day, week after week, year after year, decade after decade. Obviously what ends up developing is insulin resistance. Our cells see too much of the insulin. They end up trying to essentially protect themselves by creating a block, a resistance to insulin. Our body ends up producing more, and then over time it can't keep up and our blood sugar starts rising.

Casey:

So, by keeping, sure, a single glucose spike isn't going to permanently damage you. But if we're doing that over and over again, we are moving down the spectrum of metabolic dysfunction. So, logically, why wouldn't we want to keep those glucose spikes down, learn to eat so that we're minimizing those spikes, so we can keep ourselves perkiend insulin. And The Lancet, a premier medical journal, did a paper a few years ago that showed that the average person is exhibiting signs of insulin resistance 13 years before their diagnosis of type 2 diabetes. And we're missing those people because we don't actually test for insulin sensitivity in the doctor's office. We don't test fasting insulin.

Casey:

And so an example that I think really helps bring this to light is like, let's say you and I, Dave, both have a fasting glucose of 80. So we both think we're totally fine metabolically. And the doctor would absolutely say, "You're doing so great." Well, let's say I'm much more insulin resistant than you. My cells are resistant to insulin. So my body is having to pump out 30 of insulin to keep that glucose at 80. And you're super insulin sensitive, so your insulin level is two. So mine's 30, yours is two. My body is much more metabolic dysfunctional, and we don't know that. Right now we do not know that. And fortunately we can actually look at our cholesterol test, a standard cholesterol panel, to kind of get a sense of that. And we don't necessarily need to go too much down that road. But the triglyceride to HDL ratio can be a rough, good surrogate marker of our insulin sensitivity.

Dave:

This short version of that to translate, you want higher HDL and lower triglycerides. For 10 years the normal response to the Bulletproof diet is a spike in HDL and a drop in triglycerides to change that ratio. Guys, this is very simple stuff and it's the cheap cholesterol test that your doctor will do for free and then tell you, "Oh my God, you're going to diet your cholesterol's high," even though it's the good cholesterol.

Casey:

Totally. And so, that's a way, if you're, a doctor's not going to order a fasting insulin, that's way to start getting a clue as to whether you're keeping that fasting glucose at 80 because you're super insulin sensitive, or because your body's actually overcompensating with hyperemia in response to insulin resistance. So all of this is to say, it starts way earlier than we're picking up. Most of it is preventable. Reducing glycemic variability improves our chances of not having chronic disease, heart disease, stroke, diabetes, obesity, and all the associated diseases.

Casey:

And glucose elevations in its own right, even if you're totally insulin sensitive, let's say I just eat the two packets of oatmeal and I go to 180 and I decide to do that every day for the next week, that 180, even though I'm metabolically healthy, creates issues. It creates like you said, advanced glycation and products. It creates oxidative stress. It creates acute inflammation. It creates reactive hypoglycemia, which makes me feel crappy and of course is an immune depressant. Even in a healthy person, glucose going up to 180 is going to cause some transient endothelial dysfunction and reduced immune function transiently. So all of that is to say, we all need to care about our glucose spikes, absolutely.

Dave:

The spiking glucose drops testosterone and drops immunity by something like 40%. So, and the advanced glycation in products, we have a lot of them over time. It causes aging, is one of the seven pillars of aging in my book, all The Upgrade Collective members, I just recorded that for you guys yesterday, the lecture from chapter two in the book about that. So those are definitely real and your immune function goes down and you have lots of advanced gly spikes. But I have to push back a little bit on one of the things you said that these chronic spikes in blood sugar are the cause of type 2 diabetes, or at least the cause of insulin resistance. Because we see insulin resistance in people who go keto for long periods of time, and it's caused by a different mechanism.

Dave:

And it's starting to look like long-term intake of high amounts of omega 6 fats, which by the way you avoid in my recommendations for a long time. But long-term amounts of those changes the amount of omega-6 in cardiolipin inside the mitochondrial membrane. Sorry to get nerdy guys. If you're listening to this going, "What did you just say?" But basically the energy producing parts of the cells become insulin resistant because you're eating a bunch of weird unnatural seed oils, even if you never eat any sugar. So how important is this type of fat versus eating spikes of sugar in the overall picture of metabolic health?

