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Transcript of Mark Sisson



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Speaker 1: Bulletproof Radio. A state of high performance.

Dave: Hey, it's Dave Asprey with Bulletproof Radio. Today's cool fact of the day will be celebrated potentially by husbands everywhere because science now has proven that you should sleep naked. The reason for that is that by wearing pajamas, you're probably interrupting your body's natural decline in temperature that's part of your nightly circadian rhythm. Also, when you cool down at night, it means you increase growth hormones and you decrease cortisol which means you get better sleep, reduce belly fat and more sexy time. That was probably my favorite cool fact of the day in 300 episodes or so.

Before we get going on the show, you might not know that we have a Brain Octane Oil 3 pack available on the website which saves you about \$14 when you stock up on it. Brain Octane Oil is a subset of MCT oil. It turns out, there's quite a lot of MCT oil out there but different MCTs do different things. This is the most ketogenic MCT in existence, made in the US. It's awesome stuff. It's what I put in my Bulletproof coffee every morning. You know where to get it. Bulletproof.com.

Today's guest is a friend, a guy whose work I greatly respect and an innovator in this space. One of the founding fathers of the whole way of thinking for paleo. If you're watching on the YouTube channel, you already recognize him probably. It's none other than Mark Sisson. If you're a long time listener, you know Mark's been on Bulletproof Radio but it's actually been too long. He's a paleo ancestral health expert and endurance athlete and author of the best selling Primal Blueprint. If you've read the notes in the back of The Bulletproof Diet, you'll note that I thanked Mark for his work in the acknowledgement section because his stuff is legit, including Mark's daily apple which gets 3,000,000 visitors a month which is size blog. He's certainly a biohacker.

The reason I've invited him back on the show is that he just came out with a really cool new book called Primal Endurance and I wanted to dig in with him because he is both a biologist by training, endurance athlete and just an ass kicker in all things. Mark, welcome to the show.

Mark: Thanks for having me, Dave. Good to see you again.

Dave: What made you write a book about Primal Endurance? I thought you did heavy lifting and you go swimming out there in Malibu and all this.

Mark: No. It's really interesting because for the longest time, I was an endurance athlete for most of my career. That's how I learned a lot of what I know about fitness and diet and exercise and training but over the past decade, I've spent a fair amount of time taking back all the stuff I said about training and decrying the concept of training for marathons and long distance triatholons

Dave: Chronic cardio.

Mark: ... chronic cardio. Chronic cardio became a term that Art Devany and I coined about 11 years ago

now to describe this activity that so many endurance athletes, myself included in the old days undergo which is basically training at a heart rate that's about 75 to 80% of your max heart rate for long periods of time. A lot of endurance athlete think that's where you need to train. As a result, I saw it personally, my career basically evaporated by I over-trained but then I saw it in athletes I was coaching. People train too hard and they train too long. They weren't getting the results that they said they wanted.

I started writing all these negative things about endurance training and I started going almost rhetorically why would you want to do that? Why would you want to run a marathon and beat your body up and incur all these aches and pains?

Dave: The first marathoner died, right?

Mark: Yeah. Really didn't bode well for the rest of us. Then, as I got into the lifestyle of the Primal Blueprint and I started talking about all the ways in which we naturally improve endurance by moving around a lot at a low level of activity, only lifting heavy things once in a while and only sprinting once a week but really going all out, not just doing intervals but going all out.

I started think a couple of years ago, there's a lot of new technology now. The ability of the body to burn fat which we assumed for the longest time was very limited and we really had to rely on carbohydrate if we were going to be at all competent in endurance competition. That changed. This whole concept of utilizing ketones instead of glucose and allowing the brain to access ketones during an endurance contest and to not feel like you have to shut down. That new technology hit. Then, some other technologies with heart rate variability. Brock knows a lot about that.

The guy who I coached for years who is the number 3 triathlete in the world, who later became the head of my publishing company, we started to think, "Well, maybe there's a way in which we can teach people, coach people to train for these endurance contests where they don't get beat up, where they don't get burned out, where they don't get over-trained, where they don't get sick all the time, where they don't get injured." That's what begat the concept of this book, Primal Endurance.

Dave: That is an epic biohack. The way I've defined biohacking is changing the environment around you and inside you so you have control of your biology. I love your perspective on this, Mark because look, I did it. I realized it wasn't good for me but I still wanted to do it. I'm going to do it anyway but I'm going to make it good for me. All right. That is absolutely grabbing life by the throat and saying, "I'm going to do it. I'm going to do it."

Great respect for that perspective. I used to be a long distance cyclist even though I weighed ... I don't know how much I weighed at the time but I was carrying at least 50 extra pounds that weren't the frame of my road bike. They were my love handles. As a teenager and I was trying to lose weight and getting stretch marks and all. I remember that feeling of bonking, when you're like, "I didn't eat enough muffins. What am I going to do?" It was so horrible. I never did lose weight from that approach, even though I'm sure I did some beneficial things and probably some harmful things, too.

Here we are. For me, that's 25 years ago and you're writing a book now that says, actually, with the right changes, you can do things and how endurance ... Ultra marathons, is this part of the plan? Marathons?

Mark: Absolutely. For me, personally?

Dave: Yeah.

Mark: I'm out. I don't ...

Dave: Me, too, by the way.

Mark: Yeah. I'm not interested in competing anymore. I was a very good endurance athlete. I finished fifth in the US National Championships in the marathon in 1980. I went on to finish fourth at Ironman in Hawaii. That was the pinnacle of my success. Actually, then, I also set the world record on the VersaClimber, that climbing machine in the gym,

Dave: Yeah.

Mark: ... for the mile climb in my late 30s. I was that aerobic endurance-based.

What I recognized was that most of my training was concentrated ... I was training myself to hurt and be able to handle it. I wasn't training myself to be efficient. That's what's changed. What's changed has been this notion that if we can alter our environment to upregulate genes that assist us in burning fats more efficiently, more cleanly, that we can increase mitochondrial biogenesis, actually increase amount of mitochondria that we have.

Dave: That's so big.

Mark: It's huge. Increase the efficiency of those mitochondria because mitochondria have their own DNA that respond to these signals so we can put more fat through, we can unburden the body of having to take in huge amounts of exogenous carbohydrate which then lowers the load of free radical damage that we would otherwise incur, putting so much sugar through the body.

