

Collagen for Soft Tissue Injury and Repair: A Special Interview With Mark Sisson

By Dr. Joseph Mercola

JM: Dr. Joseph Mercola

MS: Mark Sisson

JM: Hi, this is Dr. Mercola, helping you take control of your health. Today we are joined by Mark Sisson, a pioneer in the paleo movement, who is going to share with us some information about collagen and other sorts of musings. Welcome and thank you for joining us today, Mark.

MS: Thanks for having me, Joe. Great to be here as always.

JM: Yeah. You are actually in California now, but you have, like us, decided to move your company down to Florida for a variety of reasons.

MS: For a variety of reasons.

JM: You personally moved earlier this year. Good move.

MS: Yeah. Right. I moved in December of 2017. I'm back in Malibu today just because I have business back here every once in a while. I just have to share with you that I just had my perfect sort of what I would call my "future retirement morning." I paddled on the ocean for an hour, and then I went to the track and I did 200s. I'm like totally stoked about what I've done so far today. If nothing else happens today past this interview, I'm good to go.

JM: Wow. That was 200 meters or 200 yards?

MS: I'm glad you asked that. I'm glad we cleared that up. 200 meters. Yeah.

JM: Okay.

MS: Six by 200. Yeah.

JM: What are you running your 200s in?

MS: Oh geez, here we go.

JM: You don't need to stop.

MS: You need to know. Thirty-three to 35, and then the last one was 32.16.

JM: Wow. You're still in pretty good shape. That's excellent.

MS: For 65 years old, yeah. I think so.

JM: That's pretty darn good. Often you do your –

MS: By the way, that's after coming off an hour of hard paddling on the ocean.

JM: Yeah.

MS: Not that I want to give you any further disclaimers. I've already given my age and my paddling disclaimer.

JM: But that is – You're a big exercise fan, as am I. I've basically been promoting that for most of my life. But I made the same mistakes you did. Actually, you're senior to me by about a year. That is engaging in too much cardio. Now, you do a little bit of cardio with the paddle boarding. But those 200s you ran, that is a classic example of high-intensity exercise.

MS: Yeah. And to take that point and develop it even a little bit further, in the old days – and I know that you did this as well – the workout was like, “Run a 200, jog a 200, jog a quarter, run a 200.” That's a decent way to do it if you're training for marathoning and stuff like that. But if you're going to do true high-intensity stuff, it's actually beneficial to recover even more. Now, what we do is we run a 200 and walk a 400, and then run a 200 and walk a 400, to try and recover enough in a recovery period, to be able to really hit it hard again when you do the high-intensity.

I wrote about this in my book, *Primal Endurance: Escape Chronic Cardio and Carbohydrate Dependency and Become a Fat Burning Beast*. We talk about this area we call the “black hole of training,” which is sort of too high not to be fully fat-burning and aerobic, but too low in intensity to not develop strength, speed and power.

We kind of try to separate them and make the slow stuff longer, slower and easier, but much more fat-burning to develop aerobic capacity. But then we make the intense stuff much more intense, faster and shorter to develop the high-end, and then they sort of meet in the middle once in a while when you do a tempo run. I happen to do it on the – I do a life cycle ride in the gym once or twice a week where I'm right in that zone, where I combine those two ends.

JM: Were you doing the 400-meter rest on today's 200s?

MS: Yeah. Just walk a 400.

JM: What do you think is the ideal frequency of doing that type of high-intensity exercise? Once or twice a week?

MS: Yeah. Not twice a week.

JM: Just once?

MS: Just once a week, for sure. Because this is the thing about high-intensity stuff: if you do it right, you shouldn't be able to do it again within a couple of days.

JM: It's kind of like doing the workout "Super Slow."

MS: Yeah. It's a simpler concept. But if you're doing really true high-intensity stuff, you can do different modalities throughout the week. But if you're going to be doing sprinting, if you do it right, you shouldn't be recovered in three days or four days, even if you're in your 20s, let alone if you're in your 50s, 60s or 70s.

I go back to my original Primal Blueprint Exercise Pyramid, which is basically moving around a lot at a low level of aerobic activity. Find ways to move your body without even counting calories, just getting the movement in and burning fat. Lift heavy things. That means go to the gym and put your muscles under a load, which is a weight-burning activity that not only builds muscle, but builds strength, builds power, creates bone density, which is huge for old people and women. And then sprint once a week. The sprint once a week –

By the way, these activities mimic human behavior for millions of years – migrating, moving, carrying loot, moving around all day long, not sitting on the sofa and not sitting in front of a computer, lots of low-level movement, lifting heavy things. Our ancestors lifted heavy rocks or logs to build a fort, climbed up to a lookout, carried babies or carried a carcass back to camp, so lift heavy things. Then the sprint once a week comes from a life-or-death sort of scenario, where you've got to run for your life all out and get that pulse of, certainly, the adrenaline, the epinephrine-norepinephrine blend there, but also the pulse of growth hormones and testosterone.

We're trying to mimic an ancestral behavior here. Our ancestors, they would never have thought, "I've got to get out. I've got to train hard today. I've got to go expend energy. I've got to go do my 200s today. I've got to do 6 x 800 on Thursday, and then a tempo run on Saturday." They obviously wanted to conserve energy as much as possible.

They were sort of forced into this really high-intensity stuff, where it was literally "Run for your life away from something", or maybe "Run for your life to catch something that you were going to eat." But it wasn't a daily activity. That's sort of the genesis of this whole thought process.

We say in *The Primal Blueprint*, "Once every seven to 10 days." By the way, Joe, as you're drinking your water there, we don't even talk in terms of like, "You actually have to run or do sprinting."

JM: It's actually vodka.

MS: Well, okay. I prefer tequila when I'm doing my podcast.

JM: No, I'm just kidding. It's water.

MS: Yeah. It's okay, Joe. It's okay if it is. Where was I going at? Anyway, it's a recovery kind of thing.

JM: So, I'm wondering, you're fairly convinced of the science behind this. I suspect that most of the coaches for elite athletes, even Olympic-caliber athletes, are not integrating this through their training program for the sprinters. I mean they're giving them more than one workout every seven to 10 days for high-intensity. Was that your observation?

MS: No, no, no. I would say that when you are 20-something, when you're an elite world-class sprinter and you've got all this testosterone circulating in your body, you can do a little bit more work, for sure. But what I do know absolutely, for a fact, is that a lot of these sprinters are spending a lot more time in the gym. For instance, one of the metrics for predicting speed or world-class speed is how many times your body weight you can hex bar deadlift. I think the number is like 2.5 or 2.75 times your body weight.

JM: Wow. That's a lot of weight.

