Announcer:

Bulletproof Radio, a state of high performance.

Dave Asprey:

You're listening to Bulletproof Radio with Dave Asprey. Today's guest on the show is a person you might not have heard about but someone whose work I think you are going to hear more about over the next couple years. He's a physician who's treated thousands of patients and a researcher and professor who's authored thousands of articles over a career of more than four decades. I deeply appreciate the chance to learn from the wisdom of my elders and Dr. Jim Stray-Gunderson is definitely one of those people who has put so much time and energy into sports physiology, worked with Olympic athletes in various disciplines and is now working on a kind of technology called blood flow restriction training that promises to have broad effects across your biology not just for sports training.

Dave:

He does this for a company called B Strong and he's also the sports science advisor for the US Ski and Snowboard Association, which by the way Bulletproof sponsored, the US ski team last year for the Olympics which I thought was particularly cool to see the Bulletproof logo on the jersey where they call them the Bibs at Killington. That was cool. Jim welcome to the show.

Jim Stray-Gundersen:

Thank you very much. Happy to be here.

Dave:

What brought you 40 years ago into sports physiology? It seems like it was much less of a field when you got there. In fact you might be one of the very earliest guys doing that.

Jim:

It wasn't a field. I would say that I've always had a strong curiosity about science. Then my other strong curiosity and passion had been sports and while for most of my education, sports and school were separate. I had an opportunity after I had finished my surgical training to combine those things and I did two postdoc fellowships one in cardio vascular physiology and the other in human nutrition at UT Southwestern Medical Center in Dallas Texas. And after those fellowships I joined the faculty there and despite the fact I was a general surgeon in the divisions of cardiology and also orthopedics, but the intent there was to do something that was starting to be called sports medicine or exercise science.

Jim:

They really, really didn't have a way of doing this before then and we kind of pioneered the idea of let's say, a clinical physician an exercise physiologist for sports medicine position, and from that I ran a lab and an educational situation for many years. That's kind of how we ended up here.

Dave:

Along the way though you've been involved in the training and regimens for a hundred gold medals and hundreds of world championships. That's some kind of elite level stuff there.

Jim:

Yeah. In my athletic career, I was a fairly accomplished runner and cross-country skier and as well as a tennis player, but never quite good enough to make it. I was at a national level in running in cross-country skiing. And I happened to get invited to a number of national team camps from time to time. Kind of the bummer of some of those introductions was I wasn't as good as the people I was competing against. But on the other hand they saw value in me in terms of what kind of medical and the physiologic knowledge I could lend to the effort.

Jim:

My first introduction was both in long distance running where I competed for the University of Wisconsin which has a very good distance running tradition and I also competed in cross-country skiing at a national level. I developed relationships within those sports and then as things developed I became kind of the science guy and the doctor for a lot of these groups.

Dave:

You also wrote this groundbreaking study, Live High, Train Low that really affected... I used to be a wannabe competitive cyclist back when I was a fat kid. I noticed fat kids aren't very effective cyclists but I would go in races and road races and things like that and I just always finished last at 5,000 feet elevation because that's where I lived. But I remember thinking, "Wow, this idea that you're going to go live at 10,000 feet in Colorado and you're going to go train at the bottom of the mountain." It always seemed like such a sexy thing to do and it's because of the paper you wrote. I would say maybe you and some Russian space program people or probably the early people looking at the effects of altitude on human physiology, what did you learn in that training and how was your view of altitude changes over the last decades?

Jim:

Yeah. So early on, I would say in the 1960s, there started to develop a great interest in the use of altitude to train primarily endurance athletes and there's all sorts of stories about athletes going up into the mountains and coming back in really great shape. The fact of the matter is that these are all anecdotes and almost no real studies have been done at the time. In and around this time, I was the physician physiologist for the US cross-country team and we had a training camp in Dachstein, Austria.

Jim:

We lived at about 2,200 meters or 6,500 feet in a hotel and we went and trained on the glacier, Dachstein glacier at 3,000 meters or about 10,000 feet. Essentially, I found myself sitting in bars talking to the coaches about what's good, better and different about this and everybody thought at that time all of the main teams, the Norwegians, the Finns, the Germans, the Russians everybody would congregate in Dachstein for these training camps in the summer where at the very least we could find snow to ski on.

Jim:

This was also accompanied by East German coaches who were saying that, "Oh, the way to do this is to go to 2,000 meters and beat the crap out of everybody and if they come back from that in one piece, then they're going to be darn good athletes. So within that environment, I started to think about this and I teamed up with a colleague of mine in Dallas, Dr. Ben Levine who had spent some time in the Himalayas with mountain climbing and had done some medical care in Kathmandu, in Nepal. What was really apparent and very apparent to me personally was when we went up to the glacier to ski, we

couldn't ski very fast. And if you go up to Everest, you can't move very fast. You can hardly do anything because essentially there's not enough oxygen to power what's going on.

Jim:

I'm going, "This doesn't make any sense. Why does going slow help somebody with race performance?" So Ben and I started thinking about this and discussing it, and in the meantime I noticed that some of our skiers who lived in Park City, Utah which is about 2,000 meters of altitude, basically 6,800 feet in and around town, but they would go down to Salt Lake City which was around 4,500 feet to do some of their harder sessions. Down there, they could exercise normally or at sea-level speeds. The coaches felt they were getting a better training effect by going down low. So I'm going, "Hmm, a lot of this doesn't make sense. There must be something else going on."

