How to Beat Genetics and Control Cancer – Dr. Jason Fung with Dave Asprey – #760

Announcer:

Bulletproof Radio, a State of High Performance.

Dave Asprey:

You're listening to Bulletproof Radio with Dave Asprey. Today's episode is going to be a lot of fun because it is with a guy who is a real expert on metabolism, and he's a Canadian nephrologist, which means he has a lot of nephews or they know a lot about kidneys, one of the two, but he's a pioneer at testing intermittent fasting in clinical settings. We have all kinds of information about intermittent fasting that's been out there. It's a core part of the Bulletproof Diet, but it's been around in spiritual traditions for a very long time, but the clinical studies of it were lacking and Jason Fung is the guy who has done a lot of that work.

And he's worked on treating obesity and diabetes. He wrote The Obesity Code, The Diabetes Code and today he's talking about one of the four big killers, the things that you have to avoid if you want to live a long time. Cancer is one of the big four things that takes a lot of us out. A lot more by the way than any viral disease, I might add. It's a real epidemic and his book is called The Cancer Code. I'm really excited for this interview. So Jason, thank you for taking the time.

Dr. Jason Fung:

Oh, glad to be on. Thanks for having me.

Dave:

So you are site chief of medicine at Scarborough General Hospital. Do I have to call you Dr. Fung or are you-

Jason:

No, Jason, it's just fine.

Dave:

You were also on the episode or on an episode before, way back in the day on episode 367, we're pushing about 900 episodes now. So people might have heard the interview about why you shouldn't fear fasting when you were on with Jimmy Moore. So this is your second time on the show.

Jason:

Yeah, that was a little while ago and I mean, you've been talking about it a while too. And back then, boy, people just thought it was like the worst thing you could do for yourself. I mean, yes, you might be 500 pounds and need bariatric surgery, but you should always continuously eat and like, how does that even make medical sense? It just blows my mind what these people must be thinking, but it was totally... it's still is very prevalent even to this day. I mean, but back then it was really, really heresy to say something like that.

Dave:

You were pushing against a lot of weight because you're a medical doctor with real training and a license and to be able to be that sure of yourself and that willing to step out there back then, what made you do that?

Jason:

So it's a couple of things, one was that I was very dissatisfied with where my patients were sort of going, that is clearly they had to lose weight and clearly they were not succeeding. And that was what was leading them to all this other disease, kidney disease is primarily what I saw them for and then most of it was related to type 2 diabetes. So weight loss was probably the most important thing they could do and yet they couldn't do it. So that's where I really got interested in it, so I was very dissatisfied with that. And then as I started to look into sort of the medical sort of science of how weight is gained, weight is lost, a lot of the stuff that we sort of took for granted, the sort of particularly eat six times a day sort of thing, which was sort of gospel by the time, 2012, 2013, 2014. None of it was supported by any science.

So what my advantage was that I could go through and I could say, "Well, let's think about it and let's go back through all the..." I could go to my library and I could look up all the scientific articles and I realized, "Well, there's no science behind it." When you actually look at the science, something such as fasting makes a lot of sense, because what you're doing of course, is you're using your body fat for literally the reason you carry it. There's no other reason. It's not there for looks. It's there for you to use as a store of calories when you have nothing to eat. So if you don't have anything to eat, your body will naturally use its body fat and that's okay. It's good actually, because that body fat is now making you sick.

So I was very sure of myself, because one, I knew the science, I had the training from before physiology and... But then the other thing was I was able to apply it to a lot of patients. So I used it for hundreds and hundreds of patients and I saw the effect for myself, like people were not doing badly. They're doing actually fantastically well. And I knew that if people didn't eat for a period of time, they wouldn't have these bad side effects. So as doctors, we actually tell people to fast all the time. So you go for surgery, you have to fast. After surgery, you have to fast. If you come in and you do an ultrasound, you have to fast. If you do fasting blood work, you have to fast. So here I am literally day after day after day, telling people to fast for these various reasons. You do a colonoscopy, you have to fast. And on the other hand, when I put on my sort of nutrition hat, I say, "Eat every two hours." And on the other side, I'm like, "Don't eat for 24 hours because you're going for a surgery."

And seeing hundreds of patients go for colonoscopies and they're fine. They fasted, they are fine. Like it didn't swear away and it bothered me that nobody else really thought about that very much. It's like, how can it be simultaneously true that the human body could survive 24 hours without eating easily with no bad side effect if you were not malnourished and on the other hand, be giving that very same person sort of advice to eat twice, three times, four times, five times, six times a day, right? It didn't make any sense and nobody really seemed to have a problem with that. So I was very sure because I had the science, I had the background, I had treated patients. So really I knew that it just wasn't something we had to worry about.

Dave:

I remember back when I was heavy and I was... I tried the Zone Diet, I tried the Atkins Diet. I had tried all kinds of stuff and I knew though, like you said, it was gospel. This is late '90s, early 2000s. If you don't eat six times a day, I'll go into starvation mode. And someone suggested eating fewer meals and I was like, "Oh God..." I still remember it because it was a visceral response, it was like, "Oh my God I'll die." I wouldn't have died, but I would probably have gotten low blood sugar because I was pre-diabetic and I

certainly would have just been unable to think. So for me, it was really kind of a scary idea that you could even consider fasting. I would have never predicted that years later I have 24 hour fast. Oops. I guess I did that because I have time for lunch. It's okay.

Jason:

Yeah, yeah.

Dave:

What do you say to people who have that same visceral response that I did?

Jason:

I'll tell you I had the same visceral response. So I remember thinking about fasting for the first time and I thought, "Wow, that's such a bad idea." Right? That was my first reaction too, and this was probably 2012. I was like, "What a bad idea!" But then I actually thought, "Well, wait a second. I see this all the time. I tell people to do this all the time. What exactly is bad about it?" And that's where I was fortunate that I could go into and look at any of the papers that had written, the physiology. And it had been worked out of course years ago. I mean, all this stuff about fasting, because... It's not something that I made up, obviously they talked about it thousands of years ago. But there was a lot of myths that had been built up around fasting to really make everybody, you and me included think it was just so bad for you.