MS: No kidding. You have some of these female Olympic sprinters who weigh 120 pounds, and they're deadlifting 350 to 400 pounds on a hex bar deadlift. That's a predictor of group speed. That's also work that you do in the gym. That means that that's not a day that you're going to go to the track and put that power into actual practice in your chosen profession.

There's a lot more time spent on this, especially with sprinters, in the weight room, developing raw power and then what we call MSP, maximum sustained power. The longer the event is, the more you have to sustain that raw power. If you're just a total anaerobic athlete or a glycolytic athlete just working on adenosine triphosphate (ATP) alone for 10 seconds, that's one indication of that power and strength. And then all of a sudden you extend it out to a 200, a 400 or an 800. Now, you have to kind of bring in other aspects of that strength and power to apply it to your particular event. A lot of that stuff now is happening in the gym. It doesn't require that a 400-meter runner to put in 50 miles a week of running.

JM: Sure.

MS: If anything, that would tear that person down.

JM: Yeah.

MS: I remember in the old days going to University of California Los Angeles (UCLA) and being blown away by the sprinters. The sprinters would be at the track. They'd show up to their warmups. They'd be having a great time. They'd be laughing, joking, stretching, warming up, and joking some more, and laughing some more, and warming up some more. And then they might do 100 or 200. It might not even be 100. It might just be a couple of starts, right out of the blocks and nothing else.

[-----10:00-----]

JM: Yeah.

MS: And they'd rest. And they'd chat and joke a little bit more, and have some more fun, and stretch a little bit more, and then they might run a couple of 200s. And then they'd put their sweats

on and go home. They're at the track for like two hours, mostly having a great time talking. Meanwhile, those of us who are the endurance athletes are slogging around the track, watching all this jock hilarity and fun happening among these strength and sprinter athletes while we're just managing pain the whole time, trying to get our 10 miles of track runs in. So big, big difference.

JM: Crazy mistakes when you're younger. I'm wondering, do you do the hex bar deadlifts or are you doing straight bar?

MS: I do the hex bar. Yeah.

JM: Hex bar?

MS: Yeah.

JM: Interesting. How much easier is the hex bar? Is it like 10 percent, 15 percent easier? I mean if you can do three plates on a regular deadlift, you could easily do what? Three plates and another 30 pounds?

MS: Yeah. Are you doing three plates on a regular deadlift, Joe?

JM: Yeah. On a regular deadlift, yeah. I'm trying to work my way up, but –

MS: Nice, nice.

JM: Yeah.

MS: Yeah. You're probably right. It's probably about 10 percent easier. But the difference is what a hex bar deadlift does is it sort of combines a weighted squat with a deadlift. The bar comes up through the center of you rather than in front of you. I think that the tendency to hurt yourself is less on a hex bar deadlift, especially when you're doing the heavy weights.

JM: Do you put the handles on the top or the bottom?

MS: I put them on the top. Now, if I'm doing lightweights, I put them on the bottom. If I'm warming up, then I'll start with them as low as I can go. But then on the heavy stuff, I put the handles on the top.

JM: Okay. You up to four plates yet?

MS: Hell no. No, no, no, no. I'm basically – I'm doing like 300 pounds. That's like, for me, I don't do one-rep maxes almost anymore. That's too much. My weak points are my wrists and my shoulders on this particular exercise.

JM: I would say it's the perfect Segway into the next topic, which is collagen. You're really ahead of the curve on so much of this thing. I mean you're really the first person who helped me understand burning fat for fuel as a concept, because it was really foreign, and you really

introduced me to it. But also, you're ahead of the curve with this collagen and really recognizing the importance of that for soft tissue injury and repair. Why don't you expand on it and maybe how you came to this understanding early on?

MS: Yeah, absolutely. How I came to it was how I arrived at a lot of my epiphanies as I had a life crisis. I play this game of ultimate Frisbee once a week, every week for the last 15 years now.

JM: You're still doing that in South Florida?

MS: I've got a great crowd in South Florida. Yeah.

JM: Okay.

MS: I mean, I hope none of my Malibu boys are watching, because the game in Florida is better than the game in Malibu, and I thought the game in Malibu was good. But I started about five years ago, maybe six years ago now. I started to develop severe Achilles' heel tendinosis.

When you play ultimate Frisbee, it's like one of the greatest games ever invented. It's a very fast-paced game. It's got the sprinting of, say, soccer, but you're throwing a Frisbee and catching it while you're running. If you're not on offense trying to catch it, you're on defense trying to prevent someone else from catching it. There's lots of running to the end zone and sprinting to keep up with your man. It's a very fast-paced game. It requires a lot of agility, a lot of side-to-side quick movement, as well as raw speed – 6-, 7- or 8-second bursts of speed down the field.

I found over a couple of years, in my late 50s, that I was starting to get these real severe Achilles' problems. I couldn't sprint. My Achilles' were really tender. They were getting thick. I went to see an orthopedic surgeon. The orthopedic guy said, "You have severe Achilles' tendinosis." I go, "Well, what does that mean?" "Well, you're screwed, basically. You can't play sports again."

A surgeon being what a surgeon is, this is one of the brightest minds in the room. An orthopedist in Southern California said, "Well, here's what we're going to do. We're going to take the back of your heel, and we're going to slit it open. We're going to scrape the Achilles' down to the raw meat. We're going to pack it up in a cast for three months, and then you'll do nine months of rehab. You'll be 85 percent of where you were." I'm like, "No. That's not going to happen, Doc."

As so often happens when I see orthopedists, I go back to my house and I go, "You know, there's something I was doing wrong here." I started to do the analysis and I thought, "Here I am stressing my Achilles', which is attached to the calves, so I'm really stressing the calves, the plantar fascia and everything around it, on a regular basis. I'm not giving my body the raw materials it needs to recover from that stress. It is that simple."

If you look at the collagen-based tissue in the body, it's tendons. It's ligaments. It's cartilage. It's fascia. It's connective tissue. It's all the stuff that goes wrong when you get old and injured, Joe. A muscle is pretty much an easy thing to fix. You can tear it. It'll need to repair itself, or you can even go in and sew it back up and it'll be pretty darn good. It'll respond to diet if you give it grass

fed meat and some healthy fats and whatnot, maybe some ketones. That muscle will come back pretty strong.

But the raw materials that are required to rebuild collagen are a different profile of amino acids. While it sounds maybe too simplistic to break it down this way, the amino acids that you get, the collagen material that you get from animals, are the same amino acids that get incorporated into the body to become this matrix of connective tissue that connects muscle and ligaments to bone. You've got this area that you want to –

By the way, it does not have much of a blood supply. Even if you say, “Well, I can get all of these raw materials from the amino acids in the meat that I'm eating, or in the protein drinks that I'm drinking,” the reality is you can get some of those, but not in the quantities that you probably need – particularly as you get older and particularly if you start stressing these tendons, ligaments, cartilage and other connective tissue and fascia.