Jim:

We also recognized that there had been a bunch of research done in the Andes where coal miners would live at sea level and then they would go up into the coal mines at even 5,000 meters. Really high altitude for a month and work in the mines, and then they would come back. A researcher by the name of [Rachna Ahire 00:11:08] ended up measuring how much blood they have after a month at sea level tap or a month in the mines and showed that their red cell mass or their blood volume expanded when they went up to altitude.

Jim:

And I also put this together with the idea that... And this is now in the '80s, in late '70s and early '80s that there was a problem with blood doping in sport. There had been some studies done in Sweden and some use done in Russia of transfusing athletes before major competitions them finding that was effective.

Dave:

So for listeners who might not kind of know what that effect was, that's adding extra red blood cells. The same thing you would get if you've lived at high altitude, so that they could perform better.

Jim:

We knew actually basically back in Nazi Germany, the Germans would give their elite troops, the SS troops blood transfusions and anabolic steroids to improve their performance in the field and essentially this crept into various forms of athletics which we now know is doping. So I had that fact and then I had a fact that when people went up really high in the mountains they increased the number of red blood cells they had and I had the personal experience of going really slow when I tried to train at altitude. Ben and I were putting our heads together and he says, "How can we explain this?" And we thought, "Well, maybe it's not the training at altitude that's doing the thing for these athletes, maybe it's the idea of living there."

Jim:

So we ran a whole series of experiments, literally over 10 years where we tested various parameters of living high, living low, training high, training low, a variety of these different combinations to see which one was effective in improving sea level performance. The short answer is that living high around 8,000 feet or 2,500 meters for three to four weeks is a very effective way of increasing your red cell mass and

thus your maximal ability to move oxygen or your V02 Max and this directly helps your C-level endurance performance.

Jim:

And the other thing we found out is that this business of training slowed up at altitude actually is a negative for sea level performance. So what we found is that if you come down low or low where you can move at normal sea level movements, that that was the best of both worlds. So we wanted to live high for three or four weeks and we wanted to train as low as possible during that time. And we found that to be a very effective way and legal and ethical way of enhancing sea level performance.

Dave:

Now, the effect of living up high, is definitely you grow more red blood cells naturally. Does it change hormones like EPO which is also used for doping but it's a biological hormone?

Jim:

The process of going to altitude causes an increase secretion of EPO. The basic mechanism is this. When you go to altitude, your lungs cannot provide enough oxygen to the blood to completely fill those red blood cells with oxygen. So the saturation of those red cells goes down to, let's say, 90% where at sea level it's 100%. And as that essentially hypoxia goes through the kidneys, there's specialized cells in the kidneys that sense the saturation of oxygen or how much oxygen is around. If they feel there's not enough red cells for the amount of oxygen that's here, they start producing EPO or erythropoietin as a mechanism to kind of counteract this hypoxia.

Jim:

So then the EPO circulates and goes to the bone marrow where it stimulates differentiation and replication of certain kind the stem cells so that they end up developing into new better red cells. And so this process happens when you first go to altitude, but you need to continue it to keep the stimulus on so the body doesn't shut the thing off. And it takes about three or four weeks of this kind of stimulation to materially increase the number of circulating red cells.

Dave:

I've worked with a couple different technologies over the years. I've spent time in Nepal, in Tibet and in the Andes and Himalayas. I'm familiar with the effects of altitude and performance. My wife did some Himalayan rescue association work as a physician. So I noticed when I came back from... Geez, that was several months up there. I felt like a great golden God for a while when I came back to altitude which this definitely explains why. But since then, I've played around with intermittent hypoxic training where at Upgrade Labs, which is one of the Bulletproof companies, in LA we have a thing. You exercise your breathing air that has no oxygen to drop your blood levels down to 87-ish and then you breathe pure oxygen afterwards, and the idea there is to up train this similar effect as if you're living at altitude.

Dave:

There's another one that changes the rapidly cycles the air pressure that you're in. You're in a sealed compartment and it takes you up to Everest and back to sea-level and rapidly cycles it with the idea that the slope of the curve is going to have an effect with some studies behind both of those. Have you noticed that there's a way that's more accessible than... And most people have jobs overtime moving to

Everest for a while and coming back down or took you to Denver. How do we access this without crazy lifestyle interventions?

Jim:

There's a couple ways at work. Most of the shortcuts have not been shown to work. One way we know that works was first developed by a colleague of ours by the name of Heikki Rusko in Jyväskylä in Finland. What he did is he converted some hotel rooms to essentially altitude rooms by changing the concentration of the oxygen in the room from 21%, which is what it is all over the world to around 14 to 15% and simulating anywhere between 2,500 and 3,000 meters of altitude. But in that case you have to spend at least half your day in there or half the 24-hour period. You need to do it again for this three to four week period of time.