So it's something like your blood sugars will go low, for example. And in fact, if you're on medications, that might be true, but assuming if you're not on medications, then your body actually works fine. I mean, that's how we survived as cave men and cave women who might or might not eat, right? Your body is going to be able to store away sugar and if it... So this is called glycogen in the liver, it stores the sugar. And if you run out of that, then your body's going to start using fat. So that's how it survives and then produces ketones for the brain so that it doesn't need as much glucose and so on and that's sort of the basis of the ketogenic diet, which is very popular and so on. Other things like, "Oh, I won't be able to concentrate again." It simply, wasn't true because when you look at what happens to the body during fasting, in fact, the body doesn't shut down, it actually revs itself up.

So it actually increases in our adrenaline and increases growth hormone. So because you're increasing your sort of fight or flight response, which is your sympathetic tone, you're actually more focused. You're actually going to be able to concentrate better. So people talk about some of the... In animals, for example, if you have a big meal, like a lion who just eats, you're not really sharp. If you eat a huge Thanksgiving meal, you're not really looking to do some high-level mental stuff. You just want to sit down and watch some football, right? But for animals, for example, what you don't want to do is you don't want to face that hungry wolf because that hungry wolf is not falling down on the job, the hungry wolf has dialed in, zoned in and ready to kill you. So the point is that when your body doesn't have energy, it doesn't eat, it's actually going to shift and start using the fuel that's carried on its own body, but it doesn't decrease it. So you're changing fuel sources, but then you're increasing the amount of fuel that your body is using so that you can go out and hunt.

So this is like a survival response. It's actually, you have more energy. People sometimes have... I remember one fellow, he came into the office and his wife was like, "Before he was so slow, now I can't even keep up with him because he's got so much energy. He's just raring to go." And what you've done of course is you've liberated the energy that's carried in that body fat. So as you start to use that body fat, your body's like, "Whoa, there's like 500,000 calories of food energy stored in this body fat. Let's go use it." When you eat all the time of course you lock all that body fat away because you're not able to

access it because you're eating, you're using the food, not your body fat. So that's what I mean by switching fuel sources, your body when you're not eating simply switches over to using your body's own stores of calories.

Dave:

It's really interesting, way back, probably the first hundred episodes of Bulletproof Radio. So this has to be like eight years ago or something. It's hard... They start to come together. We're pushing 900 episodes now so... What year was that? But Dominic D'Agostino came on, was another one of the early keto and fasting influencers and he's been focused a lot on cancer. And because I wrote a book on mitochondria, you can't write about mitochondria without touching into a lot of the cancer research. And I was so impressed that after building up your medical practice and your reputation as an expert on ketosis and fasting that you said, "All right, I'm going to take a step forward in that world and write specifically about cancer." And there's a guy who's come on the show, a cancer researcher and I should have written this in my notes ahead of time, but he's like, "Oh, within five years, we're going to understand the genetics of cancer and we should have no more cancer."

And I remember thinking to myself, I think only like 5% is probably genetic. Most of it seems to be environmental and some of it appears to be fungal and that may be misdiagnosed, but I don't think we can solve all of it genetically, but I am also a knowledgeable guy, but I'm not a medical doctor and I certainly haven't written a book about cancer and I'm not planning to. So was my thinking somewhat accurate there in that it is primarily metabolic? Or what's your take on it?

Jason:

I think that you are very close, I mean, this is what the book is about. I got into it for much the same way from a metabolic sort of energy standpoint, looking at the metabolics of cancer, but this whole... And I talk about this in The Cancer Code that how we've sort of come through several really great paradigms of what cancer is, because cancer is sort of the most interesting disease. We don't understand what it actually is or what causes it. So if you look at diseases like heart disease, well, it's blood vessels get blocked off, they clot and you get a heart attack. COVID is a virus or TB is a bacteria. So we know a lot of these causes, but cancer is such a mystery and we still don't understand sort of what it actually is. So initially we thought it was just a cell that grows too much. By the '70s we started to think about genetics, or what they thought about was that, well, here's this randomly mutated gene, which causes cells to grow too much. And that's been the paradigm that we've used for a long time.

And unfortunately we reached the sort of limits of that paradigm probably about 10 years ago. So I remember The Human Genome Project finished around 2000 and then in the '90s, we had great optimism for what your guest was talking about that, "Hey, we're just going to figure out the one or two genetic mutations of say breast cancer and then that's it. We're going to find a couple of drugs. We're going to block it and that'll be it. No more cancer." So that's very 1990s. By 2000, we decoded the human genome and we thought, that's it, right? The roadmap is there. We just have to follow it. And the problem of course, was that we didn't cure cancer in the year 2000 and then we embarked upon an even more ambitious plans instead of sequencing one person's DNA, we actually sequenced about 33,000 tumor samples, and this was called the Cancer Genome Atlas.

So we took cancers and we sequenced it and we thought, "Okay, well, let's take a thousand of these breast cancers. Let's compare them all. Find the one or two genes that are mutated, develop these one or two drugs. Boom, that'll be it." But instead of finding one or two mutations, what they found was like 50 to a hundred. So if you have patient A with breast cancer, they have 50 mutations. Patient B has 50 mutations, but completely different mutations than this person sitting next to them

even though these cancers will look identical. So this whole paradigm sort of just flopped. It was not able to provide the treatments because you can't develop 50 drugs for patient A and 50 drugs for patient B and a different 50 for patient C. It just wasn't going to work. It's hard enough to get one drug, right? They're very expensive. You have to make sure they're not toxic and so on. So that whole paradigm just fell. And that's why we never were able to get anywhere further in that sort of thinking.

And what happened of course, was that then in the 2010s, we started to move past that sort of genetic model and this is where the story gets really interesting because now we're trying to answer the questions sort of one level deeper. So not that there are not genetic mutations. They're clearly are genetic mutations, but what is causing those genetic mutations. And this is the sort of new thinking about cancers, that this is more of an evolutionary disease that is these cells are mutating, but what is guiding that mutation is this sort of evolution backwards almost to a more primitive state. That is the way that we see cancers. They're sort of primitive cells. They're de-differentiated. They look very bizarre, but in a very stereotype way, that is they don't look more evolved. They look less evolved. So it's sort of this backwards evolution in time.

And when you're talking about evolution, the most important thing is actually the environment because it's the environment which selects for what traits are expressed. So the whole idea is that the environment plays actually a huge role in the development of cancer. And this is something we've always known about, but sort of got buried in this sort of genetic paradigm, because it's like genetics is sort of like talking about the seed of cancer and having the right seed is important, but it's not enough. Like if you don't have fertile soil for that seed, it's never going to bloom. So if you look at people in other countries, for example, they might have the same seed, but without that soil, they won't get the cancer. So a Japanese woman in Japan, when she moves to San Francisco, her risk of breast cancer within a couple of generation doubles or triples. So the genetics haven't changed, but the diet and the lifestyle have changed. And that's what's important is the sort of lifestyle and diet contribution to cancer.

