Episode 402: How to Use Glucose As a Continuous Health Marker for Metabolic Health With Dr. Casey Means of Levels

Child: Welcome to my Mommy's podcast.

This podcast is sponsored by Four Sigmatic. They are one of my favorite companies. I've been talking about them for years and they are well-known for their incredible and delicious mushroom drinks and products of all kinds. I have personally been starting my day with their coffee with Lion's Mane in some form for years. I really like their ground mushroom coffee with Lion's Mane because it works just like any other coffee, whether in a coffee maker or I use Chemex or a Ratio. And it has an added benefit. So, obviously coffee is one of the most consumed beverages in the world. Theirs is unique because it adds Lion's Mane. So you still get to keep the benefits of coffee but the addition of Lion's Mane really supports productivity and focus in a really unique way, and I find really helps cut the jitters. Lion's Mane is one of my favorite mushrooms, and I love that their coffee contains it. They have both the ground coffee and instant packets, which are great for on the go and then I always keep in my purse, especially when I'm traveling. Their coffee with Lion's Mane also includes a mushroom called Chaga. And you might have heard me talk about this on my interview with Tero, who's the founder of Four Sigmatic on this podcast. But Chaga is known as the King of Mushrooms. And it's one of my favorites because it is a really functional mushroom full of antioxidants and beneficial compounds that support the body in various ways, including by supporting the immune system. They have many other products as well, including single Elixir blends of mushrooms like Cordyceps, Chaga, Reishi, and Lion's Mane, as well as several other coffee products, including one with Lion's Mane, one with Cordyceps. I really loved all of their products that I've tried and my kids love their Reishi Cacao at night, and I love that it helps them sleep. A common question I get, does this coffee taste like mushrooms? Or people say, "I don't like mushrooms. Will I like this coffee?" And I can tell you their coffee, especially the Lion's Mane coffee tastes exactly like regular coffee, does not at all taste like mushrooms. You just get the benefits of the mushrooms without the taste. I have found that mushroom coffee is also very gentle on the gut. So it doesn't leave the jitters or that crash like some coffees do and the Lion's Mane seems to really enhance the natural effect of the caffeine. All Four Sigmatic products are organic, vegan, and gluten-free. And every batch is tested by a third-party lab to ensure that they don't contain any heavy metals, allergens, negative bacteria, yeast, mold, mycotoxins, pesticides, etc. So you're getting the highest quality product available. They are all backed by their 100% money-back guarantee. So you can try these with complete peace of mind. I love this company so much that I've worked at an exclusive offer just for "Wellness Mama Podcast" listeners. You can receive 10% off of your whole order on any Four Sigmatic products including their mushroom coffee or their Reishi, which is part of my nighttime routine. Check them all out at foursigmatic.com/wellnessmama and use the code wellnessmama, all one word, at checkout to save 10%.

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mushroom, Bee Propolis and olive leaf extract. We're gonna talk about propolis again in a minute. But this B.Soothed Cough Syrup is free of drugs, dyes, dirty chemicals, and refined sugars. And it's delicious, has a naturally sweet berry flavor and my kids love taking it, which is great. Like any remedy, I hope it's one that you never need but if your family gets the slightest hint of any of the ickies this year, B.Soothed is one of my first lines of defense. But it's not the only Beekeeper's product I love. My family is also obsessed with their Propolis Throat Spray and their B.Powered.

So first their Propolis Throat Spray. If you're not familiar, propolis is a natural compound that bees make from plant and tree resins. It's not honey, but the bees make it to defend their hive from germs. Think of it like the hives immune system, and now we can benefit as well. This natural spray is also free of dyes, and chemicals, and anything unsavory. And I like to use four sprays every morning for immune support or anytime I'm feeling tired or when I'm traveling. Another thing I love of theirs is called B.Powered. And it's I think the most powerful honey on the planet because it's not just any honey. It's a therapeutic blend of propolis, like we just talked about, royal jelly, which is essentially the food for just the queen, and bee pollen. And together, these support all-day energy and are a little boost for the immune system. It'll give you natural energy but not leave you crashing later in the day. It is delicious. It can be drizzled on foods like yogurt, or put in smoothies, or eaten alone. A trick I have is to put a teeny bit of sea salt on it and eat just a little tiny spoonful straight. Like I said, it contains raw honey, that is an easily digestible natural fuel, bee pollen, which is denser in protein than any other source gram for gram on the planet. And it's used by Olympians to improve their endurance and enhance their performance. It also contains propolis, which is packed with antioxidants and germ-fighting compounds like we just talked about, and royal jelly, which contains the neurotransmitter acetylcholine, and some really unique fatty acids that promote mental clarity, brain health, and focus. Really incredible stuff. I would encourage you to upgrade your medicine cabinet and check out all of their products, some of which sell out often. You can check them all out and save 15% on your first order by going to beekeepersnaturals.com/wellnessmama. So that's beekeepersnaturals.com/wellnessmama to save 15% and upgrade your medicine cabinet.

Katie: Hello, and welcome to the "Wellness Mama Podcast." I'm Katie from wellnessmama.com and wellnesse.com. It's wellness with an E on the end, my new line of personal care products, including good for your hair and scalp hair food hair care, dry shampoo, toothpaste, and hand sanitizer. You can check all of those out at wellnesse.com.

This episode goes deep on using glucose as a continuous health marker for metabolic health. This is something I've been experimenting with lately. You guys might have seen me on Instagram with a continuous glucose monitor on my arm. And I have learned so much from just one month of tracking that I wanted to have one of the doctors that helped develop this on and go really deep on the subject.

So I'm here with Dr. Casey Means who is a Stanford-trained physician, and she's the Chief Medical Officer and Co-Founder of a company called Levels, which if you wanna check out, you can go to levels.link/wellnessmama, which will let you bypass the waitlist for them. But this is a continuous glucose monitor that you can use even if you are not a diabetic to see what foods and other lifestyle factors impact your glucose and how. And I learned some really, really fascinating things from this experiment, including

carb-based foods, like sweet potatoes that almost have no measurable spike at all for my blood glucose and others that I would think would be fine, that have a huge spike. It really helped me personalize. I also found I got spikes from certain types of exercise and sauna. And Dr. Means explains today why these are different than food-based spikes and they're actually a really good thing. But we go deep on things like chronic inflammation, why 88% of Americans have at least one biomarker out of range that shows metabolic dysfunction, ways to improve your overall glucose, your insulin sensitivity, your fasting glucose, and to mitigate carbohydrates so you can eat more of them without the spikes. We cover lots of other topics as well. This is a super fascinating episode that I know you're really, really gonna enjoy. So let's jump in. Dr. Casey, welcome. Thanks so much for being here.

Dr. Means: Thank you so much for having me.

Katie: I'm so excited to delve into this topic today because even though I have been in the health world for 14 years now, I feel like I've learned so much in the last couple of weeks from doing a deep dive into continuous glucose monitoring and you guys have a resource that makes that easy and you have a lot of expertise in this area. Before we go deep, I would love to hear how you came to focus on this.