Jim:

How that plays out for people who live at sea level is they can convert their bedrooms or bedroom in the living space into essentially an altitude situation. There are companies that have sprung up that make altitude tents. Basically you're changing the environment you live into one in which you're hypoxic. Now, that environment can be as small as a big plastic bag or it can be as large as being up in the Himalayas where it's everywhere. But what's critical in there is making the body hypoxic long enough so that you can stimulate this initial secretion of EPO and maintain it because there's redundant mechanisms that try to maintain homeostasis of what's going on. So you have to create a situation where you're convincing the body that it needs to change and adapt to this altitude environment.

Dave:

You're also one of the guys who helped to create the World Anti-Doping Association. What's the difference biologically between a professional athlete let's say, doesn't have a day job, goes up to altitude, lives through three for four weeks, raises EPO levels, comes down and competes. You got another semi-pro guy who has a day job, can't do that and uses physiologically normal amounts of EPO to get his blood levels to the same number of cells per liter as the other guy. What's the perspective on that? I'm asking you as an expert on doping.

Jim:

It's a very good question and it's been put before a number of ethics professors and stuff like that. At WADA, one of the things that WADA does is it keeps a band list of various drugs and methods which they consider unethical and illegal. The nitrogen tents came up in front of this and basically say, "Well, what's the difference between a nitrogen tent and living in Park City, Utah or taking an EPO shot?" And the difference spoils down to a number of things and we talk about pharmacological versus environmental manipulation. The positives about environmental manipulation is that the body always has its feedback mechanisms operative.

Jim:

So you're able to prevent the complications that can occur where with pharmacological manipulation, I mean you can take as big doses that's tolerated for a while but if you take too much, it can kill you and this is what happened with a number of Dutch cyclists in I believe it was the '90s. And so again, we get back to these redundant control mechanisms that keep us safe when we are manipulating our environment where that's not the case when we're administering a drug.

Dave:

But if you're administering the drug in the same amounts and measuring your EPO levels are the same as the guy at altitude, that avoids all of those ethical arguments, doesn't it?

Jim:

It's very hard to do that and on a practical basis nobody does that because the amount of EPO that's injected overwhelms any kind of physiologic increase.

Dave:

Got it. So it's a harder to dose thing. As an anti-aging guy, I know anti-aging doctors who use EPO in people with low blood volume as people age and they're using things that are on the water list, but they're using it to make older people young again.

Jim:

May I interject just a second?

Dave:

Absolutely.

Jim:

Pretty soon with the aging, the only people that aren't going to be using these drugs whether it's anabolics or some form of blood doping are the athletes.

Dave:

I think you're right.

Jim:

The rest of the population is going to be enjoying themselves. Good point. The problem is that with depending on what exactly you do, there are health consequences that can be very negative associated with these various practices.

Dave:

It's a serious conundrum and I don't know the right answer. I feel like full disclosure no matter what, whether it's a training technique or a special swimsuit or an injected cocktail of non-banned things, whatever you're doing, it'd be nice if we all learned from what our best athletes on earth did because our older people who would probably benefit from knowing that, there's science that gets lost in the secrecy of competition.

Jim:

Absolutely.

Dave:

But it's guys like you who get to see a hundred gold medalists, who get to peek behind the science.

Jim:

And to be very frank about it, there's tremendous pressure to succeed and to improve your performance when you're at this international level. Essentially anything goes. We put these anti-doping systems in place to protect the athletes to have safe and fair events. Hopefully they abide by that. The lessons that are learned from elite sport can be translated into helping the everyday population, live healthier and better lives.

Dave:

Your work is definitely a part of that and I want to transition to talking about blood flow restriction training, which is introducing some of that hypoxia.

Jim:

Yeah. So let me put that quickly right here.

Dave:

Sure.

Jim:

And that is that as altitude training is to essentially creating an environmental way of getting an EPO injection blood flow restriction training is a way of getting a growth hormone injection when [crosstalk 00:24:09].

Dave:

Love it. Okay. And I guess growth hormone is also banned.

Jim:

Yeah.

Dave:

Man. All these 50-year-old athletes, their lives must suck.

Jim:

Well, doping control is only present in international sport.

Dave:

Yeah.

Jim:

Actually, there have been a number of masters athletes, master cyclists as a matter of fact who have been using EPO by USADA.

Dave:

Yeah. I talked to Mark Sisson about this. He's an Ironman triathlete multiple times, a really good athlete. He's not, I don't believe, professionally competing now. Now, I use all that stuff and it's kind of ridiculous

that I couldn't maintain my health as I was working to do this. I don't know we're going to have... At my anti-aging world, I imagine hundred-year-old athletes. We're actually able to do it. I just don't know if they'll be able to do it without a little bit of a boost. So maybe we'll make an exception if you're over 100 and you're allowed to use a certain longer list. But that will solve itself over the course of the next few decades and we'll figure it out.

Jim:

Yeah. I think in any competition at any age, what's critical is a safe and an even playing field. And so what constraints have to be put on the athletes and their coaches and their doctors to assure a safe and even playing field is the right thing to do.

Dave:

Yeah. I 100% agree with you. If it's not even, it's not real competition and then safety, we all know that a real serious athlete, most of them if you ask them, and if you could be the best in the world for five years and then you don't care what happens afterwards, they're going to say, "Yep. But then five years later, when they're popping tumors or keeling over, they might regret their decision earlier."

Jim:

Well, there was a study that asked that very question. A majority of athletes said that they would be willing to win that gold medal even if even costs them their life in a few years.