Casey:

Yeah. So the key thing that I think we have to drill home here is that mitochondrial dysfunction is a root cause of metabolic dysfunction.

Dave:

Yes.

Casey:

And there are many things that lead to mitochondrial dysfunction. And one of them is repeated glucose spikes and chronic over nutrition. But I mean, glucose spikes are low hanging fruit. And the sad thing to me is that there are so many people out there trying to do better with nutrition. 50% of Americans go on a diet each year to lose weight. And people actually think they're making really good decisions, and

sometimes they're not. And that's not because of lack of effort, it's because of intentional misinformation. And it's because of lack of awareness and closed loop biofeedback. And this is actually something we saw in our dataset that was fascinating to me, which is that in our best and worst foods there were things that were of the same category. And you can imagine the person going into the store and saying, "I'm going to choose this one over this one," thinking it's the same, but it's actually not. So an example of this is, we saw that people who got a Quest Bar or a Bulletproof bar were in the best top 50 scoring foods, lowest [crosstalk 01:00:59]-

Dave:

Oh really? You looked at both? That's cool.

Casey:

Didn't even look at it. They just are in the top 50, like it's not searching for it-

Dave:

Because of people naming it for it.

Casey:

Yeah. Because they're logging these in the ... But Clif Bar was in the lowest 50 scoring foods. To not confuse people, when I say lowest scoring, I mean biggest glycemic impact. So we use a score at Levels called the zone score, which is a score of one to 10, one being a really sort of it's like the bad mark on the report card, and this had a really high glycemic impact on you. And a 10 zone score saying this had minimal impact. And so you can imagine the person going to the bar section of Whole Foods where there's like a 100 different bars and they're like, "Ooh, these all are probably healthy, so I'm going to grab the Clif Bar." But they have a 40 point spike in glucose on average, versus the Quest Bar, the Bulletproof Bar, which had less than 10 milligram per deciliter spike.

Casey:

And so both those people are trying to make a healthy choice, but they're unfortunately, because they don't have the data they're going to get bamboozled by one of those choices. And we see the same thing with cereals, like Cheerios, top 10 were scoring foods. Magic Spoon, which I'm not saying Magic Spoon is healthy, it's still an ultra-processed cereal, but had a very, very low glucose response. So, that's just all just is to say that what really stings is when people are really trying to make good choices, but they just, something is kind of ... Without the data it's really hard to know what's causing a glucose spike in them. And when that adds up over time to sort of really have these physiologic impacts.

Dave:

It's so well put. One of the things that I've found from using Levels is that if I'm going to sit down and say, "Maybe I should eat." Or maybe, what would I say? One of the things that I've found from using Levels is that I sit down at a meal and say, "All right, do I want to order this? Or do I want to eat some of this?" And then I'll actually think about it, because I know after having done this for a few weeks, I know what it's going to do to my score. I've had perfect blood sugar all day, and is it really worth whatever that thing is? And you realize it wasn't, it was just a transient thought. It was your meat operating system saying, "Carbs, carbs, everybody eat carbs."

Dave:

And it's not like I'm denying myself. It's not like I'm eating zero carbs. It's not that I'm eating in ketosis most of the time, I'm just on a moderate carb. And when I eat the carbs, they're the kind that don't spike my blood sugar. And when I do eat them, yes, I have lots of fat with them. I have protein with them. And if I know I'm eating carbs, like substantial amounts. Yeah, I'm going to take some supplements someone's designed specifically for blood sugar. And then, what do you know? I usually stay within the numbers. And if I don't, oh my God, I'll do 10 squats, just air squats. And you wait 20 minutes and your blood sugar drops. Who would have thought I put the blood sugar in my arse, and that's okay. So what else besides going for a walk can you do before or after a meal to keep your blood sugar under control if you're going to eat the donut?