And that's what's really important because if you can understand what part of diet is important, then you could take a woman in San Francisco and you could potentially draw her risk of breast cancer by a factor of two or three. It's very powerful and requires a lot more of this sort of new thinking. So I think you're right on the money in that, no, this genetics thing... We've done it, we've done it for like 30 years and it's actually failed to a large degree, but now we're sort of moving beyond that, looking at the environment, the evolution, the metabolic side of things and of course this is where insulin and diets and so on play a big role. And we didn't know this before, but in... So I did my medical training in the 1990s, and we never talked about diet as a risk for cancer. But when you actually look at what percent contribution it plays to cancer, you can say, okay, let's take cancer and say, what percentage this tobacco smoke, what role does it play? It's about 35% contribution, which is the biggest and diets about 30%. So really almost as high.

And in 2000, we finally recognized that obesity, which is a state of too much insulin, obesity and type 2 diabetes are actually huge risk factors for certain types of cancer, including breast cancer and colorectal cancer, which is sort of the number two and three cancers in America. Number one is lung cancer, but that has nothing to do with obesity. It has everything to do with smoking.

Dave:

What about pancreatic cancer? I mean, that's what took out Steve Jobs. What do you think is contributing there?

Jason:

Pancreatic cancer now, Steve Jobs had a very rare type of pancreatic cancer, but the standard sort of pancreatic cancer, which is actually very, very deadly is actually one of the obesity related cancers unfortunately. It's not the-

Dave:

One of the what?

Jason:

It is one of the obesity related cancers.

Dave:

Oh, obesity. Right.

Jason:

So liver cancer, pancreatic cancer are also included in that. So it's sort of sad because if you look at cancer rates overall, most cancers are actually decreasing over time. A lot of it because of less smoke for example, but those obesity related cancers are actually starting to sort of move their way back up, which is of course very concerning. Liver cancer sort of has tripled in the last sort of 20 years. And this is directly related to the obesity epidemic, as well as this sort of epidemic of type 2 diabetes that we're getting.

Dave:

It seems like if you're exposed to a lot of chemicals, you're exposed to toxic metals, that you're exposed to xenoestrogens, including mold toxins, all of those are also independent risk factors for obesity and cancer. How do you sort out toxins versus diet if the toxins make you fat?

Jason:

Yeah. There is bit of it's sometimes hard to tease it out, but there's statistical ways that you can try to do that. It's not perfect of course, but if you look at the overall sort of contribution of toxins, they tend to be relatively small because you're not going to get them. So it's hard to get these toxins that are sort of worldwide sort of thing, right? Whereas obesity, you can track it, it sort of started, it didn't start, but it was the biggest problem in America and now you see it in Asia and so on. So you can track these things as opposed to certain say toxins. So aflatoxin for example is something that causes... and wood dust and other things. These all cause cancer, but you're not going to see sort of in all parts of the world as opposed to obesity. So you can try and distinguish between those two, but for sure those are problems for sure. We know it. And there's a list of carcinogens that the world health organization maintains.

But when you look at in a population, how much it contributes to cancer overall, it tends to be sort of like 1%, 2%, 3%, which together can be important, but obesity and diet and so on, tend to be the biggest part.

Dave:

Unquestionably. Do you know why coffee only causes cancer in California?

Jason:

Coffee is a tough one. I mean, the problem of course with these studies is that they typically take coffee drinkers versus non coffee drinkers and then they say, "Okay, well, what's the difference between the two?" And then try and make some conclusion, but this sort of stuff is very hard to... Because there's a difference between coffee drinkers and non-coffee drinkers, other than the fact that one drinks coffee. Some might be... They're under very high stress, for example, real go getters and other people might be much more laid back and... There's so many differences between the two that it's often hard to distinguish, whether it's just the coffee. I mean, the same problem exists in all of nutrition, to try and tease out these things is very difficult.

So we actually went through a number of these hypotheses for diet. We thought maybe fiber was the problem. That didn't turn out to be the case. We thought it was fat and thought it was various vitamin deficiencies. So we tried... I'll tell you that they've tried, and these are million-dollar studies. So they've tried vitamin A, B, C, D E, and they've tried selenium and they've tried omega-3 fatty acids, all tested the supplements and randomized controlled trials and of course, none of them really had any effect on cancer. Well, some of them did, the vitamin B and C... Vitamin B ones actually tended to increase the rates of cancer. So that wasn't good.

Dave:

And vitamin D3, having higher levels didn't lower the... I mean, I actually cited several studies about that.

Jason:

Yeah, there was some very early-

Dave:

How about the [crosstalk 00:23:55]?

Jason:

... enthusiasm sort of about eight or nine years ago for vitamin D3, low levels seem to correlate. In fact sunshine and elevation also tended to correlate with cancer risk and so on. So they do these randomized controlled trials where they randomized some people to placebo versus vitamin D3. It turns out it didn't make any difference overall for anything. And it looked like it was very promising, the epidemiologic study, which is why you need to do these sort of follow-up studies to make sure that there actually is an effect. And there didn't seem to be a huge effect of supplements, like vitamin D supplements.

Dave:

A lot of the studies that I saw did very low levels of supplements over short periods of time, and the convincing data that I've seen involved looking at blood levels of vitamin D from wherever they came from and looking at higher levels of vitamin D being pretty well correlated with lower cancer risk and lower a bunch of other metabolic risk, but the trials where you're saying, I'm going to change this one variable for six weeks, probably not going to do very much.

Jason:

Yeah. These ones were a sort of a couple years long, so they-

Dave:

Okay, that's good.

Jason:

... were a bit better. But the problem is, of course, there's several problems. One is that it could be a true result, or it could be that you didn't do the right thing, which is perhaps it's not the vitamin D supplementation, perhaps it's the sunshine, for example, that might make a difference. And that's a plausible reason, or you could say, "Well, these things..." These cancers, for example, take years to develop, like 30 years to develop sometimes. So supplementing for two years may or may not work. So the problem with these studies, of course, is they answer very, very specific question of to whether or not this particular regimen works or not.

So the important thing is that vitamin D3 didn't show any signs of toxicity, which is good, because if you're going to take it, you have to know this or benefit. Well, there's no benefit that we can measure, which is not to say that there [crosstalk 00:26:02] thing.