Dave:

Man, that is a hairy ethical dilemma on both sides of it. I don't know that I know the answer. All I do know is that transparency is key so we can all benefit from whatever people do. Let's talk about blood flow restriction training because if it's like a growth hormone injection and athletes aren't allowed to inject growth hormone, but they are allowed to do blood flow restrictive training, perhaps more of them are starting to do it. In fact, I know they are. Tell me about what BFR which is not a big some kind of rocket from Elon Musk but blood flow restriction training. Tell me about what it is, how you came across it and what it does.

Jim:

Blood flow restriction training started in Japan about 1966. It's been around for 50 years or so. Primarily developed by a Yoshiaki Sato who was a young bodybuilder. He had an epiphany while he was at a Japanese funeral where he had to sit in position for a long period of time and we would say his legs fell asleep, but when he was able to get up from this position, he thought his legs felt like he had just done a really maximal intensity strength training workout. And he goes, "I wonder what that's all about." So he started putting various straps and wraps and all sorts of things around his legs, started experimenting.

Jim:

After 30 years of literally trial and error of all sorts of things, he came up with an elastic inflatable, relatively narrow device that he called Kaatsu which in Japanese means additional pressure. In 1998 and 2000 were the first times where some of the stuff that he had did, he had started doing studies and were published in English in Western journals. The West started hearing about this. In my case it took another 10 or 11 years to hear about it. Dr. Sato treats Kaatsu like a Japanese martial art where you come into his dojo and you have to scrub the bathrooms for three years before you ever get to do anything.

Jim:

And so he developed a series of disciples that do Kaatsu in and around Japan. These days, there's approximately 5,000 of them and they do somewhere in the neighborhood 50 to 100 sessions for people at their little Kaatsu kiosk. It's mainly centered in Tokyo, but around Honshu and around Japan. I had the good fortune of being introduced to him and kind of being taken into the fold. From their standpoint, they wanted to reach out into the west and from my standpoint, I was very intrigued by blood flow restriction training kind of upsetting the balance of training.

Jim:

Basically, we were getting a really good performance benefit out of work out that cost very little. So as things developed, I spent several years working with Dr. Sato, then at a certain point, we decided to split up. I had a series of thoughts about how to make a better system, a better mousetrap and I joined with my partner Sean Wieland at B Strong to come up with a more affordable, more comfortable, safer and effective system that could be used anywhere anytime. Really that's what we're doing and the basic mechanism is what we do. This is really not really widely known but what we're trying to do is we're not trying to cut off blood to an extremity, what we're doing is we're changing the character of the venous outflow such that the working muscle is not getting the delivery of oxygen, hypoxia again. Oxygen and blood in a manner in which it can sustain the work.

Jim:

And in many ways that's what happens in the mountains too. So there's a lot of parallels. I would say that blood flow restriction training is local hypoxia where altitude training is systemic or whole body hypoxia. The kind of "so what" of that is that when muscle is asked to work or any tissue is asked to work, but it's not getting all the oxygen it needs to replenish the ATP and the intracellular phosphates and the energy stores of the cell that at some point a metabolic crisis is created. And this metabolic crisis then does a couple things.

Jim:

One is it stimulates local mechanisms to build more and better muscle and blood vessels and all these sorts of things, but yet also we become aware of this metabolic crisis. This is what we do when we listen to our bodies. When you've been on your bicycle and in a criterium and your thighs are burning, your thighs are let are letting your brain know that there's a metabolic crisis going on there. That signal of a metabolic crisis or disturbance of homeostasis then causes the brain to react and among other things put out a neuro humoral anabolic response.

Jim:

This has been documented by increasing levels of growth hormone after these kind of workouts, but it's really a growth hormone is a marker for a whole constellation of anabolic hormones that are stimulated by these sorts of things. It's also not that strange in the order of the same kind of growth hormone stimulation or the same magnitude of growth hormone stimulation that you get with a super maximal intense workout where the metabolic crisis is caused by damage to the muscle. The difference here is that normally with these really intense or long-duration workouts, you get damaged that is the signal for this change where with blood flow restriction training we've just deprived it of the oxygen that it needs at the time and it's easily reversible but we've created that metabolic crisis that elicits this signal. So what we get is we've kind of biohacked the system by depriving the working muscle of all the blood flow and oxygen it needs. We're eliciting the body's response to maximal intense and damaging exercise.

Dave:

Now, earlier you mentioned you get a brief signal that then the body says I don't need that anymore. What's different with BFR where okay, so for 20 minutes I had blood flow restriction but now I don't. Why do you get a physiological change there but you don't get it from just general hypoxia for the same period of time? Why do you get a physiological change there but you don't get it from just general hypoxia for the same period of time?

Jim:

Well, the systems are a little different and it's not an instantaneous thing after one session. You have to be doing a training program with blood flow restriction to ultimately see the increase in muscle mass, the increase in strength, the increase in vascularity, the increase in bone density in tendon to fitness and all of these things that happen. It's really no different than any kind of intense training. We get the same kind of hormonal releases, it's just that we can't tolerate the intense training the way we can tolerate this relatively easy blood flow restriction training.