All these things come together, they converge to create an opportunity for people who are going to be going at a relatively high rate of output. What we like to talk about is this really applies well to ultra marathoners and century riders and triathletes. We know there are people who are setting records now, training ketogenically, training with this methodology that we're using to set personal best for sure but also to starting to set world records. Those distances are coming down. Now, while we said, "Well, it certainly applies to people who are just going to be burning fat over 12 hours or 15 hours." Now, its applying to people who are going to be burning fat predominantly over 2 hours.

I think the next breakthrough in world record marathoning will come from a ketogenic athlete who has put the time in because it's a long adaptation process at the elite level. You get 80% of

your benefits in the first 21 days. Then, the next 10% might take 6 months and the final 10% might take another year to kick in. If you're an elite athlete, you have to factor that into your career and how much are you willing to take a year off and train this way to come back and be stronger than all your peers.

If you're a citizen athlete, an age group athlete, why not start this right away and get more efficient at your ability to perform work at a relatively high level of output by being more efficient from the work you did in the gym training to sustain power, from the work you did at the training table, by eating more fat and cutting back on simple sugars and other carbs like that and by being really, really smart about the time you spend actually training in the field.

Dave: You've rejected consistency for training and you've added huge amounts of variability into it?

Mark: Yeah. I'm a skeptic. I'm a cynic actually more than a ... I mean, I'm ...

Dave: Screw those skeptics. They're not strong enough. They can do better.

Mark: Yeah, exactly. I question just about everything. Certainly, that's what got me my moniker at Marks Daily Apple and the things that I've written because I question authority and I question conventional wisdom. When we look at all of the variables in putting together a training program, it turns out that humans are fractal, that our behavior patterns were fractal over millions of years, that our body adapts to that fractalness almost better than it does to a rote metronomic consistency.

Just as a general rule of thumb, one of the little bullet points on the book is be more inconsistent with your training to race more consistently well. What we mean by that is, if you have a training calendar laid out. Here's what I'm going to do Monday and Tuesday and Wednesday and I have all my workouts planned for the next 2 months, we haven't built in a lot of the necessary variability to account for what happens when you wake up one morning and you don't feel right. You still going to do that workout? You going to take the day off? Are you going to utilize the strategy of heart rate variability? Just give you clues as to what you ought not do.

Conversely, maybe you have a day planned where it's an easy day. You're just feeling like you're jumping, chomping at the bit, there's no reason why maybe you couldn't put the Friday workout that was going to be a really hard workout today which is Tuesday.

What we're teaching is we're teaching an intuitive ability of each person to dig down and understand how the body works and grock how the enzyme systems work and how training work so that you can intuitively train to your maximum potential given the variables of how much time you spend working, how much time you want to spend with your family, just your genetic limits because some people are just not going to run a 2 hour and 20 minute marathon and but we're trying to teach through the book here's how you can set up a strategy that you know all these different variables and you can insert them into your own personal equation and come up with the ideal outcome.

Dave: When I was, I don't know, 22, I had to have 3 knee surgeries. The doctor said, "You're lucky you can really walk." Actually, I only had 2 knee surgeries. I'm like, "You know, I'm going to get healthy. I'm going to lose this 100 pounds," so I started working out an hour and a half a day, 45 minutes of cardio, 45 minutes of maximum output weights 6 days a week. I'm like, "I don't care if I'm sick. I don't care if I only slept 2 hours. I'm going to go to the gym. It's what I do."

I got addicted to it. I did this for 18 months and at the end of 18 months, I could bench press all my friends. I was still fat. I didn't lose any weight. I got strong and I've seen this. My friend Alex Lightman in Santa Monica. He can run 2 hours a day. He's 78 pounds of fat on him that he can't get rid of with that strategy. You talk about this recovery thing and all that. Back then, no one talked about how varying based on how you feel or taking a rest day or getting extra sleep, how that was going to make any difference.

When did you first start really realizing this? At that time in the 80s when you were winning or was this way after?

Mark: No, no, no. It really kicked in. I retired in '82. I took 5 years off of any sort of training hard. I became a personal triathlete. Because I'd done Ironman, I had a cache about me. In the early 80s, I could command \$100 an hour to train people. That was great money in those days. As we say in Malibu, some people can live on that in those days.

What I was doing, I was walking or I was jogging 13 minute miles with my clients who were not ... They were maybe housewives looking to lose weight or they were businessmen looking to just become more efficient at what they did but they weren't necessarily trying to be world-class athlete. They were just trying to get into shape. Certainly, I had dialed in part of the diet so I was able to give them the wisdom of the dietary advice that became the Primal Blueprint.

It was my training 4 hours a day at a very low level of this activity. Then, once a week, I would go to the track and I would do my work out. It would just be a 20 minute or a 30 minute interval session.

Five years later, I end up coaching an elite team of triathletes that travel around the world and were the best in the world. I'm the coach. I'm already old by then. I get into some of the races with these guys. I'm keeping up with them. I'm going, "Wait a minute. I took 5 years off, just doing easy stuff. All I did was my own workout once or twice a week. I did some stuff in the gym. I reconfigured my diet but I'm at fit now as I was when I called myself an elite athlete and now I'm an old coach." I'm in my late 30s now and I'm entering world championship. I won my age group in the world championship duathlon at the Desert Princess and finished 11th overall.

It was like, okay, that was the light that went on in my head that there was really something to this low-level training combined with the occasional all-out really hard training that first of all made me sane, kept me sane because I wasn't putting in 30 hours a week of 75 to 85% heart rate all the time. I wasn't training myself simply to hurt because that had been the old ... The old way of training was you go out and you do an hour run or a 2 hour run. If your heart rates at 80 to 85% of your max, you're basically training yourself to withstand that in a race when you finally get to a competition.

What you're not doing in that case is you're not training your body to burn fat. You're not training your body to become more efficient. You're simply training your brain to withstand the pain and you're over-training your heart, we now know. You're literally damaging your heart if you're doing that amount of hard training all the time.

It was that combination of seeing what a low level of consistently low level of activity would still generate aerobic benefits and make me more efficient when I finally did get into racing. That's really when the light went on. Again, that was back in '85 or '86. It's almost 30 years ago.