Dave:

For cancer, specifically you're saying?

Jason:

For cancer, yeah. But are you going to raise your risk of other problems? And there wasn't any sign of that either. The vitamin B supplements on the other hand, actually there was a signal that you're going to get more cancer in that. So that's a different story. You can't just say, "Well, there might or might not be a benefit. Let me just pop this vitamin B supplement." Because you could actually be doing yourself harm.

Dave:

Do you have any theories about that? I have a theory about what's going on with the B vitamins, but I'd love to get your take on why they might increase-

Jason:

Yeah. I think that it's the wrong sort of way of looking at cancer. So cancer is this... the cell that has evolved, it has become... it's sort of a separate organism almost because it's sort of growing and doing its own thing. It's not sort of playing by their own rules. And the problem with giving vitamins is that you're going to encourage growth and when you encourage growth, then these cells that grow very quickly are going to take advantage. It's like if you have a field that's sort of... and you want grass to grow, and you say, "I'm just going to throw down a bunch of fertilizers because then the grass will grow." But all you get is a bunch of weeds because that's what takes up the growth the fastest. So these are the fastest sort of most primed to grow and therefore they're going to be the first thing out. So I think with some of the vitamins, you have to be a bit careful.

So B vitamins are very important for cell growth and therefore, if you're just saying, "Okay, cells go ahead and grow." Some of the regular cells may grow, but some of the cancer cells may grow as well. So if you look at some of the treatments we use for cancer, in fact, the entire field of chemotherapy was launched because of this same thing. So some of the leukemia patients they thought would do better with folic acid. So they tried folic acid, and this is in the '40s And those patients did worse. Their cancers actually accelerated and they didn't get better. So the doctor, Dr. Farber, he actually switched, he said, "Okay, forget giving folic acid. Let's give drugs that block folic acid." And it was super successful. That

was sort of the birth of modern chemotherapy, all trying to block that vitamin B. And decades later, we're giving folic acid again in one room, why? Hey, there's a little bit of a problem in some of these patients, but that was the problem specifically for vitamin B.

Dave:

It makes me laugh because by law, they put folic acid in food, and I've been railing against that because a third of us, including me have genetics where we don't handle it and it increases our disease risk. But if you put methylated B vitamins and things like folinic acid, or you do P5P instead of B6 it seems like cancer is to some degree of a methylation issue that that's part of why cells grow or don't grow. Would you change... I know there may not be studies, but would you change your hypothesis or your thinking if we had talked about using biologically compatible B vitamins instead of ones that stole methyl groups?

Jason:

Yeah, I think it certainly could be... I think that that's a very logical thing and it would have to be of course tested, but there is a difference and this is, again, one of the things that always gets me is that people try to break nutrition down into its sort of most simple parts, that is-

Dave:

Like drug companies would.

Jason:

Yeah, exactly. It's like, "Oh, food is just the... it's just fats and carbohydrates and proteins." It's like, okay, but there's good fats and there's bad fats. There's trans fats, which are really bad for you, right? And there's omega-3s, which are fairly good for you. So there's a lot of differences even within the fats. And the same thing goes for vitamin B or folic acid, for example, because what they give you in the supplement is not usually what you get in the natural food. It's the easiest to synthesize chemically, it's just not what you get in the supplement.

Dave:

Like vitamin E, which is not good synthesize-

Jason:

Vitamin E is the same. Yeah.

Dave:

Yeah. Okay.

Jason:

And the same thing with vitamin D, right? I mean, you can get vitamin D3, which is fine, but when you generate it in the skin, for example, there's a whole complex reaction we've described. And what we're doing is we're pretending that none of the other stuff matters other than the vitamin D3. So you try and break it down to its very most simple thing, but you lose a lot of complexity. We know there's a lot of complexity. I mean, there's huge issues with all kinds of if you have methyl groups here or if you have extra this and that, I mean, you know in a drug that it will totally change what happens, but yet somehow we don't think it matters for like other chemical compounds.

Dave:

Well, if you think about methamphetamine versus Adderall, it's the methyl group that makes us so highly addictive.

Jason:

Yeah. And it's only a couple of atoms here and there. It's really not that much. So it's the same thing with vitamin. So you could... I think that is a huge difference getting the natural form, but of course it's hard to do in an experiment on natural foods that are high in folic acid, for example. You're going to get so much confounder and that's why they don't do studies like that. But whenever we try and give people supplements, we actually wind up failing most of the time.

Dave:

There's the systems biology and the functional medicine doctors I've worked with in my own research, especially around fertility and all, there's a ratios of B1s and there's a dependence of B6 on B1 level. So if you give B6 in the absence of B1 or B3 you end up creating problems that wouldn't have otherwise existed. And in food, if you eat a piece of liver, which is why I've been recommending desiccated liver for 10 plus years as a great source of B vitamins, because it has all of the stuff that goes together in ratios, pretty similar to what we have, because I think it's lower risk. But the broader aspect of stimulating growth, look, if you want to live a long time, you better stimulate regeneration. So growth hormone, oh, that increases cancer risk.

Like, okay, what else could we do? We could do IGF-1 from lifting weights and eating a lot of whey protein. Oh, insulin, like growth factor. Growth factor, wait, I'm promoting cancer, but I'm swole. Right? So how do we balance regeneration with not getting cancer?

Jason:

Yeah. I think that's very important because essentially the two are actually opposites, so growth and longevity are fundamentally at odds with each other and people always find it strange, but I always say, "Well, let's think about... Suppose you go buy yourself a sports car, right? And you rev that engine and you red line it and you have a good time on the track. And you do that day after day, it's going to burnout really fast." So the only way you're going to make it last is to stop revving that engine sometimes, go bring it to the garage and rest it. Right? You can't just keep revving it. That's the same thing with growth, when you're revving up growth all the time, it's going to take a toll on your longevity. And there's almost nothing you can do about it. The cell actually cycles between sort of growth. If you're eating and what we've discovered over the last little bit is that the nutrient sensors, so insulin and mTOR predominantly, those are nutrient sensors. So when you eat, your insulin goes up. When you eat protein, your mTOR goes up.