Dave:

Maybe if you're injured, it's a great thing. So if you've turned your rotator cuff, you can still put the B Strong bands on your arms, pump them up and do basic movement stuff and you're going to be getting some recovery, I'm guessing maybe even better than normal?

Jim:

This is another really important facet. So let me differentiate between local effects of blood flow restriction training on the muscle that you're actually working and then what I'm calling a systemic effect which is this hormone release. And the hormone release goes everywhere. So any tissues that have been working or any tissues that have been injured are going to enjoy this anabolic hormonal milieu that's been created. So for example, let's take the example of a rotator cuff that's been damaged. Now, that rotator cuff and that arm will not tolerate normal levels of training, but your legs and the other arm are perfectly good to do all sorts of things.

Jim:

So the general concept in rehab with blood flow restriction training is to exercise as much the body's muscle as possible to get the biggest systemic effect and then lightly in a way that doesn't negatively influence the healing structures, do some exercise with them, the consequence is that number one, you stay fit in all your other structures and number two is you optimize the rate of healing for the injured part.

Dave:

So you might recover faster from doing this because of the systemic effects than if you had just done normal physical therapy or done nothing at all?

Jim:

Yeah, absolutely. So let me take-

Dave:

How much faster?

Jim:

Ballpark, you can say twice as fast.

Dave:

All right. So everyone listening to this, you have an injury, not healing very well. So then maybe you start doing blood flow restriction. Now, if you're a professional athlete, you can't do this, but if you're the rest of us, you could also inject BPC 157 peptide into the injured area and maybe you'd heal twice as fast from the peptide and twice as fast from the blood flow restriction and pretty soon your Wolverine.

Jim:

Right. Absolutely. I can share an example with you. We had one of our Nordic combined skiers ski jumping and cross-country skiing who fell on a jump four weeks before the Sochi Olympic Games. He fractured the upper part of his humerus or his upper arm bone and he tore his rotator cuff. He broke a couple ribs. Generally, this was a season-ending injury. It's season-ending for a couple reasons. One is under normal circumstances, he could do almost nothing to maintain his level of fitness and when you do nothing, you lose your fitness very quickly at an elite level.

Jim:

The other thing is that normally it would take... The numbers that doctors throw out, it is about 12 weeks to heal this kind of fracture and we said, "Well, that's not good enough." And the orthopod that we saw recommended that he go in and put a few screws in to fix his fracture, but that would necessarily take this athlete out of the Sochi Olympics. The athlete didn't like that answer and at the time we were able to try blood flow restriction training with him. The short story is in six weeks he ended up competing in the Sochi Olympics and doing as well as if he had never had the fraction.

Jim:

It was also kind of nice because it was his sixth Olympic game. He was 37 years old and he was elected flag bearer for the US. And just to annoy me, he carried the flag in his left arm which is the injured arm during the opening ceremonies. We were able to, number one, keep him fit while his shoulder got better and number two, we were able to heal his shoulder quicker than would be expected.

Dave:

What if someone has, say, anemia or at post chemotherapy or something like that where they aren't doing so well even if they're bedridden, can you still do this and get results?

Jim:

Absolutely. There's a study ongoing right now. Well, one of the things is that sarcopenia is associated with morbidity and mortality in people that need to get operated on.

Dave:

This means loss of muscle for people who don't have a medical work.

Jim:

If one is frail and has no muscle, then they don't tolerate big surgical procedures as well as the next guy. At UT Austin in Texas, they've started a study where they have patients that have some form of

abdominal cancer and they've had weight loss and are sarcopenic, and they do a six-week program of twice a week, B Strong training sessions. What they want to do is ultimately study whether or not this improves morbidity and mortality. But what we know already is that we can improve their strength as measured by hand grip strength. We can improve their lean body mass. We can improve their ability to get around.

Jim:

So we're pretty excited about those results. One of the big healthcare crises in Japan is for seniors to take care of themselves and the Japanese population is aging tremendously. They essentially don't have enough young people to take care of the old people. Dr. Sato and Kaatsu have gotten an award from the Japanese government where they take Kaatsu bands and they go into the homes of people that are essentially homebound and needs someone to come into the home to do activities or daily living, the clothes, et cetera, shopping, that sort of thing. Within three months, these people don't need that extra person to come to the house anymore.

Dave:

Wow.

Jim:

And this is from a self-esteem standpoint from use of resources standpoint. It's absolutely huge.

Dave:

That's a big thing. I'm kind of attracted to the idea of putting the B Strong bands on my arms and legs, standing at my desk on the Bulletproof whole body vibration plate, bending 20 minutes on a conference call, maybe do an occasional air squat for good measure.

Jim:

There you go.

Dave:

And maybe I'm holding plank for 30 seconds at the end and then just being done with it.

Jim:

You could do it now.

Dave:

I could do that and I'm going to be able to function though. Wow. I don't have any of the bands with me. I have some elastic things, but I don't have the puff up ones. I've ordered yours or I've asked my team to get yours because I recognize that yours are the ones I want. So I have some just cheapo ones meant for resistance, but you pay double for that. And I've done it with ice too. I have a vest burn machine downstairs which is not the same, but it provides whole body cooling at the same time, and only for cardio not for other muscle moving exercises. I kind of look at them as different.