I, for myself, having done the analysis, I started supplementing 40 grams of collagen a day from another vendor. Within four months, my Achilles' were better. You and I can be talking today, Joe, and I could have these two scars on the back of my leg and I'd be all pissed off about the surgery that I had that didn't quite come out the way I was promised it would come out. But I'm here telling you that I just got off the track, where I ran 32 seconds for a 200 at age 65. And that's the first time I've been to the track in probably six months. It's not like I'm into that phase of training. It just that a friend was there today.

What does this look like in terms of the science? Well, recently, there's a very cool study. I think I sent it to you. I don't know if you had the chance to look at it. But they labelled these collagen peptides literally in a drink. It was like a gelatin drink.

If you talk about gelatin and you talk about collagen peptide and talk about collagen bone broth, we're talking about the same peptide. We're talking about these glycine, proline, hydroxyprolines – some of these really specific amino acids, dipeptide, tripeptide that actually cross into the bloodstream as a unit and get incorporated into the body.

They labelled some of these and then they did this interesting protocol where they had these guys do six minutes of intense jumping rope. The reason they did that was — if you can envision an Achilles' tendon, which is a coiled spring for the most part, you're keeping it coiled all the time when you're doing jumping rope. It doesn't have a blood supply. It's got like one-tenth of the blood supply that the surrounding muscle have. But if you've envisioned it as like a sponge, it's full of fluid. Every time you stress that piece of tissue, the fluid leaves and it tightens. And then as it relaxes, the fluid comes back into the sponge.

Since they gave this collagen drink to these subjects 15 minutes before the jump rope exercise, there were these collagen peptides in the bloodstream surrounding the tissue and it got incorporated at like a little over two times normal uptake. That was kind of a fascinating study to me that indicated that it's really happening as the way I envisioned it, that the body will selectively take in these collagen peptides into these parts of the area that are being stressed, particularly if you don't have any other source of raw material in your diet.

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If we look at how we've crafted our diet, even in the paleo world – I might even say especially in the paleo world, where you're eating these choice cuts of meat – but you're not gnawing on the bones or the skin or the tendons or other nether parts of the animal. You're just eating the choice cuts of meat and then throwing the rest away or whatever, giving it to the dog or making whatever. We don't make bone broth anymore. Most of us don't. We've had decades of not having any access to collagen. You remember when you were growing up, I'm sure your mom probably had Knox gelatin all around the house, right? She probably took it for –

JM: It was used primarily for making Jell-O.

MS: Correct. But that's gelatin. Literally when you were a kid, we actually had access to some of these collagen peptides through Jell-O. I know women took Knox gelatin for their skin, hair and nails. They knew that was perfect use of this material. But I haven't seen much Jell-O or gelatin in our circles in the past 10 or 15 years.

JM: No.

MS: It's almost like half a generation or more that's gone without any collagen. I see it in the sports arena, in pro-sports, where all these pro athletes are tearing anterior cruciate ligaments (ACLs), medial collateral ligaments (MCLs), ligaments, tendons and all kinds of stuff. I'm going to have to say that a lot of this is because their diet is so horrible to begin with, and then they don't take in supplemental collagen that I think would be probably wise on their part.

JM: Great. There's not many people who are more sophisticated in their understanding of optimizing the paleo diet and ketosis. You've written very eloquently on that in the past. I'm just wondering – That's a lot of protein, 40 grams, but it's a special type of protein. As you mentioned, it's high in glycine, proline and hydroxyproline, and relatively low on the branched-chain amino acids, which are the primary ones that stimulate the mammalian target of rapamycin (mTOR) and muscle anabolism and building muscles. I would think that that level of protein has to be counted a little bit differently in a traditional protein. You're not getting that stimulus as much.

MS: I'm glad you brought that up. Yeah. First of all, now I do 20 grams a day. Twenty grams a day is for my maintenance level of collagen. You hit the nail in the head. Collagen is such a unique protein blend of amino acids and it's so specific to collagenous material in the body that it does not sustain life. When you buy a collagen product and it says 10 grams per serving or 20 grams per serving of protein, because it is protein and it has to say protein on it, when you look at the supplement facts panel on the back, it's 0 percent of the daily value. In other words, it cannot sustain life. Interestingly, if you remember back in the '80s, there was this liquid protein diet that was all the rage. Do you remember that?

JM: Sure.

MS: It was a 500-calorie-a-day protein program where you just drank.

JM: Medifast and OPTIFAST were two of the big ones.

MS: All that stuff, and you just drank liquid protein. Guess where the liquid protein came from?

JM: Collagen.

MS: It was collagen. It was collagen, so people were taking in what they thought was 500 grams of calories in the form of protein on a daily basis. But because it was collagen, it was not enough to sustain life. People literally died on this diet. They had congestive heart failure, arrhythmias and things like that, because it was not the right kind of protein to build muscle.

JM: But if they weren't doing this long, they probably got healthy because they were maximizing autophagy.

MS: Bingo. That's the good news-bad news. The bad news is you could have died. The good news is if you didn't die, like in a niche-kind of thing, "If it didn't kill you, it made you stronger," right?

JM: Yeah, absolutely. Yeah.

MS: A lot of people wound up having great skin, hair and nails and lost some weight. That was the upshot of that. Anyway, it was an interesting concept, that even the World Health Organization (WHO) and U.S. Department of Agriculture (USDA) and the Food and Drug Administration (FDA) say, "You can't live on collagen protein." They're basically acknowledging that if you eat collagen protein, you're doing it for skin, hair, nails, tendons, ligaments, connective tissue, bones, fascia, a lot of structural components in our body that are well-served by doing a daily dose of some form of collagen.

That's also why bone broth has become all the rage in the health food circles in the last five years. There are now, I'm going to say, 40 commercial bone broth companies. It's not because bone broth is particularly great-tasting or whatever. It's just been a great source of collagen.

Here's my shameless plug. I had such a great experience with supplementary collagen, I created a line within my Primal Kitchen food line of collagen products, as I am so clear on people meeting to supplement with collagen on a regular basis. We make that collagen-based coffee creamer. We make many of our products mixed directly with water and tastes great. We make an unflavored one. They put it in coffee. They put it in soups, smoothies or whatever. Can you tell that I'm a big believer in collagen gelatin?

JM: No, no, no. You're an integrity, because you're promoting something you fully believe and take yourself. You think, in belief, it's truly going to help others. There's nothing wrong with that. But I'm wondering if we could dive deeper into collagen, because as I understand, there's about 20 different collagen proteins and at least a few primary sources of collagen, which would be fish, beef, of course, and chicken. Can you expand on that and the benefits and differences between them?