Dave: It seems like training yourself to tolerate suffering is a badge of ... It's a badge of courage. It's what you can do. I find that if you want to take an obese person and get them to work out every day, especially without changing their diet, they will be suffering athletes in that they will be really good at tolerating suffering and setting aside the pain and doing it anyway but when you do it right, it's not supposed to be suffering. I've developed an intolerance to suffering in that I have a high capacity for suffering. I just don't want to do it. I believe that if I'm s, I'm probably not doing it as effectively as I could. It's a useful signal.

Mark: It's a great signal. That's exactly right. There's a little bit of suffering has to enter the equation if you want to be good but I'm talking about a little bit. I'm not talking about practicing suffering every day.

Dave: It's not suffering for suffering sake. "I'm a good person because I'm put ... " No. But so many people use that

Mark: No but so many people use that. "I'm a good person because I went to the gym. God is punishing me because I'm not losing weight and I'm putting all the time in." I talk about it for years, I've talked about all the people I know at the gym that I go to that have gone, the run the treadmill 45 minutes 5 days a week. They still got the same 25 pounds to lose except they're now a little bit more giggly. It's actually worse. It shouldn't be that way.

People get caught up and this is one of the tax that we talk about in ... It is addictive. It's addictive because when you do that high level heart rate training on a daily basis which the body recognizes is not healthy and should not be doing, you create endorphins. Endorphins are not some wonderful god molecule that we should all be seeking on a regular basis to make us feel good. Endorphins are a survival mechanism. Endorphins evolved when, being chased down the veldt or the plains by an animal and you've survived thus far but now you're cowering up in a tree and you want to survive rather than just give up like a deer in the headlights. Endorphins are supposed to make you feel good, to be able to overcome and get to the next level of survival.

Far be it from me to dictate what evolution had in mind but my sense is that endorphins were to be deployed on a very infrequent basis as a survival mechanism because in the old days, if you were in a survival situation every day, you would gag after a while. It was a numbers game that was going to take you down. This idea that we chase endorphins, we're chasing the runners high ...

Dave: It's bad news. It's addictive.

Mark: It's false economy. It's addictive. It's also, by the way, it's a reason why so many substance abusers gravitate to endurance athletics because it's replacing one addiction with another. We're still talking about opiates. It's just an androgynous opiate instead versus one that you shoot up. Anyway, that's my take on this whole concept of pain and suffering and I'm a good person because I go to the gym and why can't I lose the workout because I'm going to the gym.

The reason you can't lose the weight when you go to the gym, especially if you're working hard on a daily basis is because you're burning sugar. You go to the gym, you're raising your heart rate so high that you're burning mostly the glycogen that's stored in your muscles or some other gel packs that you're taking. You're locking the fat into the fat cells. It can't get out. As a result, you get home and you say, "Well, I just spent 45 minutes or an hour and a half on the treadmill. I have to replenish my glycogen so that I can go do it again tomorrow."

It's this vicious cycle of depleting sugar, then going home and eating more carbohydrate to replenish sugar so that you can go do it again and burn more calories but over time, the brain is wired to try and overcompensate for that insult that you gave it that day. The tendency, unless you're really a gifted endurance athlete and you're a 5'11" 132 pound man who's a marathoner, the tendency is for the body over time to add those excess calories as fat. Even though you're in the gym doing the work and you're sweating and you're burning calories, because you haven't trained your body to burn off its excess fat and you become so dependent on sugar, it's this rat hole down which you fall.

Dave: There's a few outspoken sports trainer people who are still screaming about caloric burden. Usually screaming, it's like, "I have high cortisol because I'm not feeding myself well," voice. What do you say to the people who go out there saying, "It's about the calories. It's about the calories?"

Mark: It's not about the calories. It's about efficiency. It's about how do you take those calories and convert them to energy.

Dave: Yes! It's efficiency.

Mark: It's efficiency. What we've seen with primal endurance is the way we train when we're actually doing aerobic training, whatever you want to call it, cardio or aerobic or whatever, it's at a rate that is the highest possible rate you can go as the limiter at which you can still put mostly oxygen through your body and not accumulate lactic acid. That heart rate has been determined generally to be 180 minus your age.

For instance, I'm 62 so 180 minus 62 is 118. I would limit my training heart rate to 118. I might give myself 3 or 4 beats a minute because of my history of having trained hard enough to do this but that is so ridiculously low compared to what I used to race and train at.

Dave: One eighty?

- Mark: When I set the world record for the VersaClimber, I held 186 beats a minute. I wore a heart monitor, 186 beats a minute for 22 minutes.
- Dave: Have you ever measured your ejection fraction?
- Mark: Not recently. At that heart rate, the ejection fraction isn't even that significant.
- Dave: It's tiny.
- Mark: Yeah. It's tiny.
- Dave: It almost has to be small when your heart's beating that fast.
- Mark: Yeah, yeah. When you're on the VersaClimber, it's unique because you can get a higher heart rate than you would running or cycling because you're using legs and arms and you're pumping blood up and down. The heart's just maxed out.
- Dave: You're not getting the gravity shock which also has to be compensated for, right?
- Mark: Correct, correct. I used to train, I used to race at ridiculously high heart rates. For me to train at 118, it's whoa! That's so low that when I started doing it, if I were to use that as a limited and say, "I'm going to limit myself to 118," I might have been running 13 minute miles. I could run 5 twenties but I was burning mostly sugar and I could do that at 170 beats a minute or 180 beats a minute but for me to hold 118 and use that as a max and use the limiting factor, the amount of oxygen I could put through my body, that almost dictated how much fat I could burn. If I wasn't burning much fat, then I couldn't use the oxygen I was putting through my body efficiently and as a result, I was limited in how fast I could go.

When we build efficiency, we use that heart rate which is basically the highest amount of oxygen you can put through your body doing work without going into some anaerobic zone or some lactic acid buildup.

We find over time that people who are running 13 minute miles are then running 12s. As long as you hold steady, you do this for a couple of weeks, then you're doing 11s, then you're doing 10s. Then 9s, then 8s. Ultimately, people are doing 7 minute, 30 second miles at 118 beats a minute.