Dr. Means: Sure, absolutely. So I am a medical doctor and I started my medical journey at Stanford Medical School and then I pursued residency training in the field of head and neck surgery. So sort of a circuitous path to metabolic health from surgery. And so, you know, I was in my surgical training, head and neck surgery, otherwise known as ear, nose and throat and I was about four and a half years into my surgical training when I had this fairly major realization that almost all of the conditions I was treating were in some way chronic inflammatory in nature. It was sinusitis, thyroiditis, you know, inflammatory masses of the airway, chronic ear infections. And so much of these conditions were fundamentally rooted in some way that the immune system was getting revved up and causing inflammation that ultimately led to, you know, the puss buildup of sinusitis or the autoimmunity of Hashimoto's thyroiditis and, you know, then we treat with medications or steroids. And I really sorta stepped back and asked myself why is everyone so chronically inflamed and why am I reaching for my prescription pad to constantly prescribe steroids, you know, oral steroids, inhaled steroids, steroids sprayed in the nose, IV steroids which all suppress the immune system as opposed to thinking about what is generating this inflammation in the first place. And then, you know, when our medications fail, these anti-inflammatory medications fail, we reach for the scalpel. But surgery is fundamentally an anatomic intervention and it's not really gonna be able to impact a core inflammatory problem.

So this got me really digging into literature and seeing so much that so much of this threat that our immune system is sensing is really caused by our exposures and our choices that we make every day like the foods we're exposed to and how much sugar we eat and how much chronic stress we have and whether we're sedentary and, you know, how much sleep we're getting and how...the quality of that sleep and the environmental toxins we're exposed to and micronutrient deficiencies that...and all of these things are really the exposures that lead to this chronic inflammation and these are modifiable. And unfortunately, they're not really addressed in clinical practice because physicians tend to not have a lot of time to talk to patients about these factors and we also don't get that much education about some of these root causes of inflammation. We get much more training about, you know, medication and surgical management.

So basically, I became really fixated on the ways we could help patients, you know, better understand how they could impact this chronic inflammation in their lives and what tools we could, you know, develop to actually empower patients and individuals to take control of their health and health behaviors in a way that was just really high impact and leverage. And, you know, it's not that a 15-minute conversation with a doctor is necessarily gonna really be the thing that can transform a lot of these behaviors. I really do think it has to be something that is something embedded in someone's daily life. And all of this got me really focused intensely on metabolic health because when our metabolism and specifically our blood sugar is out of control, it can directly drive inflammation and impair all aspects of health. And then on the flipside, controlling our blood sugar is like a super power. It can improve energy, it can improve memory, endurance, sleep, mood. It can also of course ward off future metabolic diseases that range from, you know, diabetes to obesity to cancer to dementia to infertility to erectile dysfunction to fibromyalgia to chronic liver disease. All of these things are related to metabolism and blood sugar dysregulation and if we could just control it upfront, you know, we could really make a big dent here.

So to me, getting blood sugar in control just seemed like the lowest hanging fruit intervention we could do to massively improve the health of individuals and the population at large and to reduce inflammation at scale, this chronic inflammation I was seeing so much in my practice. And it's just such a massive thing. You know, we have 88% of the country being metabolically unhealthy right now based on a recent University of North Carolina study meaning that 88% of Americans have at least one biomarker indicating metabolic dysfunction. Either waist circumference, glucose or cholesterol. And that's hundreds of millions of people who could be living a better life if they had their blood sugar under control and their metabolism better under control. So that became really my laser focus and building tools to help people get control of this. And that's what led me to starting Levels and to really being committed as a clinician to working with entrepreneurs and engineers to scale tools that are gonna help people take control of their health and, you know, ideally, keep people out of the operating room in the long-term. So now that's my core focus and have moved away from surgery and I'm laser focused on digital health as a way to improve healthy behaviors at scale.

Katie: That's...and it's so exciting that we have access now to tools that let this be easily measurable. And obviously, we're gonna go very deep on glucose today specifically but before we move on, you mentioned 88% of Americans having at least one biomarker for metabolic dysfunction. Can we just briefly touch on what each of those biomarkers are and if that's something that we can track as individuals as well without having to go through our doctor? Like is tracking waist to hip ratio, is that a good metric like to track and how do you recommend people track those?

Dr. Means: Yeah, absolutely. So in this particular study that was done out of UNC, they were looking at defining optimal metabolic health as having optimal levels of five factors. So those were blood glucose, triglycerides, high density lipoprotein cholesterol, blood pressure and waist circumference without the need for medications. So if people had all of these things in the optimal range, they were considered metabolically healthy and only one in eight Americans met that criteria.

So, you know, simply, this really...I mean, these are simple tests to do, right. It's just measuring your waist circumference, blood pressure, getting your cholesterol checked and getting...making sure you're getting your glucose checked. And those are all things, you know, that are simple and important to do but, you know, then the question is, "Okay. Well, if one of these is off, how do we move it in the right direction?" And I think that's where we really struggle. We often are prescribed, you know, either a statin for the cholesterol or a medication for the glucose or an antihypertensive medication for the blood sugar. But we're really, I don't think, getting the support we necessarily need to actually change these things from the inside out.

So those are the five things that they looked at in that study.

Katie: That's so fascinating. Okay. So to go deep on glucose...to start off, let's define...for anybody who maybe isn't familiar with tracking this as a metric, what is considered a healthy range of blood glucose and at what times? Like how would someone know if they were able to measure what was considered healthy?

Dr. Means: Great question. So currently we have standard criteria in healthcare to understand sort of what is a "normal" nondiabetic glucose level. And what I would say is that those are fairly lenient. They're really more guidance to know whether you're in a category of risk like prediabetic or diabetic. But these ranges don't actually tell you what might be optimal for metabolic health. But I'll review those first just for context since this is what you're gonna see, you know, if you go on the internet and google healthy glucose levels.

So standard criteria by the American Diabetes Association is that to be normal, you know, nondiabetic individual, you need to have a fasting glucose that's less than 100 milligrams per deciliter. The second criteria is what's called an oral glucose tolerance test and this is a test where you drink 75 grams of glucose, a standardized drink and then they check your glucose over the course of two hours after that drink to see what happens for your glucose. And if your glucose goes up after that drink but at two hours, you're less than 140 milligrams per deciliter, you're considered to be, you know, normal. If your glucose is 140 to 200 2 hours after that drink, you're considered prediabetic and if you're above 200 2 hours after that drink, it's considered diabetic.

And then there's a third test that is the hemoglobin A1C which is a marker of basically three-month average of glucose in the blood. And for that, it's a blood test and it's basically if you're below 5.7 of a hemoglobin A1C meaning that...and what they're looking at is your red blood cells and how much sugar is actually stuck to your red blood cells. That's called glycated hemoglobin. If that percentage is less than 5.7% of glycated hemoglobin, it's considered a normal A1C. If it's between 5.7% and 6.4%, it indicates prediabetes and 6.5% or more is diabetes. So these are kind of like the standard criteria. But then really the question is what should we actually be shooting for if we want to be as healthy as possible. And that I think is actually very different ranges but it's not...we don't have a standardized opinion in healthcare on this and I think that's largely because nondiabetic individuals haven't really been testing their glucose very much in the past. We haven't really known how important this is. But for that I would actually kind of give you more what I would say is my opinion based on just intensive review of the literature and I would say really the healthiest range you wanna shoot for is

keeping your glucose between 70 milligrams per deciliter and 120 milligrams per deciliter throughout the entire day. So really not going above 120 if we can.