MS: Sure. There's Type 1, Type 2 and Type 3 collagen. Those are the primary ones. Bovine-sourced collagen are probably the basic element, probably covering 80 percent of the bases. There are different sources of different blends of collagen peptides. Some are higher in proline. Some are higher in glycine. Some are higher in hydroxyproline. But they all have kind of the same sorts of dietary peptides, just at relatively different levels and different amounts.

I don't really get into the weeds too much on putting together a product that has Type 1, Type 2 and Type 3. And then we have hyaluronic acid, which is another factor in some of these detailed products. I'm just basically saying that if I'm going to cover 80 percent of your needs with a 100-percent grass fed, naturally derived bovine source of Type 1 and a little bit of Type 2 collagen, I'm going to suggest that I've covered 80, 85 or 90 percent of your needs. The rest, you're just sort of splitting hairs. That's kind of how I feel about all the Type 1 and Type 2 stuff.

JM: I like your perspective. You're very pragmatic.

MS: Yeah. I mean I think that marine collagen is a great product. We talk about sustainability or whatever. We can go into more detailed discussions on that. But marine collagen, basically, similar amino acid profile, just in relatively different amounts, but tends to mix better with water. If that's a benefit for you, then it makes this a little bit easier with water. You'd just want to use a spoon to mix it up. That's great. It costs twice as much expense.

By the way, it tastes a little bit less, I'm going to say, gamey at its basic level. Like our basic collagen peptide, unflavored collagen peptide, tastes a little bit like collagen. The vanilla tastes great. The chocolate tastes great. But the plain, it tastes a little bit like collagen. I sort of want that taste. I want to know that it hasn't been so refined that it's now like, "I can't tell whether I'm taking creatine or collagen." That's all.

I mean there's a point at which – I've been in the supplement business for 35 years now. There's a point where you sort of have to weigh the pros and cons, for the expense and for the benefits I'm delivering, what's the best product that fits my market.

JM: Yeah. Let's go dive a little deeper, because there is, in my view, a rampant opportunity for essentially what appears to be fraud, and people who are purveying collagen broth, because there's a lot of them in the market. What is not disclosed in many, in fact, I suspect most, is that the source of the collagen is coming from CAFO, confined animal feeding operations, and animals raised in China, full of heavy metals, full of heavy metals. They're not disclosing that. They're confusing – not confusing – they're misleading people into giving them a vastly inferior product. Although they're getting those amino acids, it's loaded with other toxins that they shouldn't be getting.

MS: Yeah.

JM: I'm wondering if you could address that, because it is a big issue in this industry. Not your product, but there are many others out there.

MS: Yeah. Here are a couple of things. First of all, yeah. I mean the supplement industry is sort of – people say it's not really regulated well. It's definitely regulated, it's just not policed well,

right? It's regulated, but not policed as well as we'd like, except in California, where it is really well policed.

JM: California Proposition 65.

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MS: Prop 65. For instance, because I produce in California and I'm a California company in terms of the source of a lot of stuff we do, the Prop 65 markers and the levels of detection is one part per million of heavy metals. It's cadmium, lead, mercury, things like that.

JM: Arsenic.

MS: Yeah. Arsenic. There's no way we could get away with one batch of an inferior product, so we test every single [one]. We get what's called a certificate of assay. We buy from some of the biggest, most reputable companies in this arena, who source products from either South America, where they're grass fed 100 percent, or Germany, where the European Union and the Codex Alimentarius completely blows away any restrictions that the USDA would ever put on, right? We've got that level of certification, of detection to begin with.

We get a certificate of assay. And then we test every batch that we bring in. Every batch that we make, we have the manufacturers' assurance, but then we test it before we put it in. That's our method of operation. Because Prop 65 is a scary thing that anybody could –

JM: That's the way it should be done. The average consumer doesn't realize that, that many manufacturers are just relying on the raw materials supplying their certificate of assay and not doing any independent, objective third-party analysis to confirm that.

MS: Yeah.

JM: There's a massive incentive for them to lie to you.

MS: No. For sure. Yeah, I mean, look. I've been in this industry, like I say, for like 35 years. I've been designing products. I know all the co-factors. I know how this thing works. But if you do it right, there's a thing called GMP, good manufacturing practices. You have to fulfill these obligations that your manufacturer imposes on himself or herself, which includes receiving a certain way, quarantining the product until it's blended, doing your own internal assay, sending it out to an independent third-party lab once it's been completed. All these steps are steps that we take.

And then now, I talk with – I'm getting ready to do a National Sanitation Foundation (NSF) certification for the United States Anti-Doping Agency (USADA) and World Anti-Doping Agency (WADA), the U.S. Anti-Doping Agency and WADA, which are certifications that not only are there no heavy metals, but there are no trace elements of anything that an athlete could get tagged for in terms of being disqualified for using a performance-enhancing substance. There are a lot of waves that you can craft your product so that it fits perfectly into that demographic.

Having said that, I think that there was a piece on the internet probably a couple of months ago exposing some companies, particularly in the chicken bone broth arena, for lots of heavy metals and that sort of thing. But first of all, we don't do chicken. Second of all, we don't really do bone broth. Ours is hydrolyzed. That's one of the reasons we do peptides. They're hydrolyzed into not only a more soluble product that mixes or blends well with water, but also presents these peptides, dietary peptides in your digestive tract, in a way that they're probably likely not going to be cleaved by the acidic environment of the stomach as much and enter into the bloodstream in a peptide form that the body's much more ready, willing and able to take in.

JM: Are there different types of hydrolysis? And does it matter what your raw starting material is? Does it matter if you just use bones or you put in some connective tissue, where you're putting cowhides?

MS: It does. In the bovine industry, hides are the primary source of collagen. Bones are a minor source of collagen. Connective tissue becomes a source of collagen, but hides happen to be the primary source of collagen material in the bovine industry.

In the marine peptide, collagen peptide, it's bones, skin and fish scales, things like that. It depends on the original animal source. Even there, it drills down into the sort of better for you. If you're going for collagen only, then you just primarily base it on hides. If you're going for a bone broth protein for instance, some companies that specialize in what they call bone broth protein. That's not a collagen peptide product. It's a bone broth protein product.

You'll see a couple of years ago, a couple of companies said, "beef protein isolate," right? You'd think, "Wow. Beef protein isolate. That's got to be better than whey." But if you think about it, would you take a choice cut of grass fed sirloin or tenderloin and powderize it, when you can get 25 bucks a pound wet for selling it? The beef protein isolate is literally taking all the nether parts of the cow after the butchering process, put it into a soup and got boiled down to a broth and spray dried into a protein. I'm not suggesting that that's a bad thing. I'm just suggesting that that's not exactly what we're talking about here when we're talking about collagen peptides. Does that make sense?