And those are signals, those are actually the exact same signals for growth. So insulin is like IGF-1. You're going to stimulate growth. When you eat, your body says, "Hey, there's food available. We need to grow." We need more cells because you want to grow while you've got food available. The opposite also happens when you don't eat. That is when you're fasting, when there's low food availability, what your body's going to do is actually go into a state of sort of repair maintenance and regeneration. What you're going to do is actually break down cells. You're going to get rid of cells because your body doesn't want all these extra cells that are going to require energy at a time that there's no energy. So your body's going to go into this sort of maintenance mode. So you're always trying to cycle between sort of growth and cell repair maintenance. So we talk about autophagy for example, which is inherently a destructive process.

So when you don't eat, we know that your body tries to get rid of these organelles and sub cellular parts, but that's not a bad thing. It's actually a good thing. So you're absolutely right. You can't do both. You can't keep going, going, going, going, growing, growing, growing, growing, because you're going to wind up with big problems. In fact, we always think growth is good, but for adult animals, adult humans, growth is generally not good. Like when you keep growing, whether it's cancers, which are cells that are growing, or whether it's cardiomegaly where your heart's too big or liver's too big, or one of these things grow-

Dave:

Lots of bodybuilders get those, right?

Jason:

Yeah. Growth is not good. It's not good for longevity and that's why you look at animal studies longevity, for example, the only consistent of course, it's always animal studies and longevity because we can't experiment on humans like this. But the only thing that consistently extends somebody's... Sorry, an animal's life, is calorie restriction because you're taking away from the growth and you're completely shifting it over to the cell maintenance and repair mode. And that's why these animals can actually live so much longer. So what it tells you of course, and it's the same thing for cancer because when you start to knock down those growth signals, it's the opposite of what we were talking about with vitamins, with vitamins, you're saying grow, grow, grow. When you fast, when you cut down these things, you're actually reducing growth signals and say, stop growing, stop growing. And of course the cells that stop growing, the ones you care about include those cancer cells.

So you're sort of trying to balance the growth, which is important when you're young and the longevity where you really want to get into this state where you're not eating, where you're eating less and not growing. You want to break down stuff, you don't want to grow more stuff. That's going to be the balance you have to strike.

Dave:

Some of the more advanced biohacking techniques, in fact, the guy who talked about this most was probably James Clemens when he came on the show, he wrote a book called The Switch, which was brilliant. And he's like, "Well, go on a protein restricted diet for a month and eat less calories and the next month, go on an mTOR month." So you're sort of going in this break things down, clean them up and then build them back, clean them up, build them back as part of an anti-aging regimen. Because if you get sarcopenia, your muscle loss as you age, which just normally happens with every decade, that also tends to, well, you don't get cancer necessarily, but you're walking hunched over and you can see through your skin. And that's not the type of aging that anyone wants either. Do you think that there's validity to that kind of feast, famine, feast, famine strategy?

Jason:

I think it makes a lot of sense because what you want to do and fasting of course does this naturally, because when you fast, one, you're going to break down stuff because your body doesn't want extra cells, right? So you're going to go into autophagy, you're going to break down cells, you're going to get rid of extra cells, but then growth hormone goes up. So then when you do eat, you rebuild those cells that you need. So that's essentially what you're doing is you're trying to cycle between sort of breaking down and then rebuilding, breaking down and then rebuilding, which is the way that you sort of rejuvenate the body, right? That's the whole word itself. You've got to get rid of the old stuff, bring in

the new stuff. If you keep pushing, it's like if you renovate your bathroom, the first thing you got to do is take out this little tubs and old toilets, because then you can put in new ones. You can't just put in a tub if you have an old tub there, right? So that's the problem.

You really have to cycle between the two. And that's what this sort of natural... Even on a daily basis, right? You feed and then you fast, you feed and then you fast. That's why you have a term called breakfast, this breaks your fast, right? So that's the point. You're going to store some calories, you're going to build during those eight or 10 hours that you're eating, then for the 12 or 14 hours that you're not eating that's when you're going to use those calories and also break down whatever you don't need. Your grandmother might've said that's the time you need to digest your food and so on. But really I think they're onto something in that this is a natural cycle. We, of course, getting back to this idea of eating 10 times a day, completely destroyed that because instead of respecting the sort of feed and fast cycle, which we've always had, right? Built right into the English language, we said feed all the time.

And you heard this I'm sure 10 years ago, like as soon as you get up, eat breakfast, breakfast is most important meal of the day, like do not even step out your bedroom door before you get a granola bar. And you are like, "Why? What is the possible reason would I have to do that?" And keep eating until you go to bed. It's like, well, that's not the way I grew up. Right? You had dinner and that's it. Right? So you have to have that fasting period. So it's the same thing on a mini scale and I think what he's talking about is on a monthly scale and I think that makes a lot of sense too.

Dave:

But when you talk about the daily scale one of the recommendations I put in the Bulletproof Diet, going back to 2011 or so was that one day a week do a protein fast, which means you can eat if you want to, but you eat less than 15 grams of protein because you still get autophagy even if you've had some fat and a moderate amount of vegetables and things like that. Is that enough to do the autophagy or do you need to do a full, no food at all kind of 24 hours fast?

Jason:

Autophagy is mostly controlled by protein. So acids, which is the breakdown... When you break down protein, you get immuno acids and that's really what's turns off autophagy. So when you're cutting down all proteins, that's when you're going to see more of that autophagy. I mean, I think it's probably better if you don't eat anything, but you're probably getting most of the way there if you restrict protein. You see it in a lot of vegetarians, for example, where they really don't eat a lot of protein because perhaps they don't like those protein sources, like the vegetable sources of protein or whatever. So you do see it sometimes where they do start to get too far into that sort of breakdown and not rebuilding phase. So some of them of course wind up saying, "Oh, I had to go back. My doctor told me to eat some meat and I felt a lot better." And it's like, well-

Dave:

Yeah. Vegans get it all the time.

Jason:

Yeah. It's tough because... And people ask me about vegetarian. I have nothing wrong with vegetarianism, but-

Dave:

You can pull it off as a vegetarian because-

Jason:

You can pull it off.

Dave:

... you can eat egg.

Jason:

Yeah. Well, some of don't, right? If you're a vegan especially. But-

Dave:

No, if you're vegan, it's a different category that it's-

Jason:

Yeah, it's tougher.

Dave:

... historically, there isn't a lot of that, at least in multiple generations. I've been pretty outspoken since I wrote my fertility book. I'm like, if you really want to decrease brain size in your offspring and have multi-generational weaker and weaker children go vegan. It doesn't save the planet. It doesn't save your health and doesn't work. I was a raw vegan, a devout raw vegan for long enough in my time and I've helped so many of them heal. And you can fast, you can be ethical, but for God's sake, don't waste your health away by excessively doing what you're talking about there.