A lot of this comes from research where they've put continuous glucose monitors on healthy populations and just looked what happens to their glucose throughout the day. And what you find in these studies is that for greater than 90% of the day people are staying between 70 and 120 if they're quite healthy. So that means no really, really big, big spikes and certainly not getting up to the 140s or higher like you see...that are considered, you know, not necessarily abnormal in these oral glucose tolerance tests. So sticking between 70 and 120 is likely ideal.

For fasting glucose, like I mentioned, less than a 100 is considered normal under standard criteria. I would say that what we should be shooting for is more about 70 to 85. So the low range of normal. There's quite a few studies that show as people's fasting glucoses increase, even in the normal range up from, you know, about 70 towards a 100 all of which is considered normal, you actually increase your risk for a number of diseases including development of diabetes and heart disease and stroke. And so really keeping that fasting range tighter in a lower range is likely where we wanna be.

And then then last thing I'd say is that we now with continuous glucose monitoring technology have the ability to sort of know what our average glucose is over a 24 hour period which is a new piece of data that we have that we didn't really have in the past when all we had was just these one-time point finger prick measurements that we could do. Now that we have a continuous data stream with continuous glucose monitoring, we can actually see our 24-hour average levels. And in these larger studies of healthy populations I mentioned people tend to have an average glucose of about 100 to 105 milligrams per deciliter. So I'd recommend that for people who are tracking it, really trying to shoot for a 24-hour average of 105 or below is ideal. I tend to try and keep mine in...actually down in the high 80s, very low 90s for an average 24-hour glucose.

So, basically to sum up, 70 to 120 throughout the entire 24 hours. Keeping an average below 105, ideally less than a 100 and then a fasting glucose between about 70 to 85.

Katie: It's so cool to be able to have that kind of data. And I know my first experience to the oral glucose tolerance test was during pregnancy and I did that with my first few pregnancies and then learned that you could also do that by monitoring your glucose on your own which I chose because I'm not a fan of drinking that much sugar water to begin with. That is not something I would ever normally do. So I would just test my own blood glucose with a regular monitor in the morning and then at one- and two-hour intervals after every meal and log that for my doctor and my midwife. And that was my first exposure to just how fascinating that variation was and it gave me so much more data to be able to really track and see, "Okay, like certain foods, even though they're carbs, I do great with those." Whereas others that should be fine would tend to spike glucose a lot more. So I thought that was really, really fascinating. And then since that time, we now have this ability to track continuously even through you guys as, you know, nondiabetics which is so fascinating. And I was so excited to get into this.

To go a little deeper on some of the things you mentioned...so you mentioned fasting glucose and I've read the same thing, that anything below 100 is considered normal and healthy. My now average is right about 80 which ironically some sources, like traditional medical sources seem to say is a little bit low which...I agree with you. It seems like optimal and normal are not the same thing at all. But I've heard from people who...other moms who have tested that will have a spike when they first wake up and then it'll go back down to really good levels. And I've, from my research found that this is sometimes called the Dawn Phenomenon. Can you explain kind of what that is and what's going on?

Dr. Means: Yes, absolutely. The Dawn Phenomenon's pretty fascinating so...and this is something that so many people, healthy people using CGMs, continuous glucose monitors will see on their data. So you basically...let's say your alarm goes off at 7:00 a.m. and that's when you, you know, you open your eyes and your glucose might be at, you know, 75 or 80 and you might see over the next half hour or so your glucose goes up to 80 or 90 or 100. And then, you know, quickly comes back down. And this is called the Dawn Phenomenon. And the physiology of this is that when we wake up, our body actually releases a surge of cortisol, one of our stress hormones, traditionally known as our stress hormone. And the purpose of this is to get us to open our eyes and get out of bed and it tells our body like it's ready to go. It pushes our body to get started.

But what cortisol also does in the body is it actually tells the liver to mobilize glucose. We have been evolutionarily wired to respond to stress hormones like cortisol and other catecholamine's by dumping some of our stored glucose from the liver into the bloodstream because traditionally if we were having a stressful event...you know, you can think way back to old times, that example of like we were probably being...you know, maybe we were being chased by a lion. We needed glucose to feed our muscles to escape whatever stressful threat was happening. So we are wired to respond to stress hormones by releasing glucose to basically fuel us to get out of bed, to move. So that's actually a fairly normal response, the Dawn Effect. We see it much more pronounced in diabetic individuals who are very insulin resistant. So because their cells are extremely resistant to insulin that effective...that glucose in the blood is gonna look a lot larger, you know, because they're not gonna be able to take it up into the cells as easily since they're insulin resistant. So you see a much smaller Dawn Effect in nondiabetic individuals.

And there's some evidence that the bigger the Dawn Effect, the more we're either dealing with problems of too high cortisol or maybe some underlying insulin resistance. So there's some evidence that the smaller the Dawn Effect, the better and that a really big Dawn Effect, you know, 20, 30 points might indicate that there is some underlying issues with, you know, chronically high cortisol response and/or some underlying insulin resistance.

Katie: That's fascinating. And that makes so much sense, what you mentioned about the response to any stressful event. The body would need to mobilize that muscle glycogen for glucose so that we would have the ability to respond. And it makes me think from the little bit of research I've done...I'd love to go deeper on this but when I was wearing a monitor, I would see from really high intensity workouts especially like really intense sprints or really intense weight training, I would see like a big spike...not a big spike but I would see a spike in

glucose. The same thing with really hot saunas. And the same thing with...I did this ceremony called Kambo which is like a frog venom which is a very stressful lymphaticand that actually...everything I...the whole time I had the monitor on, that spiked my glucose. It was the only time it was ever above like 125 or something. But I'm...so is that the same thing? Is that why people will see that spike in response to exercise or sauna or stress?

Dr. Means: Absolutely. And I'm dying to hear more about this frog venom ceremony. That is so interesting. But yes, you're exactly right. That is the same physiology. What we see with high intensity interval training and high intensity workouts as we do with stress. When we start a really intense exercise, one that's, you know, bringing us to a high VO2 max, you know, really 80% or above of our max heartrate or our VO2 max, that is...even if it's exercise that we're intentionally doing and we know we're doing it and we love it, you know, even if it's our favorite Peloton or a lifting workout, you know, that is still actually gonna generate a stress signal in the body. It is going...the body will release cortisol and it will release other catecholamine hormones to drive the body to be able to respond to that stimulus. And so that is gonna tell the liver, "Okay. There's a stressor. It's exercise. Get hat glycogen broken down into glucose, get it into the bloodstream."

And so that's actually really...can be a sign that you're having a high intensity workout. And to some extent, I actually now look at my spikes during workouts as a measure of how intense I am going. It's almost like a biofeedback about whether I'm pushing myself hard. And there's evidence that those spikes are not actually maladaptive. So glucose spikes after food are gonna create one pathway of physiology where, you know, you eat the high carbohydrate meal. Glucose is broken down and is in the bloodstream. That's gonna cause body to release insulin to help the body essentially take up this glucose into the cells. And that's one process. But with exercise, it's very different. The body's mobilizing stored glucose for an actual need and the muscles interestingly actually have an insulin independent way of taking up glucose. Just by the sheer movement of the muscle fibers contracting, these cells can actually take up glucose independent of insulin. So it's a very different physiologic pathway. And high intensity workouts are pretty universally shown to improve insulin sensitivity over time and improve our metabolic health over time. Even the next day after a high intensity workout people may be more insulin sensitive. So very different type of spike than a food spike and not one that we should necessarily fear.