Casey:

There's several things. So the first thing is you can preload the donut, and by preload I mean fat, fiber and protein. So have a chicken breast before the donut, give it 15 minutes, eat two small handfuls of almonds or whatever, nut, pumpkin seeds. Or have some high fiber food. So like a chia pudding or something like that. There is evidence to support the fact that pre-loading with fat, fiber or protein diminishes the post-meal glucose spike for several reasons. It may slow down GI transit times, so you absorb it more slowly. Fiber may actually block your ability to absorb all the nutrients, which is pretty darn magical. And yeah, so that's, and protein can have several different effects. One is that it slows digestion. The other is that it may actually increase your insulin response. So you kind of just see lower glucose, which I don't know if that's a great thing.

Casey:

Interestingly, dairy protein seems to be the one that spikes insulin a little bit more. But not to get things too complicated, fat, protein, fiber before the donut can help reduce glucose spike. There's other things as well. There's of course the apple cider vinegar shot, which appears, vinegar appears to be an insulin sensitizer. It actually doesn't just have to be apple cider vinegar, it could be white vinegar. The key thing is to check the vinegar and make sure it doesn't have sugar, because there are some balsamic vinegars in the store that have three to five grams of sugar per tablespoon or two tablespoons, so.

Dave:

Balsamic's a bad choice anyway. It's the highest in lead and it's the highest in mycotoxins of all the vinegars and probably histamine too. So yeah, it tastes good. Add a dose of allulose or Stevia and apple cider vinegar. It will taste like balsamic anyway.

Casey:

Totally.

Dave:

We can just get over the balsamic thing.

Casey:

I have actually really moved away from balsamic since wearing glucose monitoring, because it's an easy way to kind of just kill your salad. I like a champagne vinaigrette or something, or like a vinegar or something like that. But just make sure it has no sugar, so that really can help. And one to two ounces of apple cider vinegar can lead to a statistically significant reduction in glucose spike from a carbohydrate meal. Cinnamon of course is one. There's various supplements. Like you talked about chromium and

others, berberine. And then of course, there's just sort of thinking about the context in which we're eating the meal. Did you sleep poorly the night before? Your glucose response is likely going to be higher.

Dave:

It's so cool. If you have an Oura ring or any sleep tracker and you have the Levels glucose monitor, it's nuts. You get a really crappy night sleep. You wake up, whatever you eat, your blood sugar goes up. It's so annoying. You can have fat and it won't do it, but any protein, "Like what the hell? I just gained 15 points of blood sugar from the same meal I had yesterday." You certainly realize, "Wow, I have a lot more control, but I have more responsibility. Like Spiderman's uncle."

Casey:

Totally, totally. I consider continuous glucose monitoring now not just a food bio-feedback tool, but also a stress and sleep bio-feedback tool, because I do see my baseline glucose just resting between meals is higher when I have poor sleep. And then of course, if I'm stressed, my glucose is often higher and stress will even create a glucose spike all on its own, which I know you've talked about on the podcast before, because cortisol basically tells your liver to dump glucose. And so I think about that now when I'm eating. Let's say you're going to eat the donut, don't eat it when you're super frazzled and stressed out after you just opened an intense email that got you worked up. Don't eat it after the night that you got four hours of sleep.

Casey:

Eat it the day that you've done a high intensity or training workout in the morning and got some good sleep. You're going to be way more insulin sensitive, so you're kind of getting a better bang for your buck in terms of that sugar load. Of course, that's not the way physiology wants us to do it, because when we're sleep deprived or stressed, it actually drive us to want hydrochloric foods. But one thing that's kind of interesting that you might not even see on a glucose monitor, but there's been studies showing that for people who have been sleep deprived, even for one or two nights, and not like no sleep, just less than optimal, maybe 6.5 hours or so, short sleepers. When you give them an oral glucose tolerance test the next day, so that 75 gram glucose load, their glucose response actually looks the same if you look at the studies. But they had to secrete 50% more insulin to keep the glucose in that same range as the people who got good sleep. So, that just shows you how insulin resistant one night of poor sleep can make you.