When they go add in the layers of training that include weight work in the gym and interval sessions like that, the fact that they can run 7:30s and be getting 95% of their energy from fat, which we know to be true based on the heart rate limit, when they start to raise their heart rate and they know they can race at 160 or 170 beats a minute, it's linear. As they're increasing their speed, they're still deriving a greater percentage of their calories because it's all about the calories as these guys say, they're deriving a greater amount of calories from fat and relying less on stored glycogen.

What that means is that the guy on either side of them that they're racing against, they're burning mostly glycogen at those high heart rates and at those speeds.

If I've trained this way and I'm good at burning fat, I'm not only sparing muscle glycogen which is ultimately a limiter of how fast I can go, I'm even sparing the brain glycogen so my brain is functioning well but it almost doesn't matter because I'm so good at burning fat that I'm producing ketones and my brain is burning ketones.

A whole different hack that we talk about which is the central governor theory of the brain. That was promoted by Dr. Tim Noakes years ago when he said, "You know, we did all this work on muscle glycogen and we determined that the reason you hit the wall, the reason you bonk is because you're out of muscle glycogen. In fact, even those people who have to withdraw from a race still have 150 grams of glycogen in their muscles. It must be something else. He determined that it was the brain. The brain was saying, "We got to shut down because we're running on fumes and if we don't shut down, there'll be damage done. We'll burn the engine out." It was the brain that was telling the body to shut down based on low glucose.

If you can fuel the brain with ketones in a race and the brain's going, "Hey, we're great. We know how to burn fat. We're not burning that much glycogen. We don't need that much glucose for the brain, if any, so let's just keep going. This pace is fine." We're seeing a lot of athlete at, again, in the 100 mile running race community are setting world records based on ... For Zach Bitter to run 7 minute miles and derive 98% of his calories from fat proven wearing an an exchange setup in the lab, this is stuff that we thought was pure science fiction 30 years ago.

Dave: Wow! There are more than a few endurance athletes who've have contacted me who literally pour Brain Octane into whatever their sports beverage is. "I just want to have some ketones when I'm in a race," and exogenous ones the best as they can get them, even if they're already nutritional ketosis, the ones who are burning sugar and ketones.

What do you think? For someone running a long-distance race, is there a time when, you know what? Have a stinger gel. Have some carbs, have some white rice or whatever else or do you say, "Stay in ketosis the entire time and just never have carbs," or is there end of the race bursts? What's your perspective on that?

Mark: We're still learning. We're still learning a lot about this. One of the things we're learning is you don't get out of ketosis by taking in some exogenous carbs in a race. There is some forms of carbohydrate. UCAN makes a SuperStarch which is high molecular weight starch that basically drips into the bloodstream at a very predictable rate. You can take in 30 grams an hour which is contributing to that glucose requirement as it may have increased over time if you ramped up your effort and not shut off ketosis and not shut off any of the other metabolic processes.

I think what's really critical is the understanding that the more time you spend training as a low carb athlete and that includes not just eating low carb in the diet but doing the actual training, spending the time at the low levels of heart rate and then building in the different facets of maximum sustained power and so forth. The more years you spend doing this, the more that metabolic machinery is cast in stone. It's there. You don't lose your ability to burn fat because

you take in a gel pack. You don't lose your ability to produce ketones because you took in some form of a low GI carbohydrate source.

It may be that what we're arriving at is a combination because this is really about what I call fuel partitioning. It's about, I've got an amount of output that I need to create. Let's say I'm going to try to shoot for a world record and it's going to be a 2 hour marathon. I know that I can only hold about 1,600 calories worth of fuel in my glycogen tank because that's about 400 grams of glycogen. I've got about 100 grams in my capatic tank in my liver tank that I can allocate for brain functioning. I might not need that but the rest of this is going to have to come from fat. Even if I'm running 4:42 a mile, if I can still get 60% of my calories from fat because of the way I trained and the balance comes from carbohydrates. Then, if I do run out, I can still supplement with ... Again, that's where the exogenous carbohydrate comes in. It may be a combination of MCT oil and some exogenous carbohydrate later on.

I think that's the exciting part about how to get to the next level of actual human performance is this figuring out what the secret formula is, how much of this, how much of that. It's going to be really cool.

Dave: It probably varies on a per-person basis based on your genetics by, probably there's a 20% wiggle room for each of those numbers, right?

Mark: Absolutely. Absolutely, yeah.

Dave: What do you think about collagen? I sell collagen. I'm not trying to promote that but they call that animal starch. I think I made a mistake. I did an extremely high fat replicating the Eskimo diet thing as I was experimenting for The Bulletproof Diet before I wrote the book. For 3 months, I ate one serving of green vegetables a day and the rest of it was fat and grass-fed stuff that could be right out of Primal Blueprint. No other dairy protein or any of that kind of stuff.

I got leaky gut, developed a bunch of food allergies. I got no tears, no mucus in my sinuses, no mucus lining in my gut which is why I likely got leaky gut. My sleep quality went away. It was not a good experiment. I wonder if it was because I wasn't using collagen at the time, I wasn't getting that "animal starch" that Eskimos would get from eating connective tissue and boiled seal bones and whatever else but for people in extreme ketosis doing endurance athletics which is a burden on the collagen, do they need that or should they just take exogenous carbohydrates to get the polysaccharides they need for covering cells of your immune system?

Mark: It's basically a question of do you get it from bones or bone broth or whatever but if you just eat red meat, if you just eat the clean protein, the lean protein, that whole concept that was originally promoted by the early paleos. Don't eat saturated fat. Just eat clean, lean protein. Then you basically, rabid starvation. You get imbalance of certain amino acids. Leaky gut is one of the side effects of that. We know that collagen has a tremendous effect on gut health for sure.

I started doing collagen because I have and I found out later when I had my DNA tested by DNA Fit that my soft tissue is prone to injury which it always has been. I still play ultimate once a

week and I play 2 hours of really rigorous, hard sprinting, ultimate Frisbee. My Achilles started hurting. I'm conscious enough at my age that I don't want to get injured so I'll back off. By over-supplementing with the collagen, the Achilles tendinitis went away. It was actually tendinitis which is a step beyond tendinitis. I take, in addition to our bars, I take a type 1, type 2 collagen blend almost on a daily basis because I'm just such a huge fan of it. I don't have access to bone broth on a regular basis.

Dave: I actually travel with 10 gallon steel pot full of bones, the TSA lets me bring it through. It's just not going to work, right?