JM: Yeah, yeah. It does. Do you think that there's a significant difference between the hydrolyzed cowhides and bone broth collagen?

MS: Yeah, I do.

JM: From bone, primarily, or hydrolyzed bone. I don't know. I guess you can hydrolyze the bone too.

MS: No. You can do all that stuff. Again, what's the significant difference? You're probably getting a higher concentration of the appropriate peptides. At least in my case, looking for connective tissue support, more than skin, hair and nails, that's what I would go to. Now, it's interesting. Speaking of hair and nails –

JM: So the hydrolyzed bone would be better than the cowhide?

MS: No, no. I think the hydrolyzed cowhide is better.

JM: Really? Okay.

MS: I do.

JM: What's the rationale for that?

MS: Again, it just seems to be a better source of those particular peptides.

JM: Okay. If you're using collagen powders, unless a consumer wanted to do an exhaustive third-party assay, are there simple parameters they can use? Like just stirring it in water and see if it dissolves. Smelling it and tasting it. What would you recommend is a good strategy?

MS: Right. If you know what to smell and what to taste, absolutely. If you don't know what the smell and taste, then you're sort of at the mercy of the marketing label or whatever. But I mean if it's this hydrolyzed collagen, they have to adhere to a standard that that's what that is. That doesn't guarantee the purity that you and I just talked about in terms of the heavy metals, but it certainly sort of guarantees that they're theoretically fulfilling their obligations as a manufacturer with a label, then that's what it has to contain.

I look at the smell. Solubility isn't so much a big issue for me. I don't mind something that you have to blend or stir vigorously or stir into warm water versus cold water. Sometimes these things clump in cold water. That's not necessarily a bad sign.

JM: Okay. Great. The protocol that you've established then is to initially build up the amounts. Maybe start with 40 grams or even more of the protein, and then work your way down to 20?

MS: Like an experimenter guy, I'm the guy who just throws a lot of stuff at it the first time. I remember, Joe, back in the early '80s, when I was starting to train for triathlons and Linus Pauling was still considered a leader in a lot of fields – By the way, he still is, in my mind, up so far ahead of the curve on a lot of things. But for instance – I'm just going to give you an anecdote – his "Take vitamin C to bowel tolerance," was his main admonition. I was taking 25 grams of calcium ascorbate a day sometimes, which I think probably screwed me up as a bit much. But that was bowel tolerance for me. I was training really hard and I didn't want to get sick. There you have it. So when I went to the 40 grams a day, I just thought to myself, I'm just going to bathe my Achilles' in this raw material. I did it twice a day.

JM: 40 grams twice a day?

MS: No, no, no. I did 20 grams twice a day for a total of 40 grams a day.

JM: Okay.

MS: I did the 40 grams every day. Some days I only did the one, as compliance has always been an issue for me, so sometimes I forget the second dose. I never felt like taking 40 grams at once was ever going to be any sort of a thing. I think there's a rate limiter on how much you could absorb.

JM: What do you think that limit is? Not necessarily collagen, but protein in general. Regular protein.

MS: Oh geez.

JM: Twenty-five or 30 grams? Is it based on your total body mass? What's the range you would say?

MS: Personally, I would say 30 grams. I'd say that anybody taking in more than 30 grams of protein in a meal, you're probably going to lose that. It's not like you're going to hurt yourself. Although if we're talking about detoxifying with Rosedale, you're hurting yourself. Ron Rosedale, sorry. But yeah, you still have to deaminate the excess. Some of it might be converted into glucose, because there's that whole gluconeogenic aspect of excess protein.

[----40:00----]

I think, you and I also talk about this, but I find that the daily requirement for protein, I used to think I had high protein requirements and all of a sudden I was like, "Geez, my daily protein requirements might be 50 to 75 grams a day." I feel great doing that. Anything I eat beyond that isn't building more muscle, isn't causing me to burn more fat. It's just extra calories that the body has to figure out what to do with.

Again, do I convert it to glucose and burn it? Do I convert it to glucose and store it as fat? Do I deaminate it and pee it out? Do I keep it temporarily in the nebulous amino acid pool or sink that's in the body?

In the last couple of years as I look more and more into this whole protein thing, I don't even think in terms of meal-to-meal or even day-to-day. I sort of look at protein intake in three and four day clumps. If I get 180 grams of protein over three days, I don't care how it came in, when it came in or whatever. That's enough to keep me going, because the body is so efficient at recycling, particularly when you're fat-adapted and keto-adapted. It's so efficient at not feeling like it needs to dispose of that protein.

JM: Yeah. That's such a key thing. You mentioned Ron Rosedale is a [inaudible 41:51] mine for many, many things. I'm not sure I believe his stance on protein now. But I ran into problems with following to have a low protein all the time.

MS: He's having 45 as his number.

JM: Yeah. I'll go below 40 for a few days a week, but then I'll go up to 60 or 70 on my strength training days. I absolutely need to pulse it. You don't want to chronically suppress mTOR. You're just asking for trouble. You're not going to be healthy. That's not how we were designed to be.

MS: No. This is the thing, Joe. As these new ideas come into our cutting-edge – particularly in the internet, where everyone’s on Google, everyone’s an expert – mTOR enters, and all of a sudden mTOR is a hugely bad thing. I’m like, “No. mTOR is not a bad thing. mTOR is the reason that we grow, babies grow, teens get stronger and adults get stronger on occasion.” It’s really about the balance.

I see that happening, as I know you do, all throughout our industry, even with my recent foray into ketogenics. I don’t like the word “ketogenesis.” I don’t like the word because it connotes an excess of ketones in the bloodstream. To think that you’re going to have an excess of ketones in the bloodstream all the time for the rest of your life is ridiculous.

JM: It’s not going to happen. If you want to be healthy—

MS: Bingo. I talk about keto in the same breath that I talk about fat-adapted and keto-adapted, which means – By the way, the term that I use is “metabolic flexibility.” We want to be able to burn fat when it’s available on our plate. We want to burn fat when there’s no food available. We want to burn glycogen when it’s in our muscles and there’s none available. We want to burn carbohydrate on our plates when it’s available – glucose in the bloodstream. We want to burn ketones when there’s no glucose. And at the very last resort, we want to burn amino acids because it is a substrate in the absence of other substrates.

But metabolic flexibility means we’ve developed this internal combustion system that is equally adapted, extracting calories from all these substrates, not just dependent on carbohydrate every three or four hours, which was the old paradigm. But certainly also not just adhering to a keto diet for the rest of your life with no more than 20 or 30 grams of carbs a day. Some people do that. God bless them. I couldn’t do that because I like food too much.