Casey:

So yeah, anyways, don't. It's just so important. And we just did, the results have not been published yet, but we did a lightweight study with WHOOP, and actually showed for the first time that our metabolic score correlates with the recovery score. So, some data showing that it actually, if your recovery's low, probably a day you want to dial into bit more of maybe little keto forward day, or just be really aware of what you're eating. And even though our physiology's going to drive us to want to eat more sugar on those days that our recovery scores are lower, I think our brains, our big human brains are strong enough to use that biofeedback and that awareness to maybe overcome that primal sort of drive. So yeah.

Dave:

I love this. I have one more question for you. Diet soda, must be good for you, because it might not spike your blood sugar as much as real soda. Tell me your thoughts on that, Dr. Casey?

Casey:

Yeah. So this is a perfect example of why the glucose monitor is not the end all be all. And glucose should not be the only metric through which you determine your diet and why the future of multi-molecule sensing is going to be very exciting, because we're going to be able to understand more features of how food's affecting our bodies and be able to disambiguate some of these mysterious ones. Diet soda, if it has sort of standard artificial sweeteners in it, they have a few effects. They one, are going to impact the microbiome. Potentially promote dysbiosis, which is deeply related to our metabolic health. Our microbiome are one of our greatest superpowers in terms of keeping us metabolic healthy by their production of short-chain fatty acids and many other mechanisms. So that's one that artificial sweeteners can perturb.

Casey:

The impact on our hunger hormones and some of our digestive hormones like GLP-1, we know that the artificial sweeteners can do that. And then also just the effect on our brain, the cephalic insulin response, which is this response in the brain where even in the absence of real sugar, our body thinks it's getting sugar, so it releases insulin. So even though the glucose doesn't rise, your body may be, we may be working that pancreas totally unnecessarily. And-

Dave:

Is Stevia and monk fruit, are those going to do the same thing? I've seen mixed numbers on those.

Casey:

We have reviewed this research, and long story short, I think monk fruit and allulose are probably going to be your best bets in terms of non-nutritive sweeteners. These are not artificial sweeteners, they're natural in a sense, and they're non-nutritive, meaning they're not going to spike your glucose. And I think Stevia, I've seen some mixed stuff, GI upset and things like that. So I tend to stick, and I also don't like the way it tastes, but I tend to stick with monk fruit and allulose at this point and I avoid artificial sweeteners.

Dave:

Xylitol?

Casey:

Xylitol, I don't know the latest date on that, but I know that with xylitol and some of the sugar alcohols there can be some of that GI upset.

Dave:

Yeah, allulose is also a sugar alcohol though. It's just, it just has less of a GI thing. So xylitol seems to not cause an insulin spike, but if you take too much of it, it gives you disaster pants. And if you go with the erythritol, you get explosive gas. And if you mix the two together in the wrong combination, you get the depth charge effect. These are long-term keto words. So what you're looking to do there is say, "It was sweet enough, but not sweet enough to wreck my gut." Unless you go into the monk fruit and allulose

territory. In which case I do notice a high dose of allulose I don't feel as good on it and there's a little bit of GI, but not like the other stuff. So I think monk fruit is best and Stevia seems to be okay. But better than all these artificial weird ones and certainly doesn't have the gut wrecking effects.

Casey:

No question. I mean, I think the take home point is, monk fruit, allulose, Stevia, and try not to eat the artificial sweetener ones, because there's enough evidence at this point that they mechanistically kind of impact our bodies in a negative way that I would say, avoid it.

Dave:

I actually save the chemical artificial sweeteners for the calorie counting people. Because they already feel bad, they won't notice if they eat them and it will make them feel worse. So it's an act of kindness to save those for that crowd of angry, hangry, sad people. Are you laughing at the suffering of trolls? I see what you're doing there, Casey, it's okay. I checked with various Buddhist Lamas about it and they all said it was okay. As long as you said you were sorry afterwards.

Casey:

No comment. And I am very grateful for the work you do. And I am hoping that we all move towards a more and more rational understanding of food and its impact on cell biology.

Dave:

The other thing we can do is we can have open uncensored, unflame and trolling conversations that say, "Well, here's the data. Here's what works for me. Here's what works for the 100,000 people who've follow my mind." And you say, "That can't work, therefore it doesn't." That's not science. We say, "What's going on here? Let's figure it out together." That's where I want us to all be.