Mark: Yeah, exactly.

Dave: For your Achilles, have you ever tried stem cells?

Mark: No. I've not tried stem cells. I'm very excited about that research. I know a lot of people that knee issues. I know somebody going through an MCL issue right now that's going to try stem cells. I've had friends with shoulder issues try it with varying degrees of success. I think that the jury's out on pluripotent cells and this concept that you can somehow inject it into a knee and get a knee and not a heart. It's a little too early for me to try stuff like that.

Dave: If your Achilles gets worse, my wife and I just went in and did adipose-derived and bone marrow-derived stem cells. Pretty much everywhere we could think of that ever had an injury. Like you, she has soft tissue injury dispositions. She had damage to her Achilles tendon from many years ago. It always hurts when she hikes and stuff. She had the injection done. It literally, a month later, it's gone. Same thing. She had a frozen neck since she was 10 years old. She couldn't turn her neck very far. One of her shoulders was frozen from falling 30 feet out of a tree as a child. Literally, 2 days after the injection, she had more range of motion than she's had as an adult. I was blown away but these were our own living stem cells, not from some other source, not from

Mark: Sure. I'm familiar with some the technology to harvest them. I would be much more inclined to do the marrow derived from the fat cell derived but still. Yeah. I guess the point is, I got the relief I sought.

Dave: Just from eating it.

Mark: Just from eating collagen so ...

Dave: There you go.

Mark: Yeah.

Dave: Let's talk some more about working out because we've all been taught, at least if you're as old as I am or as old as you are that after you've exercised, you've got to load up on carbohydrates so you can replenish glycogen because you don't have glycogen, you'll be weak.

There was a guy named Rob Faigin in the mid 90s, he's one of the first natural body builders, at least first that I knew about, of my generation. There might have been other ones. He wrote a lot about what happened if you ate protein after you worked out because you'd get a suppression of cortisol and an increase in growth hormone and testosterone. He positioned as a teeter totter. That really informed a lot of my early workout theories but what do you think you should have after you work out?

Mark: Yeah. My strategy is I don't eat. I work out fast. I don't eat for 2 hours after I work out primarily because I'm not hungry, primarily because I've gotten so good at burning fat that I wake up in the morning, I don't feel hungry. I'm not compelled to eat. I advise my audience, If you don't feel like eating, if you're not hungry, why eat?

I don't know if you saw a paper circulating a few days ago about over-nutrition and studies over nutrition which is basically even if you can put calories through and not gain weight, eating more than you should is probably not a good idea.

Dave: Yes. I would support that. I did 4,500 calories a day, between 4,000, 4,500 for more than a year. I lost or maintained weight. I did not gain weight. I don't think it was necessarily healthy but it was just astounding that the calories in, calories out just simply didn't work. I don't think it was a good thing to do but I did it.

Mark: I don't think it's a good thing to do either but as an experiment.

First of all, back to the post-workout meal. There's 2 schools of thought and the old school of thought was refill glycogen, you got this 45 minute window in which your body's prepared to really ramp up glycogen re-synthesis but if you look at your strategy, it's, "Okay, why do I even care about rebuilding glycogen, really?" Only if I'm going to go do this tomorrow am I really concerned about rebuilding glycogen today.

Once again, you take a look at the traditional 100 mile a week marathon runner which I was. You're running an average of 15 to 20 miles a day, every day without a day off unless you get injured or get sick. You had to think in terms of refilling glycogen. That made sense. That also kept you skinny because the converse of that is if you do a hard workout and particularly if you do a lag day or some workout that uses major muscle groups and does it to max effort, you do get that pulse of growth hormone and testosterone that is what you're seeking if you're trying to put on muscle and taking carbohydrate in blunts that pulse. It blunts that pulse of testosterone and growth hormone.

As a 62, soon to be 63, year old guy, I want all muscle mass that I can get and so I want to take advantage of that opportunity. I don't need to replenish glycogen because I'm not going to go hard tomorrow. In fact, I'm not going to go hard for 4 more days. My glycogen stores will refill so that when I get to a hard glycolytic workout or a weight workout 4 days down the road, my glycogen stores will be up to where they need to be but the old post-workout refeed was based on, "Because I'm going to do it again tomorrow."

Dave: It was based on some flawed assumptions that also drove the behavior that then drove ... It's a

chicken and egg thing with bad outcome.

Mark: Exactly.

Dave: Speaking of testosterone, okay. You're 63.

Mark: Yup.

Dave: You probably measure your testosterone levels, I would imagine.

Mark: I do.

Dave: All biohackers do. At what point are you going to take exogenous testosterone or are you never going to do it?

Mark: No, no, no. I started about 2 years ago.

Dave: You did? Okay, cool. Kudos to you. That is such a valid anti-aging strategy. Actually I appreciate that you talk about that. I was on testosterone for about 8 years because I wasn't making my own. My mother had more testosterone than I did when I was 26. It absolutely helped me to turn my biology back on. I'm not on testosterone right now because my levels are where I wanted them to be, when I finally dialed in all the stuff but I'll be damned if I won't go on testosterone if my levels dip and I can't fix with my diet. It's how it's supposed to be.

Mark: As I turn 60 and I started to realize that I want to live an awesome life as long as I can. One of my best friends who I used to do triathlons with 30 years ago is a preeminent anti-aging doc. I respect what he said. He said, "Look. Why don't you ... Let's just try this out, see how you like it. It's 100 milligrams in the butt once a week. It's not a big deal."

For 2 and a half years, that's what I've been doing. It's fine. It's part of my regimen now. I got to tell you, I don't necessarily notice anything as a result of it but I'm looking at those sorts of advantages going forward. There's no reason not to. Having done the research and the science, I don't think there's any reason not to. My wife's been doing bio-identical estrogen ...

Dave: Progesterone, yeah.

Mark: Progesterone, testosterone manipulations for 10 years.

Dave: Giving women testosterone might be more important than giving men testosterone.

Mark: Yeah.

Dave: What the right levels do for women, it's really important. I think it's left over from doping scandals with bodybuilders in the 70s using methylated testosterone compounds that aren't natural. There's some sort of weird puritanical thing against it. I'm not joking about. I'm planning to live to 180 years old. I think it's achievable given the change in anti-aging ...