And so we've actually, you know, built that into the software with Levels to be able to sort of exclude those spikes from your overall glucose scores because they are a very different physiology.

Katie: It was so interesting to see that. And that makes sense. I'm glad you explained that those aren't necessarily negative, to have those kinds of spikes because the first few times in the sauna or from running, I'd be like, "Whoa, that actually is pretty amazing. Like it can get as high as from eating sometimes." But it makes sense. And then I noticed over time that for like 24 hours after I would have very steady glucose even if I ate carbs which makes sense because your body then has to replenish that. And, you know, you always hear like it's okay to eat certain types of healthy carbohydrates, especially after exercising. I got to watch that in real time. It was so fascinating.

Dr. Means: Exactly. And I think another thing that's kinda fun to think about is like when you're seeing that spike, you are actually seeing your body clear its glycogen stores in a way. You are emptying that tank of that stored glucose and so you're really moving...as you...let's say you're working out in a fasted state. You're doing an early morning workout, you haven't eaten any carbohydrates and you get this glucose spike with a high intensity workout. You know that's coming from within your body because you haven't eaten anything. So you're actually clearing out that stored glycogen and moving towards that point when you're not gonna have glucose in the body to really be able to mobilize for your activity and you're gonna have to transfer into fat burning. So when we sort of run out of that glycogen, as we empty that tank, we start to increase our fat burning percentage and the more we do that and get into that place where we actually have to tap into that fat for energy, the more we're gonna build that metabolic flexibility that is so good for health, that ability to flip-flop between glucose and fat.

And you can imagine if you, you know...let's say you're eating glucose during a workout. You're, you know, eating Gatorade or gels or whatever and you're replenishing that glucose exogenously. You're not gonna empty the tank, right. You're gonna keep providing your body with this glucose energy and not gonna need to tap into that fat.

And so, it's really...I would say it's great to be able to see that on a monitor when you're working out to really know like, "I am getting...working through this glucose and that means that I am gonna start burning more fat." And that we know is great for health. And, you know, I think Dom D'Agostino on your podcast did such an amazing job of explaining a lot of that physiology of why you wanna get into the fat burning. But what you're seeing on your monitor is that happening in real time.

Katie: Yeah. And I think that's...you're so right. The goal absolutely should be metabolic flexibility and that's my concern when people get overly dogmatic with any particular diet and do the exact same thing over time. I had a doctor years ago tell me, you know, "Don't do the same thing every day. That includes don't eat the same things, don't eat the same amount of things, don't eat the same...at the same times, even don't take supplements on the weekend." Just don't ever let your body get totally adapted to anything because at the end of the day, the goal of all of those things is to be very adaptable, metabolically flexible humans so our bodies can handle whatever we throw at it.

Before we move on from this topic, last thing on fasting glucose. Are there any things that can help...if someone notices they have a high fasting glucose over time to help get that number down?

Dr. Means: Yeah, absolutely. So this really gets into some of the core, you know, physiology of why our fasting glucose might be higher. And so just for a brief background on that, you know, we ultimately, our metabolism, you know, is the set of chemical reactions in the body that generate energy from the food that we eat. And we generally need to take fat and glucose and convert it into a usable form of energy in our bodies. And this is required for our bodies to function properly. And ideally, like you were talking about, you can flip back and forth between using fat and glucose based on what's available. But right now, because of just the massive exposure that the average American has to refined carbohydrates and glucose we are getting so much glucose

into our bloodstreams from our diets that over time we just keep spiking the glucose, we're eating lots of snacks, we're eating multiple times a day and what happens is that every time you do that, every time you have a glucose spike, you are spiking your insulin as well, this hormone from the pancreas that let's the body take that glucose up into the cells. And when this happens over and over, day after day, year after year, decade after decade, what happens is the cells become resistant to the insulin. And when that happens over time, it makes it...the body has to produce more insulin to actually get the same amount of glucose into the cells. You need that glucose in the cells. You need to convert it to energy. And so the body's like, "Okay, we're just gonna pump out more insulin to get this glucose in." But when this happens over time, there can actually reach a point where it's hard to even get the glucose into the cells because your cells are very resistant to insulin. And then you're gonna start to see that glucose creeping up. You're gonna start to see that fasting glucose creeping up over time. And that's that, you know, linear progression down the spectrum and the continuum of metabolic dysfunction from really a healthy insulin sensitive, you know, low glucose at baseline range to these higher levels of baseline where both insulin is higher at baseline and glucose starts to be higher at baseline.

And so that's sort of one reason why people might be seeing their fasting glucoses in the, you know, 90s or 100s is because their cells have become resistant to insulin and they're having trouble getting the glucose in. So then the question...then it becomes how do we, you know, do something about this. And the answer is really to improve our insulin sensitivity again. We need to make ourselves more responsive so that we can actually start bringing that insulin and that glucose down. And the way that we do that...one of the ways we do that is by keeping our glucose spikes down. If we can...and I like to think of it almost like working out. Like we go to the gym and we lift weights so that we can become stronger. We do reps to build muscle. And we have to do the reps with our metabolism to get a stronger, you know, more insulin sensitivity. And the way that we do the reps with our metabolism is we keep our spikes low. When we keep our spikes low day after day, week after week, our cells perk up again and they start hearing that insulin signal more robustly. And you need to basically then produce, you know, less insulin to get the same amount of glucose and then that glucose can start sort of falling again.

And, you know, the added benefit of that is that another function of insulin other than takin glucose up into the cells is that it also blocks fat burning. When insulin is high, it actually tells our body to not burn and break down fat for energy because it's a signal that the body has tons of glucose on board. So it doesn't actually need to use the fat. So as we get more insulin sensitive, we, you know, build our metabolic fitness, we bring our insulin down, we can allow our bodies to tap into those fat burning pathways more and we can start to lower our glucose levels.

So that's really a key is tracking glucose and learning what foods are spiking the glucose and then starting to bring it down. More broadly, I would say it's not just about the food as well and the spikes because there's many other things that contribute to glucose spikes than just the food and the carbohydrate content we're eating. The other things that really contribute to it are the stress that we're under, the sleep that we're getting and the exercise that we're doing. So to really have a comprehensive positive glucose response, we not only need to eat the foods that for us don't, you know, spike our glucose but we also need to make sure that we're managing our stress, we're getting good quality sleep, we're getting physical activity. You know, muscles are a

glucose sink. They're gonna take in that glucose. So doing those things are just as important for having just really holistic metabolic health.

And the last thing I'd say is that some people...I think some of us assume that like our fasting glucose, you know, it just is a...you know, it's just...it's at one place and it's gonna slowly like increase over time or whatnot but it's actually...our fasting glucose can actually bounce around day to day. And something that people might find is like on a day that they eat high carbs, don't exercise, don't get good sleep, their fasting glucose could be 5 or 10 points higher than a previous day. So just really making sure that we're monitoring it and keeping it, you know, as low and stable as possible and over time just making sure we're consistently keeping those spikes down so we can maintain our insulin sensitivity and improve it.

Katie: That's so, so interesting. And like you said earlier, to have...if you're gonna have spikes, have them from exercise because that's...like I got to see that adaptation in real time and it was so cool. And also to see things like those other factors you just mentioned with sleep and stress and exercise that...like I had read the research for years and you hear those soundbites of, "Even one night of impaired sleep can give you the glucose the next day of a prediabetic." And I actually saw that. It was so creepy.