Jason:

And I think it's important to... Like if you want to be a vegan, be a vegan. It's your own life. Right? But you got to understand that [crosstalk 00:42:59].

Dave:

You can also smoke if you want.

Jason:

Well, exactly. I'm not going to tell you not to, but you have to understand what's real. That is plant sources of protein are not as good as animal sources of protein because we're animals. We use animal protein much more effectively than we use plant proteins because we're not plants. And so therefore it's a lot harder to get the proteins you need to really be healthy, eating a vegan diet. It's not to say you can't, but it's going to be harder. So you just have to know that and if you know that and you still decide to, go ahead, be my guest. But I see sometimes these things out there, "And oh you can be a vegan body builder, look at me and stuff." I'm like, "Yeah, but there's challenges. So let's not gloss over those." Right? "Let's [crosstalk 00:43:46]."

Dave:

You can also run a marathon carrying dumbbells, but it might work better not to carry the dumbbells, just saying.

Jason:

Yeah, exactly. And that's the whole point. So you do see this sometimes in those people where they really get just too far into that. And I mean, other people go the other way where they're taking a lot of animal protein-

Dave:

Let's talk about the carnivore diet, thumbs up, thumbs down?

Jason:

You know what? It's too new to really know what's going on there. I mean, there's multiple things. One is that a lot of the carnivores that I talk to anyway, they wind up eating very infrequently sort of-

Dave:

Yeah. Lots of [inaudible 00:44:25].

Jason:

They eat once a day sort of thing. Right? So therefore, even if you are stimulating all those sort of growth pathways, it's very infrequently compared to eating three times a day with three snacks sort of thing. So maybe that balances. And the other thing is that people who do well on it, because I really think that variety of diets can work for people. So if you find what works for you, so if somebody goes carnivore and their sugars come down and they lose weight. Hey, maybe the carnivore diet is not the greatest from a theoretical standpoint, but losing that weight and getting rid of the type 2 diabetes is hugely beneficial. So hugely beneficial that it basically negates any of the bad effect that possibly could happen with the carnivore. So you always got to balance these things. Like if you're eating carnivore and you're not losing weight, well, then forget it, right?

Dave:

Maybe it's not working, right?

Jason:

It's not working. Forget it. But if you're getting the benefits that you thought you would get from it, if there's a good chance that you're better off doing that. So I'm like... I don't know the answer because it's really-

Dave:

It's [crosstalk 00:45:29].

Jason:

... a new diet. I'm not against it. I actually have had a couple of people do it and I was actually surprised at how well they did. So it's not the easiest diet to follow though, because you start like... Just from what patients told me, after a while you start wanting some of those other things.

Dave:

What I think is going on there is that there are a lot of plant compounds that are bad for you, like the seed oils and I've been... Those are out of the Bulletproof Diet as much as possible. You need some undamaged omega-6 occasionally. But there's a lot of inflammatory plant stuff that you eat and when all of that goes away, you start to feel good. But most people who go carnivore, get where they want to go and then they add in a small amount of plant stuff that tastes good and it feels like glucose is kind of important for glial cells in the brain, but not an excess of glucose. So I'm a supporter of Carnivore Diet for a time, but I don't think most people are going to thrive for years on it just like I don't think most people are going to thrive on a vegan diet, but do it for six weeks. That's just fine. It'll probably be good for you because you'll have gotten rid of your mTOR. It's okay.

Jason:

Yeah. And it gets back to the idea that maybe you can cycle these and do very well with them, right? Because now you're sort of hitting different highs and lows, different advantages, disadvantages, and it keeps you from sort of getting bored of what you're doing. So there's different ways to do it and I think just understanding sort of the basic principles was usually what I'm about that is... And one of the things that always got me was that we talked sort of endlessly about the sort of what you eat sort of thing and we completely ignore the fact that it's not just what you eat, but it's how often you eat as well. It's just like if you make a salary and you make a hundred bucks, that's great, but do you make a hundred bucks a day or do you make a hundred bucks a year? I mean, think different, right? So if you're eating certain things, but you're not eating very often, hey, it might be okay. So that's the thing. Right.

Dave:

Well, your book goes into so much detail about all of the different aspects of cancer, but one thing that really stood out when we talk about nutrition and cancer is hyperinsulinemia, can you explain what that is for listeners and why it matters for cancer?

Jason:

Yeah. So insulin is a normal hormone. So its job is essentially to tell the body to store energy and that's why obesity is a disease of sort of too much insulin. If you have too much insulin, you're basically storing too much of it. Right? And it doesn't almost doesn't matter what you eat because what's going to happen of course, if you have too much insulin, so for example if I was just to pump you full of insulin by injection, for example, then all of those, whatever you eat, all of it would go into storage, leaving you with nothing to use for your heart and your liver and your kidneys and then you're going to eat more because you have no energy, but then the insulin is just going to sort of suck it away. So it's a disease of too much insulin and same with type 2 diabetes, which is very closely related. It's a disease of too much insulin.

And in cancer, it's different because insulin is also a growth factor. So not only is it important for sort of weight gain metabolism, but it's also a growth factor. So when you start to have too much insulin, then not only does it lead to the obesity type 2 diabetes, but it's also going to tip the scales in terms of growth, which is going to tip the scale in favor of cancer. Then that's the... Excuse me, that's the big part about it that we hadn't really thought about or known about, but it has really come to the forefront in the last 20 years is this link between nutrition and metabolism and growth because they're the exact same thing. We didn't know that, we didn't know that insulin, which is always a sort of metabolic hormone is this sort of key growth hormone in our body as well.

You see it in other cases, for example, you look at tall people. Like they get more cancer, right? There's a large Million Woman Study and you can see that taller people actually get more cancer because again, if you're taller, you're having more of this insulin effect that's why you got taller in the first place. But over time, you're actually going to tip the scales in favor of growth, which leads to more cancer and other things like that are important because insulin is something that we can control. If you have too much insulin, then you can do something about it, right? You can eat foods that are not going to stimulate insulin, or you can do more fasting, which is going to reduce your insulin of course if you're not eating and lower your risk of cancer because of if too much insulin was a problem, that's how you're going to lower it through... By lowering it, you're going to lose weight. You're going to get rid of type 2 diabetes, which is going to lead you to less cancer.