Casey:

This is the most exciting aspect. Well, I get very excited about this in general, but one of the most exciting aspects about each of us having a personal dashboard of our data is that you can't fight with it. If I am showing someone that I ate this and it caused no glucose response or caused a huge glucose response, that is my truth. I mean, that I can say, "Oatmeal is not heart healthy for me," and I have the data to prove it. And I think what we're going to see happen in the next five to 10 years with this more of this bio-wearable data. I mean, I think about heart rate variability too, thinking about this objective marker of stress, and all these choices we're making, and really knowing what is causing stress dysfunction in our body.

Casey:

Coupled with glucose, coupled with the sleep data, I think, and I'll stick just to talking about food here, I think we're going to see it shift the conversation in some of these new nutrition war spaces, because it's going to become the norm for nutrition influencers to really I think have to show the data and show the goods. And it can't just be personal opinion. It has to actually work and have this readout, and that is a world I want to live in where we actually have to have objective data before we go crazy talking about why something is the best thing or the worst thing in the world. And so I think we're going to start to see a lot of nutrition, at least the forward thinking nutrition influencers start to lean on more of this, and we're already seeing it start to happen. And it's a more transparent world. It's a more personalized world and it's a world with more agency and critical thinking and we all want that, so.

Dave:

Levels is doing something else. So they'll give you your individual dashboard, but when you say, "Well, it wasn't just this one person, because maybe they were weird." It was, "We looked at a 100,000 people and this actually seems to work for 87% of people." You're like, "There you go. Maybe you should try that first. And if it doesn't work for you, you did to get your data, then do something else." And this is going to totally just blow up all the dumb marketing campaigns that are built on, "It's heart healthy." Like, "No, it's not. It's just, it's balance sheet healthy is all it ever was. And we're done with that." So your combined dataset is the most precious thing that Levels is doing for the world. But your individual dataset is the most precious thing you're doing to make a person feel good. And when the feedback from the person goes into the system to increase our knowledge of human metabolism, that's where the real win is. That's why this whole space just has me all lit up. That's why I want to do the interview today. So thanks, Dr. Casey.

Casey:

Thank you. Thank you. And I think the personal, the collective and some, Michael Schneider at Stanford's doing really cool work about the glucose type stuff, which is, let's say 87% of people respond a certain way but there's a lot of outliers there, how do you actually find patterns amongst different subgroups, different phenotypical groups within the average that all respond similarly to the same stuff? Then can you start to guide people based on, "Okay, if you respond this way to this food, it's likely that because you're kind of part of this glucose type that you're going to respond similar to other food." So that sort of predictive modeling is also, I think, where we're going to see that intersection between individual data and population data. And Stanford's doing some really cool work on that, but we're just super grateful to get to chat about this with you on the podcast, and so thankful.

Dave:

Well, thanks for co-founding one of the most exciting biohacking monitoring companies. And thanks for getting us out of the stamp collector, coin collector, baseball card collector. "Oh, does that make you happy? You collected a bunch of data and you didn't do anything with it." This is one of those things where you can literally look at it. "Oh look, I have an 80% metabolic score day. It actually work, so I wave it over my arm," and you know. And am I happy with an 80% metabolic score? Absolutely. I don't care if it's a 100, plus last night I got garbage sleep, so I'm actually really stoked on that.

Dave:

And I haven't been on a zero carb diet either today. So there you go, it's a win. But I know, before even though I have access to a million dollars' worth of upgrade labs tech downstairs, I couldn't do this. Unless I pricked my finger all day long, which no one's going to do.

Dave:

So anyway, thank you. I think you're doing good work in the world, Casey. [Levels.link/dave](https://levels.link/dave), guys, you want to be at the front of the line to get this. It is worth the wait, and it is worth doing very much so. Because if you know everything you put in your mouth does something to you, you'll be more aware of it. And end of the day you'll live longer.

Casey:

Exactly, couldn't agree more. Thank you, Dave.

Dave:

You're listening to The Human Upgrade with Dave Asprey.