Dr. Means: It is amazing how much of a profound lever sleep is. There are so many ways that sleep impacts our metabolic health and just like you said, there are studies showing that you can take a group of...there's a really interesting study where you take a group of healthy, young, nondiabetic individuals and subject them to four hours of sleep per night for just a few nights, just a handful of nights and they go from basically totally healthy glucose levels to prediabetic levels. And this is just absolutely amazing. The fortunate thing is that it is reversible when you actually get the sleep back under control. But it's amazing how these nonfood factors actually have a massive impact and the mechanisms are pretty fascinating with sleep. Sleep deprivation acutely increases our inflammation in the body. Our cytokines, like CRP and TNF alpha increase immediately after one poor night of sleep. Low nights of sleep immediately decreases our insulin sensitivity. It also changes our growth hormone. Our ghrelin, our leptin hormones. These are associated with energy storage and satiety and hunger. So it's, you know, it's not just about being tired. It's actually massive hormonal cascades that are changing when we get a poor night sleep.

Katie: That's so cool. And I know I've been saying for the past couple of years and I've seen in my own life just how personalized and individualized health is and I have said for years that I think this is the future of health. Anything that allows us to see those very personalized aspects because at the end of the day we are each our own primary healthcare provider and we're the ones putting food in our mouth and we're the ones exercising each day. And I feel like this really gave me a fascinating window into seeing what my own optimal versions of all of these things were gonna be whether it was the sleep and seeing how if I went to bed after 10:00, I would have a slightly higher fasting glucose than if I went to bed before 10:00 or if I ate after dark, I would have a higher fasting glucose than if I stopped eating at dark. And it made me also think, you know, all these things we read about like light impacting hormones which impact glucose, all of these things...to just get to see it in real time was so cool. And I found for me that things like just going on a light walk after meals had a big difference in my glucose and also sleep being a huge factor and stress. Like I could see those patterns in real time. But the monitor also let me test all kinds of different foods and see how my body responded. And at

first, I was like, "Okay, well, I'm gonna eat super, super clean and I'm gonna have like perfect levels." And then the second week I was like, "Actually, I'm gonna throw a lot of stuff at it and see what happens just to know." And it was really interesting because it seems like it's not all about carbs at all. Like I think that we can kind of fall into that way of thinking when it comes to glucose of like, "Oh, carbs are bad." And what I found, especially for me with working out more, I actually needed certain carb sources, sweet potatoes were a great one for me. But if I didn't get enough carbs, I would actually see too low of dips and also just be like grumpy and hungry. So it ironically got me to start eating more carbs but to identify the ones that I needed. But when it comes to carbohydrates, are there any general guidelines that are kind of across the board for people or amounts we should be staying under or is this really a very personalized, everybody has to figure it out kinda thing?

Dr. Means: Yeah, I would say the general guidelines that I can say is that no human body needs a refined carbohydrate or sugar. The, you know, ultra-processed grains and sugars are not good for the human body. They create hormonal cascades that are unnatural and we don't need them. So that's really the only blanket statement I would say about carbohydrates is that ultra refined versions of them are not good for human health.

But other than that, I think it really is how you put it. It is...every person really needs to understand their body's relationship with carbs individually. What's so fascinating is that we really used to think that, you know...we learned about the glycemic index charts and we thought, "Okay. Well, a particular food is gonna raise everyone's blood sugar the same amount." But what we've learned over the past four or five years through scientific research is that that's actually not true. And what's more likely is that each person responds to the same carbohydrate very, very differently in terms of how much their glucose actually rises in the blood. So you and I could both eat the exact same banana with the same amount of carbohydrates and potentially have a very, very different glucose response. And this was laid out in this fabulous paper that was published a few years ago by the Weizmann Institute in Israel called personalized nutrition by prediction of glycemic responses where they put continuous glucose monitors on a bunch of healthy, nondiabetic individuals and then gave them standardized meals and saw what happened. And based on sort of the more glycemic index philosophy, you'd think everyone would respond the same but it was just all across the board. So what might be a very, you know, metabolically healthy choice for one person was not for another person. And then they looked at what were the factors that actually went into predicting how someone would respond to a particular carbohydrate. And some of the key factors were things like microbiome composition and body type. So anthropomorphic features like how much visceral adiposity people had, how much visceral fat which is a...which can be sort of a signal of how insulin sensitive someone is. And even some things like sleep and movement had an impact. And so really how I like to think about it is like a carb in the mouth is not necessarily glucose in the bloodstream. There's a lot that has to happen between, you know, when it goes in the mouth and what actually happens in the blood that can really be very, very different.

And I am similar to you. You know, I...my body I think really thrives on a lot of carbohydrates. I'm actually 100% wholefoods plant based vegan and so I'm eating tons of carbohydrates each day and my glucose stays essentially flat. And the reason for that is because I have tested really every food in my diet and at this point understand which carbohydrates, which plant foods spike me and which don't. And the ones that spike me, I figured out how to modulate them to actually work well for me. So for instance, unfortunately, unlike you,

sweet potatoes are massive spikers for me. And some of the biggest spikes I've ever had have been from sweet potatoes. Up to like the 180s with one cup of just plain sweet potato.

Similar...oatmeal, grapes, corn. Those all will get me well above 150. And certainly rice or things like rice cakes or rice crackers. So for me, you know, it's like, "Okay. Well, those are gonna spike my glucose a bit. What can I do to maybe modulate them to be able to still have them in my diet?" And that's when you really get into the fun experimentation that you can do with a continuous glucose monitor. So something we know, a general principle is that when you add protein or fat to carbohydrates, it's gonna generally blunt the glucose response. So if I add, you know, tahini to that sweet potato, I'll have a lower response. If I add...so protein and fat are good sort of tools you can use to blunt the spike. Another one is fiber. Fiber tends to...carbohydrate foods with higher fiber...since fiber is non-digestible and absorbable, it's digested by our microbiome and not by our own bodies, it can be a helpful way to kinda offset some of the carbohydrates. So I'll actually add a bunch of chia seeds or flax seeds to a sweet potato now.

The other thing is actually food sequencing. So we know that if we actually eat other foods before we eat the carbohydrates in our meal it's also gonna blunt the glucose response. So if we eat like a salad or some sort of protein and fat before we actually eat our carbohydrates, we'll have a lower glucose response than if we just flipped it and had the carbohydrate first and the fat and protein or salad after. So something about the bulk and the slowing down of the food in the GI tract when the carbohydrates enter seems to be better.

Another thing is actually food timing. So whether you're eating the food earlier in the day or later in the day. So food that's eaten, you know, earlier in the day during daylight hours tends to have a lower glucose response than food eating after dark and you alluded to this with the late-night eating. And this really comes down to melatonin. We release melatonin at night to help us prepare for bed. It's released from the pineal gland. And this hormone actually tells the pancreas to produce less insulin. So we actually...for the same amount of carbohydrates sort of after dark, late at night, we're gonna probably see a bigger glucose bump because our...you know, we have less insulin circulating and so less ability to get that glucose up into the cells.