JM: Yeah. I agree. I’m in your camp for sure. There’s another benefit. I’m not sure if you’re aware of this yet, but I’ve been in connection with one of Richard Veech’s primary assistants, William Curtis, who helps write his papers. Veech is probably the premiere guy in the world on ketones. He’s out at the National Institutes of Health (NIH) in Maryland.

If you’re metabolically flexible and you are travelling, you can do this biohack. I encourage you to consider it. The hack is simply that when you are flying at 35,000 feet, you are being exposed to ionizing radiation. You are, unquestionably, causing DNA damage. It’s just the way it happens. That’s why flight crews have about a 30 to 40 percent increased risk of cancer. It’s well-documented.

How can you biohack this? Well, first of all, be metabolically flexible, and then secondly, do not eat the day that you fly. That’s fasting day. Because when you’re fasting, you’re metabolically flexible. Your ketones will go up. What’s the benefit of that? When you have high ketones, it does a number of things. It pretty much shuts off and radically improves your body’s ability to nullify the damage inside that fixes ionizing radiation.

It does it through two primary mechanisms – well, three. The ketones are HDAC1 and 2, histone deacetylase inhibitors, that activates forkhead box O3 (FOXO 3a). It increases superoxide dismutase (SOD) and catalase. And they also increase nicotinamide adenine dinucleotide phosphate (NADPH), which is a source of electrons to recharge glutathione. And then finally, they help create nicotinamide adenine dinucleotide (NAD+), which recharges PARP, poly (ADP-ribose) polymerase, which repairs the DNA damage. It's a simple hack that doesn't cost you anything. You can radically improve your DNA when you're flying.

MS: It's interesting that you say that, because people ask me how often do I intermittently fast. I say, "Well, not often." But then they'll go, "But Mark, you only eat lunch at like 1:30 or 2:00, and then you'll have dinner at 7:00 or 7:30, so you're fasting." That's not fasting. That's just how I eat. That's just how I eat. That's just what I call [inaudible 46:41]. But when I intermittently fast is when I fly. I do exactly that. I just don't eat when I fly.

First of all, because the food sucks. It's so bad that you just can't. It's like, "Wow. I have sunk so low if I'm eating this particular thing they serve on this flight." That's the main reason. That is the only time I truly fast or don't eat or skip multiple meals in a row. It's when I fly.

JM: Yeah. Well, you have been doing your body a great service, especially if you fly a lot. You will damage your DNA. There's just no doubt about it. It's equivalent to multiple X-rays.

MS: Yeah.

JM: I want to get back to the fitness, because you are such an expert in that, and just maybe point out what appears to be a bit of an incongruence in your sprints that you had this morning, because you are, every week, playing ultimate Frisbee. To me, that's a sprint workout.

MS: Yeah. You're right.

JM: If you're doing that once a week, but you still did the sprints today, is that like an exception? Or you just skip ultimate Frisbee?

MS: No. Here's what happens. We're doing this on a Tuesday. I play ultimate on a Sunday.

JM: Right.

MS: I didn't play Sunday because I was down at JJ Virgin's event.

JM: Okay.

MS: I missed my game. When I said it's been a long time since I've been to the track, when I said that, it's been like six months since I've been on the track. I went to the track today because I didn't play Frisbee this weekend. So, to your point, and to clarify – I'm glad you're looking through all of these. You're digging up all of these holes, Joe.

JM: It's my job.

MS: I'm exposing my soft underbelly here. Because I needed to get a sprint in and I had a friend go on the track today. By the way, I called him up to go paddling and he said, "I can't paddle with you, because I'm going to the track." And then I said, "I'm going to paddle first. I'm going to get a great workout in, and then I'll meet him at the track." As I said, that's like my perfect retirement day.

JM: Yeah.

MS: One day, if I do retire, that'll be like my perfect –

JM: You're not going to retire. That's the end of it. You're going to be on your death bed if you're going to retire.

MS: Right.

JM: But then I'm wondering too if you're – with respect to biohacking – familiar with Alberto Salazar. He was a contemporary of yours.

MS: A very good friend of mine.

JM: As you know, he was the coach of the U.S. Olympic track team the last Olympics.

MS: Yup.

JM: From my understanding is he spent 120,000 dollars, purchased a NovoTHOR red-light bed, near-infrared. All the athletes, all the Olympic track athletes were on it. They got the most medals than in any other Olympics is my understanding. I'm just wondering if you're familiar with that or if you talk to Alberto about it and what your thoughts are on photobiomodulation (PBM) for exercise.

MS: I haven't talked to Alberto about it. I'm open to the suggestion. I do a Joovv Light. I don't know if you know the Joovv.

JM: Yeah. Exactly. I've got one too. Yeah. I use it every day.

MS: I love it. Those guys, I think they're onto something. I've got an NIR sauna. I take advantage of that.

JM: You're doing it, man. You're doing it.

[-----50:00-----]

MS: I'm doing it. I might say, well, you know, if I had not been doing that, I would have run 35- and 37-second today, instead of 32 plus. By the way, after today's stop at the track, I'm like, "Geez, I've got to go back to the track." Maybe I can get it down to around 30 again. But that would just be maybe too much to ask.

JM: Yeah. What was your best time for doing 200s when you were like – last century?

MS: Here's the thing. I was an endurance athlete. The longer the distance for me, the better it was, because I didn't have a high maximal oxygen consumption (VO2) max. My VO2 max was 67.5.

JM: Wow. You were the lead athlete. People don't know you were in the Olympic Trials, which is a badge of honor.

MS: I qualified for the Olympic Trials in 1980, the year we didn't send a team. But I ran 218.01. I actually ran 216 in 37 seconds at that rate, but they rejiggered it.

JM: Geez.

MS: I ran 220, 220, 221, 222, 222, 222 and 225. I ran a bunch of sub-225 marathons. The longer the distance, the better I was, even though I only had a VO2 max of 67.5. Now, I've never broken 60 for a 400. But I was the guy who grew up at track. In a workout, I could run six of them in 65 if you gave me 2-minute rests in between. I had this ability to tap into my absolute highest VO2 max.

When we're talking about VO2 max, there are two aspects of performance. One is, "What is your VO2 max?" The other is, "At what level can you consistently perform? At what percentage of your VO2 max can you perform?" Because there are guys who have VO2 maxes of 80, but they can't perform for long periods of time at that. They're limited to their sub max potential. I wasted such a high level of my VO2 max that I'm very clear that I got every possible amount of speed out of my body that there was ever going to be to get there.

People say, "Well, Mark, if you went back and had to do it all over again knowing what you know now about ketosis and fat burning and all of these other stuff, would you do it differently? And what would the effect be? Would you be any faster?" I suspect I wouldn't be any faster. I suspect I would have greater longevity. I would suspect that I would have been able to do it longer.