Mark: According to Kurzweil, if you can make it to 2040 or 2045, you're good.

Dave: Exactly, right?

Mark: Yeah.

Dave: It depends, if Ray's right or not, I don't know but it's something like that. I think it's doable. I think he might even have his numbers wrong. At least if you're fortunate enough and if you could prevent enough damage early enough age, maybe it's there but that means that you will be on exogenous hormones at some point if you're body's not making them or you'll die.

Mark: Or you'll be downloading your consciousness into a machine.

Dave: That's a fair point. I think it's already halfway into my iPhone. If it just had more ram, right?

Mark: Yeah. Yeah.

Dave: Let's talk some more about brains since we talked about downloading them. One thing that ketones can do is extend the career of an athlete. We're talking about extending life. What do ketones do for extending your athlete life? In other words, being able to compete into your fifties or something with ketones?

Mark: We don't know yet because we haven't had any real proof, any long-term studies of athletes who were at the elite level who were ketogenic by plan that had undergone extensive training and maintained a high level of competitive output. We don't know yet.

I suspect that what we'll see is that there'll be a greater longevity simply because this whole energy pathway that we're talking about with fats and ketones is less reactive oxygen species generating than the glycolytic, glycogen carbohydrate/glucose pathways and that athletes have depended on for the last 30 or 40 years.

When you see athlete who are 35 years old and they look like they're 55 years old, part of it's because the amount of time they've been out in the sun but part of it's just because of the amount of oxidative damage that they've done, that is cross linking, it's acrylamide, it's ... What's that ...

Dave: Advanced glycation end products.

Mark: AGEs. My ARD reaction when I was looking at it.

Dave: There you go.

Mark: All sorts of manifestations of an inefficient energy production system that ironically is only available because we have an unlimited supply of carbohydrate. In other words, if we hadn't created ... Again, we get back to Jared Diamond and Cordain and agriculture and it was the best

of times, it was the worst of times, it's the greatest mistake humanity ever made but the reliance on carbohydrate allowed people to train hard every single day because they thought they had to train hard and they had to refill glycogen.

As a result I'm one of these ... I did damage to myself. I'm paying the price today for the damage that I did 30 years ago. I think that we'll see that ketogenic athletes and people who are doing cyclic keto- I'm not talking about staying in ketosis your whole life. I'm just talking about using cyclic ketogenesis to build a better metabolic machinery to put through fats and ketones and carbohydrates and maximize the energy output in a race. That's where it's headed.

Dave: You added a key word there, cyclical ketosis. That's exactly what I recommend in The Bulletproof Diet because when I did full ketosis for that period of time, I felt negative effects but if I go out of it one day a week, "Okay, I'm going to eat a lot of rice today." It feels like I just have more power throughout the week or if I do have 50 or 100 grams of carbs, I still maintain that fat burning ability that it seems to be different than the sub-20 grams of carbs a day crowd. I respect the guys that do that but I don't feel good if I do that.

Mark: I respect the guys that do that but I like to eat a wide variety of foods. Again, back not wanting to hurt. I don't want to suffer. For 2 years now, the tag line for Primal Blueprint has been live awesome. How do we extract the greatest amount of pleasure out of every moment possible which includes every fricking bite of food that I eat, I want it to taste good. If I'm limiting myself to foods that are within a fairly narrowly defined ketogenic diet and I'm excluding copious amounts of green vegetables that have been grilled or sautéed or steamed with butter, whatever. Even a certain amount of starchy inputs, even if it's a taro chip with which to scoop some guacamole, I don't want to limit myself to that stuff.

Dave: Agreed. I had an interest- I'm trying to remember which audience this is. This is Brendon Burchard's High Performance Academy. This is about 1,500 people in the room. They're all high-performing people and said, "Please raise your hand, how many of you know about ketosis? How many of you have been in ketosis?" I'd say 90% of the room raises their hand. I said, "All right. How many of you are in ketones now?" Five people. It's like, okay, point made. They all felt the benefits but it was too hard to do it and to travel and do all the other things or they just didn't enjoy it because they wanted their wine or they wanted their whatever else it was.

Mark: Todd seems to be able to stay in ketones and have his wine.

Dave: Yeah. How does he pull that off? The Todd we're talking about is the guy from Dry Farm Wines. Mark, you and I are both fans of the guy.

Mark: No. So, I think ketosis is a great tool and it's a great training strategy but I would suggest ... I tell athlete, "Spend 2 weeks in and then hang out." You can still be low-carb. To be in ketosis, you might have to be below 50 grams during the time that you're in ketosis but you can move up to 120 grams or 130 grams a day of carbs and in that space, be consuming plenty of vegetables and enough fiber and enough other great-tasting foods to not feel like you're sacrificing anything and also not feel compelled to carbo-load just because you're out of ketosis. There's a nice little space you can find yourself in where you're at 100 to 150 grams a day and still be utilizing all the

metabolic machinery that you built when you were in ketosis.

Dave: Yeah. Being in ketosis sometimes is really important. It depends, for an endurance athlete, one side of things. Look, I'm running a business. I want my brain to work really well. It's a different frequency of ketosis but if we're resetting hunger levels, resetting your body weight set point, ketosis has so many just useful things.

What's the number? When you stick your finger and look at the blood ketone levels, what are the meaningful numbers for you? I get different answers to this question from different people.

Mark: I think 2 is a meaningful number. I'm not looking for 4s and 5s.

Dave: I love 2. Two is definitely you're in nutritional ketosis. I think if you have cancer or something, you might want to get a lot higher than that but I don't think it's necessary. For me, the magic number that sets my brain free is .5 which is sub nutritional ketosis which starts at .8 but .5 is where you reset your ghrelin and CCK levels. Ghrelin's the hunger hormone. CCK is the satiety hormone. When you reset both of those, all of a sudden, you're, "Oh. Now, I don't care about food so I'm going to make healthier and more intelligent food choices because I'm not craving-driven anymore." For me, freedom from cravings is one of those things that reduces suffering the most in the least amount of effort.