So there's just so many ways to modulate the carbohydrates to make them more amenable to our particular metabolism and it really comes down to, you know...like I mentioned, food sequencing, food pairing, food timing and then there's just a number of other, you know, adjuncts that you can try as well. You can like you mentioned, exercise or walk after a meal. Just a 20-minute walk after a meal can lower glucose responses. Making sure you're eating in a mindful way and not when you're stressed. That can actually have a really big impact on how we process the food. Making sure there's not a ton of cortisol surging through the body when we eat that food. Making sure we're eating our carbohydrates on days when we've gotten a good amount of sleep and we're not, you know, in a sleep deficit which is gonna make our baseline, you know, insulin sensitivity worse. There's just so many levers to pull to get a healthier glucose response. And so I think that's really the fun of experimentation and you just can't do it unless you have that continuous data stream to kind of create these different permutations of meals.

Katie: Yeah. I was very careful to track and so now I feel like I have a good bank of meals that I know all were scored like 9 or 10 in the Levels app. And so I like feel like really confident I can eat those without causing any kind of glucose spike.

This podcast is sponsored by Four Sigmatic. They are one of my favorite companies. I've been talking about them for years and they are well-known for their incredible and delicious mushroom drinks and products of all kinds. I have personally been starting my day with their coffee with Lion's Mane in some form for years. I really like their ground mushroom coffee with Lion's Mane because it works just like any other coffee, whether in a coffee maker or I use Chemex or a Ratio. And it has an added benefit. So, obviously coffee is one of the most consumed beverages in the world. Theirs is unique because it adds Lion's Mane. So you still get to keep the benefits of coffee but the addition of Lion's Mane really supports productivity and focus in a really unique way, and I find really helps cut the jitters. Lion's Mane is one of my favorite mushrooms, and I love that their coffee contains it. They have both the ground coffee and instant packets, which are great for on the go and then I always keep in my purse, especially when I'm traveling. Their coffee with Lion's Mane also includes a mushroom called Chaga. And you might have heard me talk about this on my interview with Tero, who's the founder of Four Sigmatic on this podcast. But Chaga is known as the King of Mushrooms. And it's one of my favorites because it is a really functional mushroom full of antioxidants and beneficial compounds that support the body in various ways, including by supporting the immune system. They have many other products as well, including single Elixir blends of mushrooms like Cordyceps, Chaga, Reishi, and Lion's Mane, as well as several other coffee products, including one with Lion's Mane, one with Cordyceps. I really loved all of their products that I've tried and my kids love their Reishi Cacao at night, and I love that it helps them sleep. A common question I get, does this coffee taste like mushrooms? Or people say, "I don't like mushrooms. Will I like this coffee?" And I can tell you their coffee, especially the Lion's Mane coffee tastes exactly like regular coffee, does not at all taste like mushrooms. You just get the benefits of the mushrooms without the taste. I have found that mushroom coffee is also very gentle on the gut. So it doesn't leave the jitters or that crash like some coffees do and the Lion's Mane seems to really enhance the natural effect of the caffeine. All Four Sigmatic products are organic, vegan, and gluten-free. And every batch is tested by a third-party lab to ensure that they don't contain any heavy metals, allergens, negative bacteria, yeast, mold, mycotoxins, pesticides, etc. So you're getting the highest quality product available. They are all backed by their 100% money-back guarantee. So you can try these with complete peace of mind. I love this company so much that I've worked at an exclusive offer just for "Wellness Mama Podcast" listeners. You can receive 10% off of your whole order on any Four Sigmatic products including their mushroom coffee or their Reishi, which is part of my nighttime routine. Check them all out at foursigmatic.com/wellnessmama and use the code wellnessmama, all one word, at checkout to save 10%.

This podcast is brought to you by Beekeeper's Naturals, a company on a mission to reinvent your medicine cabinet using clean remedies made from bee products that really, really work. They believe, and so do I, that your family deserves to feel your best every day all day, and their products are clean science fact remedies that naturally support your daily health, like their B.Soothed Cough Syrup. It's a truly clean cough syrup that helps you get back on your feet quickly without any of the junk you'll find in others. So I don't know about you, but I remember some pretty foul-tasting cough syrup from when I were a kid. And looking back, they probably had all kinds of dyes and chemical ingredients I might not wanna consume these days anyway. So I am so excited to have found B.Soothed, which is made with just natural immune supporters, like pure buckwheat honey, elderberry, which you've probably heard me talk about a lot. Chaga mushroom, known as the king of

mushroom, Bee Propolis and olive leaf extract. We're gonna talk about propolis again in a minute. But this B.Soothed Cough Syrup is free of drugs, dyes, dirty chemicals, and refined sugars. And it's delicious, has a naturally sweet berry flavor and my kids love taking it, which is great. Like any remedy, I hope it's one that you never need but if your family gets the slightest hint of any of the ickies this year, B.Soothed is one of my first lines of defense. But it's not the only Beekeeper's product I love. My family is also obsessed with their Propolis Throat Spray and their B.Powered.

So first their Propolis Throat Spray. If you're not familiar, propolis is a natural compound that bees make from plant and tree resins. It's not honey, but the bees make it to defend their hive from germs. Think of it like the hives immune system, and now we can benefit as well. This natural spray is also free of dyes, and chemicals, and anything unsavory. And I like to use four sprays every morning for immune support or anytime I'm feeling tired or when I'm traveling. Another thing I love of theirs is called B.Powered. And it's I think the most powerful honey on the planet because it's not just any honey. It's a therapeutic blend of propolis, like we just talked about, royal jelly, which is essentially the food for just the queen, and bee pollen. And together, these support all-day energy and are a little boost for the immune system. It'll give you natural energy but not leave you crashing later in the day. It is delicious. It can be drizzled on foods like yogurt, or put in smoothies, or eaten alone. A trick I have is to put a teeny bit of sea salt on it and eat just a little tiny spoonful straight. Like I said, it contains raw honey, that is an easily digestible natural fuel, bee pollen, which is denser in protein than any other source gram for gram on the planet. And it's used by Olympians to improve their endurance and enhance their performance. It also contains propolis, which is packed with antioxidants and germ-fighting compounds like we just talked about, and royal jelly, which contains the neurotransmitter acetylcholine, and some really unique fatty acids that promote mental clarity, brain health, and focus. Really incredible stuff. I would encourage you to upgrade your medicine cabinet and check out all of their products, some of which sell out often. You can check them all out and save 15% on your first order by going to beekeepersnaturals.com/wellnessmama. So that's beekeepersnaturals.com/wellnessmama to save 15% and upgrade your medicine cabinet.

And it seems like from watching you guys on Instagram that things like grapes and rice that you mentioned are almost universally spikes for a lot of people. Like I agree with you 100%. There's no need...the body does not need refined processed carbs at all. There's no biological need for that but if we do need carbohydrates, seems like those two seemed a lot more common in causing big spikes. Are there other foods that are just very common spikers?