And then one of the things that happened to me was by the time I entered a triathlon and I went to do the Ironman in Hawaii, I already had a career as a marathon runner. I'd already hurt way too much for too long for one person. I shifted over to triathlons and I did that for a couple of years. I finished fourth in the Ironman in Hawaii in 1982.

I was a crappy swimmer. I was a great runner. And even though I couldn't run anymore, because I got injured and I couldn't train at the level, that's why I became a triathlete. I became a great cyclist as it wasn't affecting my joints as much. My swimming was so bad that I just had – Unless I really wanted to work on my swimming, that's the end of my endurance days. I'm not willing to hurt that much for that long anymore.

JM: I think you might have been able to improve your performance if you did an interesting biohack. That is using these ketone esters. I think the non-racemic one, the d-ester, stereo-isomer.

MS: The literal and figurative rocket fuel.

JM: Yes. Jet fuel. That is correct. But if you take – I mean there are a lot of endurance athletes, like Tour de France athletes, who are taking that regularly. They're busting like almost every winning team is on this stuff. It's expensive. It's a dollar a gram. They spend about 100 dollars when they're going to race, but they're elite athletes.

MS: No. What's interesting is – and then what we haven't seen yet, but I suspect would be the next level is none of those guys really have gone truly low-carb. They haven't really gone into a keto reset. They haven't really built their metabolism yet to burn fats. If they got to the point where they spent six weeks off-season in ketosis and developed that metabolic machinery and increased mitochondrial biogenesis and got to the point where they could do more work, burning more fat, and then introduce the ketones, and then offset the need for all those gels and all that crappy carbo stuff, then you'd start to see a next level of performance, I think.

JM: Yeah. Yes, indeed. I got a personal question for you. In your training for sprinting, what, in your mind, is the most painful sprint to go? Is it the 200? Is it the 400? Is it the 800? What was your least favorite workout?

MS: Well, I could talk about the old days. In the old days –

JM: Yeah, yeah.

MS: The least is 16 x 800 x 220 to 224.

JM: Wow.

MS: That was 800 under 224, and then walk or jog a quarter, and then do another 800, and walk or jog a quarter, and do another.

JM: Sixteen times.

MS: Sixteen times. Yeah.

JM: Wow. For me, I thought the 400 was a little worse.

MS: Yeah. I mean if it's just for a straight race, if you're going to try and meet out the energy in what you think is an even pace –

JM: It's like the longest sprint.

MS: It's like the longest sprint. Yeah. People say that. But the 400.

JM: It's people on steroids.

MS: Yeah. It's 99.9 percent glycolytic. You typically run out of that stuff after 20 seconds.

JM: The last one is just on motivation. The last [inaudible 55:49] for that.

MS: That's right.

JM: I was just delighted to hear that you have the Joovv. Do you have the combo one or the –

MS: I have the big one.

JM: Yeah.

MS: I have the big one and I lie it down on the floor and lay next to it, instead of standing in front of it.

JM: Don't lay on it though.

MS: No, no. God. No, no. I lean it against the wall, and then lay next to it. Yeah, yeah. No. Jesus.

JM: But is it the combo one?

MS: What do you mean the combo one?

JM: That has red and near-infrared. Or is it just near-infrared?

MS: It's just near-infrared.

JM: Oh, perfect.

MS: Yeah.

JM: Let me give you – I just finished a paper, a review on PBM, by Michael Hamblin, who's out at Harvard, probably the top expert in the world on it. Because the energy density in that radiation is really important, you'd want to max out about 30 joules. If you get a lot more than 30 joules, you actually get a negative side effect.

MS: Yeah.

JM: With the Joovv, that is about five minutes on each side, with just that one wavelength. Otherwise, I wouldn't go more than five minutes on the side.

MS: Yup. I know.

JM: Okay.

MS: Jesus. That's good. I'm glad we cleared that up.

JM: Yeah, yeah. I just wanted to make sure. Have you encountered any other hacks lately? I'm not into hacks a lot, but you know –

MS: Yeah. First of all, I don't even like the term.

JM: I know you don't.

MS: We talked about this. I am the anti-wearable tech person. I think the information that I get from wearables is worse than not having information at all – to have a piece of device tell me that I didn't sleep well last night when I thought I slept damn good, or have an heart rate variability (HRV) thing I'm ready to go out and do the best workout I've ever done, when in fact all it's picking up is my premature ventricular contractions (PVCs), because I have a damaged heart from all years of running I did.

JM: Yeah. You can't use HRV.

MS: And then the Fitbit, I mean the people who I know who strap that to their leg when they do soul cycle, because they can't not get their steps in.

JM: You're right. Almost all the wearables are high in electromagnetic fields (EMFs).

MS: Yeah. That too. I have to laugh at some of this stuff. Because since Day 1 with Mark's Daily Apple 12 and a half years ago, I'm like, "I want to teach people how to be intuitive about their lifestyle choices." It's basically, "How do you feel? How do you look, feel and perform? But how do you feel?" So when you wake up in the morning and you do a workout, "Are you ready for that workout? Do you feel like doing that workout? Are you excited about the workout?" It's not, "Don't worry about it." "Do you have enough energy when you wake up in the morning?" "If you're not hungry, do you still have to eat?" No. If you're not hungry, why are you going to eat in the first place?

JM: Yeah.

MS: A lot of this is just developing an intuitive sense that even if you eat the wrong thing, you don't beat yourself up. You don't make yourself guilty for having made an inappropriate choice in the moment, because part of that is self-love and knowing that you're going to get back on track.

I'm like trying to take this high-tech movement and swing it back to, "Okay, use the information to get you to identify when you are ready to do something you're not ready to do." A good example would be a heart rate monitor. You know, I train with a heart rate monitor. I was one of the first guys using a heart rate monitor in 1979. It was a thing with actual leads coming down to a cigarette pack.

JM: It weighed about 10 pounds?

MS: Yeah. It was great. It was great information. But the research hadn't been done to know where the different zones were and had correlated lactate with a buildup of lactate and all the other things that needed to be put into place for it to even be a useable device.

[-----1:00:00-----]

Now, but after a bunch of years of using one, it's like, "Okay. I know what my heart rate is at different levels." In fact, the only reason I ever used a heart rate monitor after the first couple of years was to keep me below, to keep me honest, to keep me below a certain level. Because I knew if I went above a certain level, I was in that no man's land, you know, that black hole of training.

JM: Getting back to that, you have a sort of counter-intuitive recommendation and approach to training, at least endurance training. I think you're using the maximum heart rate formula of 220 minus your age. You're pretty much staying there during your cardio. Is that right?