Mark: Again, back to the whole concept here which is to enjoy as much of life as possible. One of those things that I find really compelling about the work that we do is it's the ... it's a bad term but the anorectic effect of a low-carb diet, of a cyclical ketogenic diet. It modulates your hunger to the point that you don't feel driven by food, that you don't feel like, "Oh, my god. This was just a wonderful lunch. What's for dinner?" It's so freeing to so many people to be able to say, go in a restaurant order something or have something fixed at home, take 7 bites and go, "You know what? I think I'm done. I think I've had enough. I think I don't need to eat any more and if I do need to eat any more, I know exactly where to get some."

I've been talking a lot about this recently but I've had for most of my life, I was guided by this criteria which was, what's the most amount of food I can cram down my pie hole and not gain weight? What's the most amount of food I can eat and not throw up? What's the most amount of food I can eat and not be uncomfortable? I think a lot of people live their lives that way. Then, you go to Cheesecake Factory and you get whatever the serving is, it's 1,600 calories or whatever and you feel compelled to finish the plate. A few years ago, I started thinking, "Well, a lot of the Western world, the developed world lives according to that mantra." I run so I can eat. Why do you run marathons? I run because I love to eat. Seriously, dude? That's why you hurt yourself?

Dave: That's sick!

Mark: That's just sick. I love to eat, too but I chose not to run marathons. The converse of this is really to ask yourself, "What's the least amount of food I can eat and maintain muscle mass and maintain energy and maintain great cognition and not get sick and most importantly, not be hungry?" You find that it's not a lot of food. It's really that I probably eat 30% fewer calories now

than I did even 5 or 7 years ago when I could maintain my weight eating that. I wouldn't gain weight but I just find I don't need as many calories to maintain because I really dial in my appetite. I really understand when I'm hungry, when I'm not and I guess the bad news is now, I feel guilty if I even slight overeat, I go, "No. Jeez. I knew better than that," and slightly overeating for me is probably half the portion I would have eaten 10 years ago.

Dave: It's funny you mention the anorectic effect of ketosis because suddenly you're not driven by these cravings. About 3 years ago, there was a group in Sweden saying that Bulletproof Coffee causes anorexia. Sweden is one of the first countries to broadly embrace a high-fat diet, a high saturated-fat diet, even. I just threw my hands up. "Well, I guess if living without hunger equals anorexia, yup." I'll own that but what was going on was people were complaining that, "Those people don't have any hunger pains therefore they're bad people." It's like, "Come on, guys. It's called mild ketosis."

Mark: No. It's called being in control of your appetite. It's a big difference between refusing to eat because you're trying to show your parents something, that you've got more control than they do versus just being so in control of your appetite, you go, "You know what? I'm not hungry. I know what hunger looks like. I'm not hungry now. I don't need to eat now. I could because my friends are eating or whatever. We're all going out to lunch." I think that's the single most empowering concept within the whole paleo primal Bulletproof world.

Dave: When I was really fat, I did not know the difference between hunger and a craving. I thought at my core, those were the same thing. When you have to eat, you're going to die. You feel like you're going to die if you don't eat now and suddenly, to be at this point where, "You know, I could eat but if I don't eat for another 4 hours, I'm not going to lose my ability to think. I'm not going to have to lay down. I'm not going to bite anyone's head off." It's just going to be like one of those things like maybe I should scratch that itch.

For me, that was, just as a former obese person, that was so damned liberating and to feel what it did for my brain. I don't care how my body looks as long as I can have that feeling because it's so much better than the way I used to feel.

Mark: Ironically, when you have that feeling, then your body starts to look better.

Dave: It's a free bonus. It's pretty cool. You mentioned you're 63 or 62, turning 63?

Mark: Yeah, yeah, yeah.

Dave: What else are you doing for anti-aging? For 10 years, I've run an anti-aging group. This is one of my passions. You do so much research. I have so much respect for you. You've got to be doing something more than just ketosis and testosterone for aging. What else is on the menu for you?

Mark: I think like a 17 year old. I literally surround myself with young people and that ...

Dave: It helps.

- Mark: I think single most important aspect to all this. I'm unapologetic about getting 8 and a half to 9 hours of sleep a night. I'm very good about that. I'm religious about that. I think sleep is critical for part of an anti-aging strategy. I'm getting some, not as much as I used to but I still get, I spent some time in the sun. I'm doing the low level training that I've now am coaching people to do. Now, I'm doing it myself and doing a 2 hour stand up paddle the other day.
- Dave: Nice.
- Mark: It's out. It's my time with nature. It's very meditative. I usually go out alone. The other day, I went out and saw a whale. It was probably a half mile away but it was just awesome to see that think breaching. I hike. Again, I hike alone. That's really my meditation is when I work out in these longer stretches. Play ultimate, again, with 20 somethings and 30 somethings and feel like I can keep up with them. Really, most of it is attitude, I think, for me.
- Dave: You mentioned earlier your heart rate variability as a measure of over-training and I've been advisor to the HeartMath Institute and a certified coach. I use it as a way to meditate more quickly. Do you that sort of work with heart rate variability or are you more around basically measuring the health of your autonomic nervous system with it so you can watch the training?
- Mark: Yeah. Here's the deal with me and HRV. I know a lot about it, wrote a lot about it. It doesn't work for me. I'll tell you why.
- Dave: Cool!
- Mark: I spent so much of my life training at a high heart rate that I damaged my heart. I have PVCs. I have premature ventricular contractions. This really started to manifest itself a couple of years ago in just skipped beats but it wasn't just skip beats. It was every other beat or every third beat was skipped for an hour at a time. I would get the most outrageously good HRV numbers.
- Dave: You're getting false numbers. Okay.
- Mark: I was getting false numbers. I called our friend, I forget her name.
- Dave: Roland McCready
- Mark: No. The gal. The gal.
- Dave: Debbie, yeah.
- Mark: Yeah. I just said, "I want to look into this." She said, "You know, well, if you got PVCs, then the HRV programs, we can't work with it. We can't recognize what's going on."
- Dave: Okay. Takes that off the table.
- Mark: It's not life threatening. It's just annoying. I have a skipped beat that when it skips, the ventricle overfills. Then, so the catch up beat is very forceful beat that's a little uncomfortable.

Dave: That changes the variability dramatically of ...

Mark: Dramatic, yeah, yeah.