Dr. Means: Yeah. I would say three that I see all the time that surprise people are grapes, white rice and then oatmeal. Oatmeal has just been really almost a universal spiker for people. And I'm referring mostly to instant oatmeal. We see less of spikes with steel cut oatmeal but instant oatmeal which is marketed as a heart healthy food and, you know, a high fiber food. This I think is honestly really miss marketing. These instant oats are somewhat refined and we've seen people go up to 180, 200 with just nothing added to their oatmeal. And so that was actually a really powerful experience for the CEO of my company, Sam Corcos. He had sort of always throughout his life felt kinda this like midmorning slump where, you know, just before lunch he'd be like really, you know, kinda tired and, you know, really feel like he needed to eat something and almost wanted to take a

nap. And what he...he just always attributed it to like, "Well, that's just my body. I kind of...I just have a little midmorning slump and I need a, you know, piece of candy or I need, you know, to have lunch." And what he realized like the first day that he put his glucose monitor on is that the oatmeal that he'd eaten every single day for breakfast for most of his life was spiking him up to like 200 milligrams per deciliter which is extremely high. And then he would crash down to the 50s or 60s which is what we call reactive hypoglycemia meaning that you have such a big insulin release from that glucose spike that you actually suck up all that glucose and end up being lower than where you started. And that can be associated with lethargy, anxiety, brain fog. And this was happening to him basically every morning. So that's the last day he ever ate oatmeal and has switched now to eggs and avocado and, you know, has basically transformed his mornings. And, you know, he used to attribute this to, "Oh, maybe it's a coffee crash. Maybe it's that I'm not sleeping well. Maybe this is just who I am." But now he can actually create this one to one relationship between an action he was taking, objective data and a subjective experience and really close that food back loop and make changes. And our bet really is that the more we can do that, more we can help people make that, really that trifecta of understanding between an action, objective data and how they're feeling, the more we can really accelerate people to make smarter choices and to make behavior changes. Closing that loop is just so powerful for behavior change.

Katie: Yeah, absolutely. And like you, I noticed when I got enough protein and fiber at a meal, that made a huge difference. And so meals that included a big salad or enough protein, I had very little spikes from. And also from me getting enough protein at breakfast. Whatever my first meal of the day was seemed like a really important factor.

You also mentioned at the beginning like when you mentioned those metabolic factors for health that those were all without medication. And I know there are some medications that are used to lower glucose and some people use these even kind of like off label because it's obviously better to have lower glucose. But I think that brings up a whole interesting other topic which is there a time and a place for these medications and/or what about supplements? Because I've read of a lot of supplements like Berberine and others that are supposed to be helpful for the glucose response. And I'm curious your take on things like that.

Dr. Means: Yeah, absolutely. So for this particular study, I'm fairly sure that they were talking about prescription medication and not necessarily adjunct supplements like Berberine and things like that. But, you know, I think that there is a place for some of these supplements in the metabolic health conversation. You know, Berberine has been shown to be quite safe and effective in reducing glucose and even potentially improving longevity over the long-term with some of the same benefits of a prescription medication like Metformin but without some of the side effects.

So that's one that I over the counter and that is definitely, you know, an interesting one to experiment with. There's also probiotics now that have been shown to...and have been clinically validated to reduce hemoglobin A1C and glucose levels in diabetics and there's a company, Pendulum Therapeutics run by Colleen Cutcliffe that is actually a clinically validated, the first clinically validated probiotic to lower the glucose response in diabetics. And, you know, I think this actually brings up a really interesting point about the role of micronutrients in metabolic health. I think a lot of us think mostly about macros when we think about

metabolic health. We think about fat, we think about carbohydrates, we think about protein. But there's actually this whole other story that is fascinating to me which is the micronutrient aspect of metabolic health. And so this is looking at, you know, nutritional cofactors, vitamin, minerals that are actually involved in our mitochondrial function and our insulin signaling. All of these metabolic pathways in the body are really just chemical reactions that are happening inside the cell where, you know, different substrates are converted to downstream products by enzymes. And all of these enzymes require nutrient cofactors to function properly.

And some of the key ones for metabolic health are things like zinc, magnesium, manganese, B vitamins, vitamin D, omega three fats. These are required for proper metabolism and actually when you get into these biochemistry cycles like the Krebs Cycle that produces...that converts glucose to energy and fat to energy, you actually can see what...you know, these enzymes require these things. And so I think it's not actually talked about enough that really the nutrient density of our diet actually also has a big impact on long-term metabolic health and making sure that all these molecular engines are running smoothly.

And a test that I actually order in my clinical private practice quite a bit is a test called NutrEval by Genova Diagnostics and it actually tells you really which of these micronutrients involved in metabolism are...how they...what their levels are and whether you need to be supplementing properly. And so those are things that I often end up targeting for patients is zinc, magnesium, B vitamins, vitamin D, omega three, manganese. And then another big one actually which is not a micronutrient but is involved is glutathione which is one of our key antioxidants. And glutathione is required for a lot of these processes to happen efficiently. So anything we can do to replenish our glutathione in the body is also helpful.

Katie: That's so cool. Okay, so I wanna get into some of the specifics of using the monitor because like I said, I was so fascinated to be able to see this data in real time and I know pretty much everybody who asked me about it while I was wearing it immediately wanted to get one and to be able to try it themselves. And I learned things. A lot more than I thought. Like things like I need more carbs than I was eating and like I said, sweet potatoes are fine and that I needed enough protein, especially early in the day. And pretty much now I don't eat after dark and even though I had so many factors already dialed in, I've seen benefits just from those changes that I wouldn't have known about necessarily without monitoring.

So walk us through how the monitor works and...I know like people may not wanna use these continuously forever so if someone was just gonna order it and use it for maybe say a month, how can someone optimize that time to get the most data?

Dr. Means: Yeah, absolutely. So just to kind of...for people who don't really know what this is. So a continuous glucose monitor is this tiny wearable sensor that is the size of two quarters stacked on top of each other that you stick to the back of your arm and it automatically and painlessly measures glucose every 15 minutes 24 hours a day and sends that information to your smartphone. And what Levels does is pairs this data stream from the continuous glucose monitor with software that interprets the data stream and helps people figure out your current level of metabolic health and also how to improve it and how to, you know, modify food and lifestyles to overall move the needle in a positive direction on metabolic health and improve metabolic fitness.

So in a lot of ways you can think of this sort of like Fitbit or Whoop but for glucose levels and metabolism. And it is really the first biofeedback bio wearable tool that we've had for nutrition. We've been able to track, you know, our steps and our exercise and our sleep and even our stress with HRV monitors now but we've never been able to see immediately in real time how our nutritional choices are affecting our bodies. And so that's really what the game changer is with this technology.

And the technology has actually been around, the hardware itself, continuous glucose monitors for over 10 years but it's been only used in individuals with a diagnosis of type one or type two diabetes as a medication management tool and a way to track glucose without having to prick one's finger. It just gives so much more data than...and data points than you would by pricking your finger three or four times a day. You can really see those full curves of what's happening to your glucose after food and exercise.

And what we're doing at Levels is bringing this technology to a mainstream market to health seeking individuals who do not necessarily have a diagnosed metabolic condition as a precision nutrition and lifestyle tool. And so it's truly as simple as putting the sensor on your arm. It lasts there for two weeks. It sends the data to your phone and the software helps you make those moves in your life to improve metabolic health.

So I would say for making the most of the program, right now we offer a core one-month program which is a, you know, a 28-day metabolic awareness journey. And how I would do it is really actually how...what you were talking about. You at first started with kinda really trying to eat clean but then you brought in some experimentation and I think that's really critical, the experimentation phase. So we like to tell people, "The first week, just eat everything you've kind of been eating normally. Just like your normal diet and like see what's happening. So don't try and necessarily like totally clean up your diet the first week. Just like eat your normal foods and start making some observations." Then over the next couple of weeks we start to learn and...through experimentations. So this is where you might say, "Okay. I'm gonna eat the same meal on Tuesday and Wednesday but I'm gonna do a high intensity interval training workout one of those two days." Or, you know, "I'm gonna eat sweet potatoes on...two days in a row but one day I'm gonna add fat, protein and fiber and the next I am not." Do some experiments with eating a salad before carbs and then eating the carbs before salad. Experiment with taking 20-minute walks after breakfast, lunch and dinner and then one day not doing that. Just try all these things and in doing that, you're really building your metabolic toolbox for understanding what are the tools at your disposal for keeping your glucose flat and stable which is our goal.