MS: 180 minus your age. Here's the difference.

JM: 180. Sorry.

MS: Yeah.

JM: Sorry.

MS: No, no, no. But the 220 minus your age used to be your theoretical max heart rate. That was what the health field suggests would be your max heart rate. But 180 minus your age gives you your maximum aerobic function. What it means is that that's the heart rate at which enough oxygen is being put through your body to fuel fat burning and to not put you into glycogen or sugar burning.

It's interesting because a lot of people who say, "Well, 180 minus your age. Let's see. I'm 40 years old. That means I have a max training heartrate of 140. But Mark, I can train at 160 and 165 all day long. I could run 545 miles or I could run 6-minute miles. And then when I do what you say, Mark, and I train at 180 minus 40 or 140 as a max heartrate, I'm like doing 9-and-a-half- to 10-minute miles. I'm almost walking, Mark. That can't be accurate."

My response is, "It's entirely accurate. Here's the issue. You perform well as a sugar burner. You're a great sugar burner. When you are training at 165 or a 170 heart rate and you feel pretty good about it, you're great at burning sugar. But you suck at burning fat. The fact that you suck at burning fat is demonstrated by the fact that you can't do much work at 140 beats a minute."

How Mark Allen became the premiere Ironman in the world is because Dr. Maffetone was the one who coached him, as some of these other athletes, Zach Bitter and some of the long-distance guys, is they kept that metric. They go for long periods of time never exceeding that heart rate. But that's your max heart rate. And then they don't use a speed or miles per hour to dictate how fast they're going.

JM: They use the heartrate.

MS: They use the heartrate. Over time, what they find is they become more and more efficient at that heartrate. All of a sudden, those 9-and-a-half minute miles become 8-and-a-half minute miles, and then 8-minute-miles, and then 7-minute miles.

The next thing you know, this guy who's 40 years old complaining about how slow he's going, if he's done it for several weeks, he's all of a sudden going, "Mark, I'm running 6-minute miles at 140 beats a minute. Imagine what I can do when I get in a race and then I'm throttling it up at 160 or 165 beats a minute." Because we know at 6-minute miles at 140 beats a minute, we know based on how hard the heart is not working, that he's burning fat. Because he would not be able to supply that much oxygen to fuel that amount of work on sugar. You have to understand the science. But when you do, and you realize as long as you're willing to spend time in this zone, you become more and more efficient. That is what endurance is all about. It's about how efficient you are.

JM: That is brilliant. Absolutely brilliant, Mark. Thank you for sharing that.

MS: Yup.

JM: How long does it typically take for a pretty good athlete who's burning glucose instead of fat at a very slow pace? How long does it take to make the transition? Is it a few weeks? A few months?

MS: Yeah. No. Six to eight weeks. But a lot of these guys are into instant gratification, right?

JM: Yeah. They're athletes. Of course.

MS: Of course. Yeah. Let's take this prototypical avatar, this 40-year-old guy who's a pretty good runner, he's going to be frustrated because that's two months out of his life that he couldn't be racing and doing whatever he's doing. But the problem is he's never going to get better. He's already hit his potential in burning sugar.

Unless you start to introduce fat at a much higher level, he's never going to race faster. He sort of hit his peak, and that's fine, but how many people want to continue at their peak and have no chance of getting better? Particularly those who are in the endurance field. Everybody wants to get better and better over time. It's an interesting mindset.

JM: It's for improving endurance. It's not true for sprinting sport, of course, because that is a glycolytic activity.

MS: Yeah.

JM: Are you still following this recommendation now, and in your case, keeping your maximum heartrate and cardio at about 115, like on the paddleboard today?

MS: Yeah. Perfect example. Again, the great thing about paddle boarding is that the heartrate doesn't get up there that high. You get a great full-body workout. But because the turnover,

because of the paddling, the turnover is so relatively slow to a bike-pedal turnover or running turnover. I could race my heart if I wanted to. But I went out for an hour, a full hour today of hard paddling. I suspect I kept my heart right around 115 or 120. I said I beat myself up. I've got the serratus to show for the paddling. I've got the lats. I've got the shoulder stabilization. Paddling, when you do it right, is the absolute best full-body workout there is.

JM: Does it hit your posterior deltoids too?

MS: Absolutely. Yeah.

JM: Yeah?

MS: Yup. If you do it right, and it's mostly, in the shoulder realm, it's mostly a stabilizer, but you're using lats because the paddle is held out in front of you. Your arms are in a straight V and you almost don't even bend your arms in. You keep them locked out, and then you do all the work by bending, dipping a little bit with your legs. There are gluts. There are hamstrings. There are quads. There are lower quads. There are lats. There is serratus. And then you stabilize your shoulders through that whole movement.

JM: Wow.

MS: Do I sound like a fan?

JM: Yeah, of course. Ultimate Frisbee and standup paddle boarding.

MS: Yeah.

JM: The question on the plate though is, "What is easier to paddle board in? The Atlantic or the Pacific?"

MS: Wow. The Pacific is more interesting for me, but I don't paddle in the Atlantic. I paddle in the bay, which is the Atlantic, but I paddle off the Indian Creek. That's really interesting because you're around really expensive homes and expensive boats and around bridges and under. It's a unique thing. And then I see manatees instead of whales when I'm in the inland waterways there.

JM: Alright. That's good. Anything else you'd like to add before we sign off?

MS: No. I want any of your listeners or viewers who don't already know it, Primal Kitchen Foods is my main company. We make healthy salad dressings and mayonnaise. We just introduced a completely unsweetened and organic ketchup that is just taking the world by storm. Again, it's like a game-changer. Yeah.

JM: Yeah. And then Mark's Daily Apple, of course.

MS: Mark's Daily Apple is the blog since 2006. The only older blog that I can think of is Joe Mercola's blog. This guy's been writing for a long time.

JM: Yeah. 21 years this year.

MS: Good man. You're a groundbreaker and a pioneer, Joe.

JM: There are a few others out there. Believe me, I've known them. But they're not popular ones. Alright. Thank you for everything you're doing, Mark. I really appreciate all the wisdom you have been kind enough to share, and some really powerful tips there. I wasn't going to go there, but it occurred to me that we should explore them. I'm glad we did, because I've heard you go over this a few times, but it really only sunk in now, especially with your explanation for it in discerning the different types of pathways that you're optimizing. We really have to optimize. Well, we don't have to, but if you want to maximize your performance, especially long-term endurance cardio, it's just crazy not to follow that recommendation, simple recommendation, 180 minus your age.

MS: Yeah. Cool.

JM: Alright.

MS: Thanks for having me, Joe.

JM: Yeah. We hope to see you soon.

MS: Great.

[END]