Dave: We all have our issues like that. This is going back maybe 3 years or so. I spent a couple days at 10,000 feet elevation, had a few drinks. This was at the Summit Series. Someone outside on Powder Mountain. I flew straight from there on very little sleep, stay up late partying to San Francisco. I did a shoot for a video series I was doing. I help plank pose on the Bulletproof Vibe. This is the whole body vibration platform I manufacture. Plank pose is hard enough to do for 5 minutes and when you're vibrating 30 times a second, it is a hell of a workout.

They're trying to get the lighting and the camera angles right. I'm like, "Guys, you're torturing me here." I held this pose and I'm just dripping with sweat. Then, I flew home to Canada and refilled my thyroid prescription. I've been on decreasing amounts of thyroid but I did have Hashimoto's thyroiditis. I'm probably down 70% of my thyroid meds but I'm still on them. My prescription was compounded and it was overfilled.

Here I am, I end up getting an inflamed sternum which causes horrible chest pains if you've ever had that and I'm getting skipped heart beats which was made me think about this from the thyroid medication. My wife's an ER doctor. She's like, "I think you're going to the hospital to get an EKG now." I'm like, "What the hell?" It turns out it was one of those confluences. You just don't know but apparently skipped beats are way more common than I would have thought

Mark: Here's how common they are. In my generation of endurance athlete, it's epidemic. It typically manifests itself as AFib, atrial fibrillation. In my case, what it is, it's a thickening of the ventricle wall. When the heart muscle thickens, it basically forms a little bit of scar tissue and a couple of cells die. Those are cells that are innervating the heartbeat or they maybe be prematurely innervating a beat because of some restriction.

The point is, when you put that amount of ... I raised my heart rate to max levels 3 days a week for a good part of my life. That's why I'm writing this book or why I wrote this book Primal Endurance is to say, "Don't do this. Do not try this at home, kids. There's a way to do this."

The good news is, it's not life threatening. I could go get an ablation and they literally go in through the leg, they could burn a couple of the cells that are causing the problem. They map them, they identify them, they burn them, good as new. That scares me. I'm going to hold off on that for a while but I take a calcium channel blocker for it now.

I go to the gym like today, I rode for an hour at 118 beats a minute with 0 negative effect at all. That's my number, 118 is 180 minus my age, 118. I held it. I'm more efficient at that 118 than I've ever been at my life so I'm even training according to my plan now but paying very close attention to max heart rate stuff.

Dave: One eighty minus age holds no matter your age?

Mark: Yeah, so it's really ... it was developed by Phil Maffetone who's one of the pioneers in this whole area.

Dave: I met him.

Mark: He was Mark Allen's coach when Mark was the greatest triathlete in the world and won Ironman 7 times. It's a pretty cool history of having worked with top athletes and proven that this method works and then to arrive at this number. Again, we say, it's 180 minus your age plus or minus 4 or 5 beats based on some little boxes that you check off, like I'm a lifetime athlete. I'm already fit to begin with or I'm way out of shape and I'm in horrendous shape. The number shifts either side of that number but it's a pretty reliable number.

We can go to the lab and you can test it because what it is, is it's trying to arrive, again, as I said, it's the highest number at which you can put the most amount of oxygen through and not be going into any kind of lactic acid buildup. It's the number at which you are burning mostly fat because we determined that as an RQ, or respiratory quotient, based on oxygen throughput.

Dave: This is such a fascinating conversation. I love being able to just geek out a little bit but not go so deep that people listening get lost. I really appreciate our conversation, Mark. I'm looking forward to getting a chance to hang out at your next mayonnaise launch. You just came out with your new mayonnaise which is made out of real ingredients which I appreciate. I missed your party for it but I appreciate it.

Mark: No. We actually now have the original mayonnaise been out 14 months now already. We'd had a Chipotle lime mayo that we introduced recently.

Dave: Ah! Okay.

Mark: Yeah and some salad dressing also based on avocado oil, the healthiest of all the oils so very excited about ... it's called Primal Kitchen. It's most Whole Foods, you can get it on Thrive Market for sure. Yeah.

Dave: Beautiful. We have one more question on our interview. If someone came to you tomorrow and said, "Mark, I want to kick ass at everything I do, not just working out, what are the 3 most important things I need to know?" What would you tell them?

Mark: Number one, always, always, always the best investment you could ever make is in yourself. Whether that's investing in more education, investing in some skills, investing in a business that you've just created, that's the single greatest piece of advice I could give anyone. That's really what's going to determine the difference.

Number 2, I'd say bear in mind that if it was easy, everyone would be doing it. Sometimes it feels like everyone's doing it and they're breathing down your throat but if was really easy, everyone would be doing it. Just stay focused. Those people who succeed in anything are the ones who persevere. Even if they start off slow, I just find, like in real estate, I have friends who gave up in real estate after 2 years but if you hang in there for 4 or 5 years, the same group of



friends are making millions of dollars just because they hung in there and they were good at it.

Third thing and I just gave somebody this advice the other day, if you have a business idea, if you want to kick ass, make sure it's a good idea. Don't just be passionate for the sake of being passionate but make sure it's actually a good business and then get passionate as hell about it.

Dave: That's very well said, given all my time in Silicon Valley. I love that one. Cool.

Mark, I don't know if you even need to give out your URL because everybody knows about it but marksdailyapple.com. Any other places people should go to find you?

Mark: Primalblueprint.com is the e-commerce site where all of our products are sold, yeah. Check to the Primal Kitchen line of food products.

Dave: Beautiful. You said you're at Whole Foods now?

Mark: Yup.

Dave: Awesome. We just got in Whole Foods as well. When you're at Whole Foods, pick up some Primal Kitchen items. While you're at it, pick up some of that Bulletproof stuff. It's going to be an awesome day.

Mark: Yes, it will.

Dave: If you enjoyed today's episode, you know what to do. Head on over and pick up a copy of Primal Endurance because you will learn something from this book even if you're not an endurance athlete.

I'll be really honest. I don't care about endurance athletics. Personally, it's not what I want to do with my life but life is an endurance event, at least if you want to live to 180 it is. The things you'll learn from reading this book apply way beyond running a marathon or doing a 10K or running 100 miles, whatever you might want to do. I think that there's something for everyone in the book. I have great respect for Mark and Mark's work. You will benefit from reading Primal Endurance. Pick it up on Amazon, head on over to Mark's website and pick up a copy of it. You will be glad you did.

Have an awesome day.

Mark: Cool!

Dave: Great.