Dave:

Plus it's a commercial-grade piece of gear. We have it at Upgrade Labs. I mean, you can't throw in your suitcase like you can in your bands. Your bands are very small. So I think there's those benefits to being cold while you increase organ circulation and there's benefits to being at your desk and just getting it done. So a lot of people listen to this. I mean they come from all over the place. It's a big show now, but I routinely hear from Wall Street traders, entrepreneurs, really busy executive types, Hollywood people, that's asking on the vibration plate because how would I double down on it. But if I just literally before a call just basically put these things on my arms and legs, took the call, maybe paced around the conference room table a bit, how much benefit am I going to get versus if I did a full training session?

Jim:

In 20 minutes, you can get more or less a full body workout and that's all you need on a daily basis. Essentially no special weight. You might have some hand grip things available. You can do calf raises.

Dave:

I like the digital hand grip.

Jim:

There you go.

Dave:

Promise, I max it out every time so I've got the heavy duty one. So hand grip training would be good. What else?

Jim:

Arm curls. I've got some five pound weight here, five pound dumbbells. That's great. And if you don't have those in a bottle, a liter water bottle is good in each arm. It's that level of lightweight that's necessary. You can do push-ups. You can do sit ups. You can do lunges. You can do hamstring curls on your back. Essentially any kind of calisthenic can be used to do those calf raises. We usually like to do them in three sets of 30 repetitions for each exercise. The idea there is that with essentially these 90 reps and these periods of rest, we end up exhausting the working muscles, energy stores and being able to create this metabolic crisis.

Jim:

It's pretty amazing. To tell you the truth, when I was first introduced to this, I was pretty darn skeptical. But then I tried it a few times and I started reading about it and I'm continually amazed at how dramatic the results can be in very short order.

Dave:

It seems like there's a variety of these hidden technologies where you do it precisely this way or you take advantage of some system that we didn't think about. There's another company that was just on looking at just cardio respiratory fitness and they were finding two 20 seconds high intensity intervals, works better than three. It's like a seven-minute workout three times a week, gets you the cardio results of much, much more work. Whoa, I grew up going if you don't do an hour of cardio a day, you're a bad person which means we're all bad people because what the heck.

Dave:

But how does this work, this being the blood flow restriction, the B Strong work, how does it compare for cardiovascular fitness versus you mentioned sarcopenia, you mentioned healing, you mentioned muscle gain? So am I going to see if VO2 max changes or I'm just going to get swole?

Jim:

Yeah, depending on the kind of training you do, you will see VO2 max changes. And I should say that the world's perspective on BFR has come from the weightlifting and bodybuilding community so that's where most of the work has been done. But the principles are the same for cycling, running, skiing all sorts of sports, soccer. And the key is creating this disturbance of homeostasis that releases a systemic response, and that's where you get... You mentioned VEGF early on. There's some good papers now showing one of them in medicine science sports and exercise. First author is Larkin and he showed that mRNA of VEGF, HIF1 alpha and a number of the nitric oxide synthase systems was up regulated by a BFR workout compared to control exercise.

Dave:

I would love it if you defined a VEGF and HIF1 alpha. Longtime listeners have heard me talk, probably more about HIF1 alpha, but I think a lot of people don't know what those are.

Jim:

I would say to the more layperson that what these are cytokines or hormones that are associated with building new and better blood vessels. Not only do you get stronger and bigger muscles from BFR, but you get more and better blood vessels. It's also exciting to think that these things can repair blood vessels because functionally these are entities or cytokines that help the endothelium which is the inner layer of arteries and capillaries and veins and is what is damaged by atherosclerosis. So if we can repair that damage, then we're talking about reducing heart attacks, stroke, a variety of other major killers of the population and make major things that cause aging. So it's very exciting. It's not just about building big muscles, it's about essentially upgrading all the systems that are involved in exercise.

Dave:

VEGF, and actually EPO are two hormones that are really interesting to me because when people are exposed to toxic mold, as I was, I did a documentary. By the way if you're listening to the show, and you have someone who says they have mold and they're acting crazy, watch moldymovie.com. It's free, my gift to you. But I interviewed a dozen experts on mold and a dozen people who'd experienced it and one of the tell-tale signs of both Lyme disease which is quite often misdiagnosed toxic mold and mold itself is low levels of VEGF and low levels of EPO.

Dave:

So I'm really intrigued to see what will happen if someone with chronic fatigue syndrome, which is another word for toxic mold exposure or Lyme disease 90% of the time, I kind of study these things because I was diagnosed with all of them, what happens if they put blood flow restriction things on and sit there while they're watching TV because they can't really do anything else? I know I've been there. Do they recover? Do you have any data on people who are just wrecked?

Jim:

We have some good stories. None of this has been characterized in a form of taking 20 people with chronic fatigue syndrome and putting half of them on a B Strong program and the other half just doing the exercises and seeing who gets better.

Dave:

You have exercise intolerance. You can't exercise when you have CFS. That's one of the problems.

Jim:

Well, you can even do little stuff like opening and shutting your hands probably.

Dave:

There you go, yeah.

Jim:

So you need to do some sort of motion but you can't just sit there. For example with quadriplegics, we can electrically stimulate muscle and they use blood flow restriction and still start getting the benefits.

Dave:

Whoa.