And then...so I would recommend that for the second and third week, just tons of like fun biohacking and experimentation and then in the fourth week, really take what you've learned and try and optimize. Try and just keep the glucose as flat and stable as you can by using all of these different tools at your disposal to do so. And I think that's a really great way to get the most out of the one-month program. And I think for, you know, for some people, that's gonna be enough to really, you know, change their diet radically. They're gonna have a totally new understanding of which foods are metabolically friendly and which aren't for them. And then for other people...we have lots of people who like to continue on for more months and just keep using this as both an exploratory tool but also for athletes using it as a tool to really understand fueling and recovery. And

for others, people who like to use it as an accountability tool. Like really as something that says, you know, "I'm keeping on track and I am doing what I need to do." And, you know, for me, now, I've been wearing one for a year and a half and I would say at this point, it's fewer surprises because I'm pretty dialed in. Although, every once in a while, I get a huge surprise spike. Especially when I eat out or eat snacks at someone, you know, someone else's home. And I just get shocked. But really, for me, it's that accountability tool now where I just make sure I stay on track. And it keeps me on point.

Katie: Yeah, it's so exciting, like I said, to have a tool like this that we can all now access and use. And I also track some of the things we mentioned like waist circumference and waist to hip ratio because that's also one that's tied in with longevity and also things like people have heard me mention on here before. Grip strength. There's some cool tie-ins with longevity there and that's a fun one to test at home with a little like grip strength tester from Amazon. But to me it's like the ability to have all of this data gives us the tools as individuals to really improve things for the long-term. And this one has been one of the most fun experiments I've done in recent years and I'm so grateful to you guys for making this available to everybody.

A couple of somewhat unrelated questions that I love to ask toward the end of interviews. The first being if there is a book or a number of books that have had a dramatic impact on your life and if so, what they are and why?

Dr. Means: Yeah, absolutely. So oh, man. So many books have really, I think moved the needle in my life and I would say particularly on the topic of metabolic health, there have been some authors that have totally changed the trajectory of my medical career. So the ones I would shout out would be Mark Hyman, "The Blood Sugar Solution". An amazing book that looks at all the different factors that go into our metabolic health really holistically. I would say Doctor Sara Gottfried, "The Hormone Cure". Ben Bikman, "Why We Get Sick". An incredible book about how insulin resistance is really at the root of the majority of the chronic health conditions we're seeing today. I would shout out Jason Fung, "The Obesity Code" and the "Diabetes Code" both of which talk about why the, you know, calories in, calorie out model that we thought about with weight loss is...just really doesn't make sense. There is much more of hormonal nuance to it with insulin and we have to get our insulin down if we wanna actually tap into fat burning and weight loss. I would say Joel Fuhrman, "Eat to Live" which was really about plant-based nutrition and a high nutrient density diet. Cyrus Khambatta, "Mastering Diabetes". David Sinclair, "Lifespan". These are some of the books that have really had...oh, and I have to throw in Michael Greger, "How Not to Die" and his second book, "How Not to Diet". You know, when I was in my medical training, my surgical training, I would be listening to a lot of these books that are just really revolutionary in terms of thinking about health in a so much more of a holistic root cause approach and really look at the modifiable factors associated with the development of disease. And I had my earbuds in as I'd be walking around the hospital, you know, when I was on call and my surgical training and I'd be listening to these books and it really just was a wakeup call to me that everything I was listening to and that was all highly referenced, totally science based, really bringing in the newest research on network consistency biology it's not how I was practicing medicine in the hospital. In fact, it was wildly different. Almost unrecognizable. I was never talking to patients about diet, nutrition, stress, sleep, toxins, exercise virtually ever. And so it planted a seed that ultimately got me to go do my own research, get on PubMed, learn more and has led me to really a reinvention of my career that has been so massively and deeply fulfilling and I think a lot of physicians are kinda moving in this direction of really wanting to help empower people to make...to take control of their own

health and not just stick with more the reactionary approach to medicine that we see today where we really wait until people get sick and then kind of mop up the mess. So I would really just, you know, shout out to all those authors because they're just not only changing individuals' lives but also changing doctors' lives.

Katie: I love that. And I'm right there with you. I think the best outcomes happen when we have doctors like you who are doing the research and who are so deeply invested and then also patients who are self-aware and willing to do things like wear a monitor and map out their diet and see what's actually working. And I think that's how we're gonna start changing some of these health statistics over time is the partnership between both of those. And it's not ever an either/or. It's a both/and. And so I'm so grateful there are tools like this. Like I said, it was so exciting to get to try it myself and so many people have asked me about it on social media. You guys have given me a link. I know it's levels.link/wellnessmama and of course that link will be in the show notes at wellnessmama.fm along with everything else we've talked about. But any parting advice for anybody who is excited and ready to jump in with glucose monitoring on how to get started?

Dr. Means: Yes. Absolutely. I would say, you know, come to our website, levelsheatlh.com and, you know, and sign up for...if you're not ready to make the plunge, sign up for our newsletter and that will give you lots of great information. I would say just keep learning. I highly recommend coming to our blog which is levelshealth.com/blog. We write a ton about metabolic health and why it matters for the average individual, why we should take control of this now as opposed to waiting for a disease to emerge. And so check out the blog. Really wonderful expert authors who are writing about why this is relevant to health seeking individuals.

And then I would say just in terms of practical advice, you know, if...again, if you're not ready to make the plunge with, you know, getting a continuous glucose monitor, I would say just focus on the core fundamentals. You know, avoid refined carbohydrates and sugars and eat more plants, eat more fiber, eat more omega three fatty acids. Doing these things alone can start to turn around a life and massively improve our mental and physical health. Tracking is really important but just some of the basics like avoiding the bad stuff and getting in more of the good stuff can be really, really, really helpful. Commit to taking a walk after at least one of your meals. Really try and get that quality sleep and just be confident in the fact that it is such a good investment. And, you know, when you're feeling stressed, when you're getting a stressful text or email or phone call, take a deep diaphragmatic breath. Take the time to really try and manage that stress response even through just a simple deep breath. It can have a massive effect on or hormones that ultimately translates into our metabolic health.

So those are just some simple things I would say to anyone wanting to kinda just boost their metabolic health.

Katie: I love it. This has been so information packed and so helpful. I will make sure that all the links...I know you guys have articles on a lot of these things and of course the link to find out more and keep learning about your guys but this was really, really fun. I enjoyed...I've learned so much from Levels and so much from this interview and Dr. Means, thank you so much for your time.

Dr. Means: Thank you so much for having me. Hope you have a great day.

Katie: And thank you guys as always for listening, for sharing your most valuable resource, your time with both of us today. We're so grateful that you did and I hope that you will join me again on the next episode of the Wellness Mama Podcast.

If you're enjoying these interviews, would you please take two minutes to leave a rating or review on iTunes for me? Doing this helps more people to find the podcast, which means even more moms and families could benefit from the information. I really appreciate your time, and thanks as always for listening.