So there's something that you can do. It's like something within your control, as opposed to this sort of genetic paradigm where it's always, oh, it's too bad, it's too bad. It's too bad kind of thing.

Dave:

One of the things that came to light when I was doing the research for my anti-aging book is that low insulin increases your all-cause mortality risk more than high insulin. And I found that when I didn't... when I went in ketosis for too long of a period, when I didn't cycle, which is rampant in the world of keto right now, this not cycling thing, that low insulin not only makes you not feel good, but it increases your risk of dying. How do people know that they don't have hypoinsulinemia versus hyperinsulinemia?

Jason:

So usually you see it in the weight. So if you're losing... if your insulin is low, remember insulin is a signal to say, store body fat. So if your insulin is low, so the extreme version was type 1 diabetes. You basically just lose weight, lose weight, lose weight until you die sort of thing. So insulin is a natural hormone, so it can be too high and it can be too low and that's the point. This happens with all of our hormones, like-

Dave:

Of course.

Jason:

... you can have too much thyroid and too little thyroid. You can have too much testosterone and too little testosterone. Like it always works in both ways, both ways are disease processes. So too much insulin is a problem. Too little insulin is a problem. And that's the thing that we have more of now is the too much insulin. That's more of a problem today than it was in 1970, for example, where there really wasn't a lot of obesity. So we didn't worry about the diseases of too much insulin so much. We sort of worried about both. I mean, there's a big worry in the '70s, for example, with anorexia nervosa and stuff, and of course that's a problem. So you have to deal with that. But now we're mostly, 90% of the problems that I see are related to too much insulin. So therefore something like fasting presents itself as a very useful solution, as a way to bring it down. Ketogenic diets are the same. It's going to lower your insulin levels.

If we're in the '70s and we had all these people with anorexia nervosa, we wouldn't be recommending this, right? It wouldn't be the right treatment because too much insulin wasn't a problem. Therefore, treatments to lower insulin wouldn't be the right solution.

Dave:

I feel like we could talk for eight hours and really kind of cover the basics of your book, and it's a very complete book, includes immunotherapy and it is now the book that I'm going to be recommending for friends and people who reach out and say, "I just got cancer or cancer runs in my family and I'm worried." I'm like, "Okay, you have a book to read now." And that's a high bar, but I think you're very logical and it's very readable. So I have kind of two questions that I want to follow up to end the interview with. And the first one someone finds out and unfortunate, I can't tell you which kind, but someone finds out that they have a common kind of cancer and they just hung up the phone with their doctor, without knowing much more, top three recommendations for people who are going to have to deal with their cancer, what are the three most important things they can do if they're playing the odds?

Jason:

Yeah. So if you're talking about one of the obesity related cancers, you have-

Dave:

Yeah. So let's talk about that.

Jason:

... to look at the cause. Yeah. Because if you're a... Lung cancer, of course, then you have to stop smoking. Clearly there's nothing else-

Dave:

Okay, we'll say an obesity related cancer like colon cancer.

Jason:

Yeah. So like breast cancer, colorectal cancer, and liver cancer, pancreatic cancer, those are obesity-related cancers. So the most important thing is to understand that there's... If you're overweight, then you need to sort of get back to a normal weight because again, that's a disease of too much insulin, both are diseases and then you have to get that down.

Dave:

Lose weight.

Jason:

Lose weight is probably the most important thing. Two is probably sugar. And I don't think there's a lot of people that would disagree. Sugar plays a huge role in all of these diseases and it doesn't do it in a direct fashion, but it does it sort of in this indirect fashion, it causes a lot of liver fat accumulation and insulin resistance, and therefore hyperinsulinemia, so it does this... And it's very insidious and it's hard for your body to handle that much of the fructose. And that's the problem with the sugar. So cutting sugar is probably one of the big things with trying to lose weight, trying to get down. If you have type 2 diabetes, then there are certain drugs that might make things better and certain drugs that may make things worse. So insulin of course would not be something I would recommend, but trying to control your sugars through your diet. And there's also certain medications that you can... Those would be the main things. I mean, they're common sense. They're logical.

I mean, in terms of treatment, you still got to follow whatever the oncologist recommends as the best treatment regimen, because by the time he gets to that stage of cancer... I mean, we spent

millions and millions of dollars trying to figure out the right regimen and I'm not going to say, they're all wrong, right? The regimens that they recommend have been tested. So you do need to take that advice, but there are ways to improve your odds. So getting to a normal weight, cutting down sugar, potentially considering Metformin and intermittent fasting has other roles. So one of the roles is in chemotherapy. Actually, they've used it sort of before chemotherapy. It makes it more tolerable and perhaps also makes it more effective and that's... So they fast 24 hours before.

And the idea here is that what you do is by fasting, you're putting yourselves into this sort of regenerative mode so that when you get the chemotherapy, you don't sustain as much of the toxic damage that accumulates, whereas the cancer, the cancer can never really go into this regenerative static mode. It's always sort of growing and therefor gets the full brunt of that chemotherapy. So they've used it in small studies where they've used fasting sort of before and after chemotherapy and they found that a lot of people can tolerate it better. So these are sort of Metformin fasting. These are ways to sort of optimize around the treatments that are available.

Dave:

Do you have enough time to talk briefly about Metformin? Some new studies that I wanted to chat about. You're good for another couple of minutes?

Jason:

Yeah, yeah, absolutely. So Metformin is really interesting because again, it plays on a hormone called AMPK which is again, one of these nutrients sensors and the nutrients sensor it sort of fools your body into thinking that there's no nutrients available and therefore cutting growth down. So in diabetics, Metformin seems to reduce the risk of certain types of cancer, breast cancer particularly, and therefore some people have started to use it sort of outside of the diabetic realm, and you'll see that in a lot of longevity, people will consider using Metformin or some of the related compounds to Metformin in an effort. The proof is still to come I think. I mean, I don't think there's any good studies, but on the other hand, it's a relatively non-toxic drug, relatively because all drugs do have side effects, but we've been using it for 50, 60 years and it's been grown well tolerated. We know a lot about this drug.

Dave:

I went on Metformin when the first anti-aging studies came out early 2000 ish for about three years, but I ended up going off of it because of some early studies about a reduction in mitochondrial function and just like four days or maybe six days before recording this, a new study came out that showed that it was exacerbating age associated mitochondrial dysfunction, and caused a failure of cellular respiration because of what it does to complex I in the mitochondria and so I've... That plus the vitamin B12, the reduction in sensitivity, I've been reluctant to recommend it as much as I used to for healthy people. But the idea of reducing your type 2 diabetes is so much more overwhelmingly important than that side effect, but if we're looking at a healthy population that may be one to hold off on for a little while based on that, I think, do you agree?