Jim:

So it's not just about let's say putting on tourniquets, it's about combining. It's impeding blood flow so that working muscle can't get the oxygen and energy supplies it needs to sustain the work. But that can be very, very little work. And for the 90-year-old who has trouble just getting around their apartment or their home, that's enough. One of the big things for seniors is getting up and out of a chair, put a set of leg bands on and try to get up and down from your chair. That's going to have a positive benefit. Getting back to your chronic fatigue syndrome or there's been a number of patients that have been dealt with and they express that they feel better and that they are more functional, but it's just kind of a good story. This has not been done in any kind of systematic scientific way.

Dave:

I can tell you there's probably a few thousand people listening who are recovering... There's probably a lot more than a couple thousand. Just by doing the math, there's a couple hundred thousand people listening. So there's probably 25 or 30,000 people now who are going, "I have that and I'd like to get better." So there's going to be some additional discussion on social media and all about what happens when you have one of these chronic fatigue things and you use this as a way to do it. I was fortunate that when I got taken out by toxic mold, I was able to spend a few hundred thousand dollars getting better. It shouldn't cost me that much, but you had to find all the stuff that didn't work and they didn't understand what was going on. But now we understand more, but still it's a 25 thousand dollar problem for most people and with your bands, what does the bands cost by the way?

Jim:

Our MSRP is 429.

Dave:

Okay. So under 500 bucks.

Jim:

For a full set.

Dave:

And then if that replaces a bunch of hormones that you would have had to take, they'd pay for themselves frankly in a month for a lot of people who were sick. Assuming it works. I was also really interested in the research that you've talked about on mitigating damage to the endothelium. One of the things that kills, I call them the big four killers in my anti-aging book, if you just look at the stats its cardiovascular stuff and the endothelium, the lining of the arteries is where the action is. What does the B strong system do for the endothelium?

Jim:

Well, the part that's been documented is that if you do a set of B Strong exercises like hand grips, arm curls, push-ups then calf raises, air squats and let's say hamstring things, just acutely and you do those with and without the B Strong bands in place. When you don't do them with the B Strong bands, you have almost no movement in mRNA for PGF, HIF alpha and nitric oxide. Synthase systems which was the control work but when you do them with the bands in place, you get very robust increases in mRNA released into the blood from these various things.

Jim:

So essentially they took a blood sample before and after these exercise sessions with and without the bands and showed that there was a much greater increase in mRNA for these various things when you did the work with the bands. The assumptions are that when you increase these things in a sustained way over time, this will improve your endothelium. And if you improve your endothelium as you were saying, it's kind of like Drano for heart disease.

Dave:

Incredible. So there's a lot of stuff here and I'm always intrigued at this idea.

Jim:

Let me show you one other thing.

Dave:

Yeah.

Jim:

We also have some preliminary data about metabolic syndrome which is being overweight, high cholesterol, high blood pressure and high blood sugar. It's kind of the American disease.

Dave:

It's what I had in my 20s.

Jim:

These people who had this syndrome were randomized to either an elastic BFR arm or to just doing the exercises themselves. And after three months, there was dramatic improvement in the group that did the BFR training and no real change in the group that didn't. In terms of hemoglobin A1C which is a marker for hyperglycemia, in the case of the resting blood pressure, in case of their lean body mass and subcutaneous fat, and in case of their lipid profile.

Dave:

Wow.

Jim:

So it's tremendously exciting.

Dave:

I'm going to be playing around with this for the next few months because what you're doing is more impactful than I realized. I've looked at Kaatsu for a long time. It hurts a lot and you have to go somewhere. It just doesn't meet my convenience factor even though it's cool stuff. What you've really made me think about is electrical stimulation. I've got some very high-end electrical stimulation gear behind me, so I don't see why I can't put the bands on, put my feet in a bucket of water with electrodes in it, and put the other electrodes up on my shoulders and then take a call.

Jim:

You have to be careful with the current on that kind of setup.

Dave:

Yeah. It's not plugged into the wall kind of. This is a clinical grade electrical stimulation system for recovery so it's not going to cause any damage. But that kind of thing, wow, and then whole body vibration.

Jim:

As you say the vibration plates, that's really good because when you're doing the vibration plates, you're actually activating a lot of postural muscles to kind of keep you upright on this thing and those muscles run out of their ATP and intercellular.

Dave:

They do.

Jim:

And so what happens is this just amplifies the whole thing.

Dave:

Wow. Bulletproof has made 30 Hertz vibration plate. We've been selling it for, I think about eight years now and it's one of things I don't talk about very often, but diehard Bulletproofers all have it because that alone, you see differences in a week standing on it for 10 minutes, but if you can put the bands on and stand on it, and you're getting an amplified results, I could do that. How long does it take to put the

bands on? I mean, normal elastic bands takes no time at all. So you're talking like five minutes, probably less than five minutes for the whole body.

Jim:

Here. I'm putting one on as we speak.

Dave:

If you guys watch this on YouTube, we'll put this part up, but it's basically just a little... It looks like a blood pressure cuff kind of but without all the dangly bits.

Jim:

I probably shouldn't have this big sweatshirt on, but basically you just put it in here.

Dave:

If you go to Amazon, you see a bunch of elastic stuff which is not related to what this is.

Jim:

Yeah, the elastic stuff or the non-inflatable stuff, we're good, is not controllable so...

Dave:

It's a little electric pump here that hooks up to it?

Jim:

This is just a manual thing and I'm good to go.

Dave:

Oh, wow. Now, hold it up just for a second, the manual pump. It's a little squeezy pump just like a blood pressure cuff.

Jim:

Yeah.

Dave:

Okay. And then a quick release thing. Now, it's on?

Jim:

Right. And it's on. I can do hand grip exercise or whatever. We also designed this so you can do any kind of other exercise. I can go swim with this. I can ski with it. I can play tennis, whatever.

Dave:

Wow. That's cool.

Jim:

You mentioned that Kaatsu is somewhat uncomfortable and that sort of thing and in some ways not that affordable and in other ways kind of complicated to use. One of the big things that we've tried to do is get the benefits of Kaatsu which is elastic, inflatable controllable BFR but with without the associated problems. You just throw these things on and stand on your vibration plate.

Dave:

I'm really interested in anything that's going to let us get more exercise or get the right amount of exercise in the minimal amount of time and minimal amount of inconvenience.

Jim:

Right. So another big thing is particularly pertinent for our athletes. Most of our athletes go over Europe to compete in World Cups and that sort of thing. At the ski team, they have really nice facilities and big weight racks and everything, but you can't put that in your suitcase. Our system weighs about two pounds all together and it goes in your carry-on. They can do workouts on the plane over to Europe and they can do workouts in their hotel rooms instead of having to find some sort of gym to maintain their strength and fitness.

Dave:

Wow.

Jim:

So it's very convenient. Another big application is that busy businessman that you talked about who's traveling all over the place and consistent exercise is out of the question or at least very hard to do, and here whether you do it first thing in the morning or before bed at night, you put in 20-30 minutes and you're good.

Dave:

I haven't asked you, as someone who has 40 years of experience after your education and all that stuff, you definitely have more experience than I do in life, how long do you think the average person alive today has the potential to live? And then I'm going to ask you, for you personally.

Jim:

I would put on my non-expert hat in this, but I'd throw out that we should be able to double it. And it's in terms of talking about the average life expectancy. And one big thing is cutting out all the negative things that we do to ourselves. The positive things are trying to eat right or responsibly and get regular exercise. Between those things, I think we can do a lot better than let's call it the average lifespan of 80 these days.

Dave:

And given your amazing access to technology and other lifestyle things, you're a doctor, you can pretty much get whatever interventions you want, what's a realistic number for you? I mean, you come from a different generation than me and you've had to live a different life. But I ask every guest on the show this.

Jim:

Well, I kind of hope to go on forever.

Dave:

There you go. There's nothing wrong with that answer. Me too. There you go.

Jim:

Another way of saying it is that my parents and three of my four grandparents, all made it into their 90's and that was, as you say, well before there are all the things that are available today for even me, let alone my kids and everything else. So there's a lot of room there. And one of the other things I'd add to that is it's one thing to live to 120, but one of the things that I'm kind of focused on these days is what I'm calling or what people have called health span where you want to be active, you want to be useful, you want to be not kind of groveling in your own saliva somewhere.

Dave:

Being alive isn't what we're talking about if you can't move and do your own power with a brain that works, without suffering through the day every day. I'm 100% with you. Part of me wants to erase that picture of aging. That's an unnatural deviation throughout most of history. I didn't get to do that and no one wanted me to do that. They'd push you over the cliff, feed you to the lions or you die in your sleep. We didn't do the bizarre stuff we do today so we're going to throw that out as our picture of being old.

Dave:

You're the old wise and able to help a lot of people, old curmudgeon testosterone deficient and enjoying your beer until it's the end of days. But that whole you know tubes, monitors, wheelchairs and all the other just unpleasant things, we're going to take those away because they're unnecessary with all we know today. I just believe that.

Jim:

Here's another semi-bizarre thought is most of the problems in the elderly are induced by gravity. So if we create a space colony in orbit, there's no problem moving around. You're weightless.

Dave:

See, that's the kind of thinking that gets us way beyond when people think is possible. I absolutely love that. Jim, thank you for being on Bulletproof Radio. Your website is B Strong as in just the letter bstrong.training and that's where the bands are available. I think there's real science to this tech. After 40 years of working with hundreds of Olympic athletes, you could pick any tech you wanted. You pick this one for a reason after you've had enough time to evaluate more than a few. So thank you for just going out there and doing something unusual that could save all of us a heck of a lot of time.

Jim:

Well, thank you very much. And my mission is to change the way the world exercises.

Dave:

All right. Well, you're doing it.

Jim:

Thank you so much.

Dave:

If you like today's episode, head on over to iTunes or wherever you listen to this show and leave a quick review. It's like leaving a tip at a restaurant or something for a podcaster or an author like me, tell me what I'm doing. If it's worth five or six or 10 however many stars they have on there these days, I'd appreciate that. And if you buy the B Strong gear, leave a review for that too wherever you leave reviews for that, probably on their website. I have no deal with them. I haven't actually ordered it yet. I'm pretty excited about it, but I wanted to learn from the inventor before I placed my order. I am going to get it and give it a shot because I think the science is strong enough and you guys have heard me test all kinds of other stuff so that's how I roll. Have a wonderful day.