Jason:

I agree. I've never recommended it to healthy people although I know certain other doctors who have done that. So I think that the benefits, again, it's one of these risk benefit things. If you have type 2 diabetes and your option is Metformin and insulin, then clearly Metformin [crosstalk 00:59:40]. But if you're healthy, then what are your benefits? Well, they're fairly murky so therefore any side effects are going to start to balance because the risk is just so much lower in a healthy population. And the other

thing is that these drugs they might be good for a certain period of time and not be good if you do it continuously. There's lots of drugs that have been like that, right? If you take it, it's good. You take, it's good. Then when you study, oh, you've been taking it for 10 years and it's really bad for you. So some of the osteoporosis drugs were like that. They were good. They're good. They're good. But if you took it for a long time, you got more fractures actually.

So there's sort of a time limit to those because they're interfering with sort of the natural thing. So if you're chronically stimulating or simulating this sort of state of semi starvation, it might be good for a while, but you're not getting the normal growth that you should be getting, right? So therefore maybe you do have to cycle these. Maybe you do have to say, take it for this and then go off of it and this and that. There's different ways, but without the studies it would be hard to know how to recommend it. So I've never really recommended it for healthy people.

Dave:

I think your conservatism was probably warranted there and I've considered it. I probably will experiment with taking a Metformin on a day when I'm doing a 24 hour fast. So I'll turn up the effect of the fast, but the rest of the time, I wouldn't take it, stuff like that. There's all kinds of stuff and we may never do studies on that, but if we know enough about how it works and you see outsized results, you can probably say, "Okay, this is a healthy practice for me, but it may never be provable." But if you look half the age of your friends, hmm okay.

Jason:

Yeah. And I think these things are relatively low-risk too. When you cycle these things, of course you're going to be a lot less prone to getting into problems. Like if you cycle say veganism, you're going to be less prone to getting into trouble. Like if you eat eggs every so often or fish every so often, you're going to be a lot less prone to getting into trouble than if you're hardcore hundred percent-

Dave:

[inaudible 01:01:47]. Yeah.

Jason:

... I eat zero eggs and fish and meat and everything, right? You could get into a lot of trouble with that. Same for everything, right? Hardcore keto, people worry about that. Hardcore carnivore, people worry about that. And some of these diets haven't been around long enough to really know what the long-term side effects are, but it seems like you do have... There's reasons that you'd have to think twice about doing them hardcore all the time, whereas if you're just sort of cycling in and out trying to get the results, targeting them to what you want. Like, if you have a specific problem, I want to lose weight. Right? Let's target that, let's get to there. And then getting there and then trying to maintenance those sort of things. It seems like you're going to run into a lot less trouble in the long term.

Dave:

Well, I love your reasoned rational thought process about cancer, about fasting. You don't jump on the bandwagon too soon, but you're way ahead of the curve and you're so willing to say, we don't know. But you're also the rare doctor who's willing to say, we don't know, but the most rational thing that makes sense, given what we do know is probably this and we'll see more studies. That's a very rare thing for anyone with a license. So thank you.

Jason:

Thank you. And thanks for the... about The Cancer Code, because that really was... What always I was trying to do is write a book for somebody who's sort of all of a sudden finds out, "Oh, I have cancer. What am I going to read? How do I know more about this? What's happening in my body?" Because sometimes you get out there and you read and it's like, there's nothing... Nobody's talking about it. Like, what is it as a disease? That was such an interesting question to me is what this disease actually is and how our thinking about it has completely changed in the last 10 years? And then people will say, "Hey, this is an interesting sort of thing." It doesn't change perhaps what the treatment is, because you're still going to do mostly what the doctor tells you to do, but at least you have an inkling of what's going on in your body so that you're not just sort of out dealing with the complete unknown. So, yeah. Thanks for that. I really appreciate that.

Dave:

You're welcome. You've done an act of service and I like to tell listeners this, no one who knows what they're doing writes books for money. It takes so many thousands of hours and like you pour your soul into a book. And yes, you should get paid for the book. You do not get paid as much as you do practicing medicine or being an entrepreneur. Like I write my books as acts of service and acts of learning and I can tell from reading your book, that you were putting the pieces in order for yourself as you were doing it so that you could be better at teaching it. So it is a book that... I mean, that is on my shelf and it's like you need to read that if cancer is your four killers, there's four. Diabetes is the first one because it gives the other three more likely, but cancer is the biggest one right up there with cardiovascular disease. They kind of race, depending on-

Jason:

Absolutely, number one and two.

Dave:

Yeah.

Jason:

Yeah. I-

Dave:

So you wrote the book, that's like here's what you do.

Jason:

Yeah. I hear you about the writing because it's like you write not because you want to, you write because you have to. It's just not worth it otherwise. Right? Because sometimes you get these people that say, "Oh, you wrote it for the money." And like if I was doing it for the money and I'm telling you, I could have done a lot of other things. I would've done a lot better than that. You write it because... And I totally hear you on that because it's like... I remember I finished the book, I finished The Diabetes Code and then I started reading up on cancer because I found that like... Honestly, I thought the whole scientific journey was just a fascinating story and it's like, "Oh, I have write this." This why you have it on your chest, you have to get it off your chest and then it's like, "Yeah. Okay, I've said what I have to say."

You don't write it because, oh, I need to write a book and I need to make money. You do something else for that. Right?

Dave:

Yeah. Absolutely. You do something else for that, but it's well done. And for people listening, if you decide you're going to read The Cancer Code, if you have cancer in your genes and in your family and your mother and father got it and your siblings did, you might want to read this book. And if you have cancer or you've had cancer, which means you have a greater chance of it coming back, you might want to read this book. And one thing you absolutely have to do, and this is funny, but it's actually proven to reduce cancer and it's, leave a positive review when you read a book that's worthy of a positive review. And the reason that reduces cancer and I'm not joking about that is that gratitude in multiple studies reduces inflammation in the body, and it's the least you can do. If you tip your barista, you also should leave a review for your authors. It doesn't take very long. [inaudible 01:06:52]. Thanks Jason for being a continued voice of curiosity and reason in the bizarre world of health and medicine, you're doing a fantastic job.

Jason:

Thanks so much. Thanks for having me on. It's great.