

Speaker 1: Bulletproof Radio, a state of high performance.

Dave: You're going to love today's episode, because we go deep so to speak on something called hyperbaric oxygen therapy. This is something that has such a broad applicability to almost anything that you might want to do. Like be more resilient, perform better, recover faster or recover from almost any disease you can think of, where there's a short-term or long-term. There's a potential for this stuff to help.

I'm interviewing one of the world's top medical professionals, who's spent his career working on this and written some books about it. There's a lot of stuff you could do to help yourself, help the people around you. You'll just find nuggets sprinkled throughout, enjoy the show, and listen through all the way to the end to get the good stuff.

You're listening to Bulletproof Radio with Dave Asprey. Today's cool fact of the day is that, get this, there's no diet that works for everyone, and now there's science to back it up. Weight gain or loss can depend on how your genes react to a certain diet, at least if you're a lab mouse. For certain strains of mice that they tested, they found that four different diets worked really well. The problem is that, one kind of mouse was impervious to dietary changes, another's blood sugar shot up on every day they could find except a typical Japanese diet.

The results of this back up recent evidence, that your response to foods might change based on your genetic makeup, and this wasn't in the study. I can tell you right now, your mitochondrial genetic makeup, which is basically the plans for how your energy production systems in the body are made, it's different than the stuff about how your hardware's made. Like your eye color, your bones, your height, stuff like that.

The thing that's responsible for taking food and air and making energy out of that, that part of you may be more or less responsive to certain foods, and that's okay. The same algorithm works. Do more of what makes you strong, stop doing the stuff that makes you weak and don't eat toxins, is generally good algorithm for whatever diet you end up working with. Those are the tenets behind the Bulletproof diet.

All right. If you've not heard of the Bulletproof performance kits, now whether you're new to the show or new to Bulletproof and just looking to try some of the foundational products for upgrading yourself, or you have specific goals, there are now a dozen specialized kits you can choose from. Like around coffee, brain function, detox function and things like that, head on over to Bulletproof.com and check out the ability to pick a kit to do what you want it to do, so that you get the right supplements, the right food and right everything else.

Today's guest is Dr. Paul Harch. We're going to talk about something that's all around you today, which is oxygen. How you can pressurize it to treat a whole host of things like making your brain work better, wounds treatment. I wanted to interview Dr. Harch, because he leads the University Medical Center hyperbaric medicine department.

He's a clinical professor of medicine in New Orleans, a graduate of John Hopkins University School of Medicine, which is a very well respected school. He comes from UC Irvine and has looked very heavily what happens when our bodies use oxygen. He's looked at central nervous system, wound healing, autistic kids, brain injured divers, boxers, people with PTSD. He's presented the research seven times US Congress, been nominated for the NIH Directors Pioneer Award.

In short to summarize all this stuff, he's total oxygen bad ass. Paul, welcome to the show.

Paul: Thank you very much, pleasure to be on.

Dave: First up, and I love to ask people when they come on the show, you've had a really, a successful career, taking something that's been in the corner of medicine, this hyperbaric stuff. Really just digging in and doing this, but why are you so focused in this area? What gets you up in the morning about oxygen therapy?

Paul: It changed my life, and specifically the powerful results I saw clinically with patients in the way it changed their lives, just left me no choice. I couldn't walk away from it. You go through life, and you watch pitchers come across the plate, and when this finally came, it was so powerful that I had to take a swing, and I did. It's been very rewarding.

Dave: What happened with you and oxygen?

Paul: Well, I was pretty disillusioned in medicine. I was nine years out of medical school, and didn't like what I was doing, didn't like just the whole scope of allopathic medicine. I got interested in the commercial and sports scuba divers down here in the Gulf of Mexico, who were coming in with decompression sickness.

People don't realize it, but it affects the brain. It's not talked about a lot for a lot of reasons, but I became interested in their neurological handicap if you will. Specifically that our results were nowhere near as good as the navies. Navy says 90% cure first treatment, you're done. We were getting about 40%, and you had to retreat them, and they'd have significant residual.

The more I looked at it, it was a simple problem. We didn't have a chamber on site like the navy, we weren't treating immediately. They had to get in from the Gulf of Mexico by boat, by land. The discovery we made was, if we used a different dose of hyperbaric oxygen, lower pressure, lower oxygen, we could treat these guys and women, months to years afterward. There were some very unbelievable cases that changed my life.

People in the midst of committing homicides or attempted people jailed with fake psychiatric conditions turned out it was brain decompression sickness. I saw this therapy, and what I was doing with it completely turned their lives around, and that's what got me started.

Dave: That's pretty powerful. You came across this and just dove in. One of the ...

Paul: Well, literally.

Dave: Right, hyperbaric dive, see what I did there?

Paul: Yes.

Dave: It wasn't on purpose. I had another guest on this show talking about traumatic brain injury, who had a real similar story. He came back from a brain injury as a veteran, and just caught himself at a restaurant beating the crap out of a punk kid, who frankly probably deserved it. Just was like, "Wait, this isn't me, what's going on here?" He found out it was from a brain injury, and went around, "How do I fix that?"

I'm very interested in hyperbaric, because my dad has been having blood flow issues in his brain. I actually gave him my hyperbaric chamber, and he's like, "I haven't felt this good in years, like this is amazing." My wife recently hit her head and got a mild concussion, so she's been doing hyperbaric on a regular basis and I've had a chamber for a few years.

People listening to this like, didn't Michael Jackson sleep in a hyperbaric chamber? When people have a brain injury or they have a life like Michael Jackson where you travel all the time and who knows what you put on your hair that's full of toxins, but it's probably not good, how frequently should people be using this? Is it just for these brain injury people? Or just for people if you high exposure, high travel? Or is it something that you might do at the beauty salon kind of thing?

Paul: Very much so, you might do it for just normal aging and beauty salon, I mean that's a trigger right there. Walk into a beauty salon and smell the chemicals. As a kid, my mom, we'd have to go to the beauty salon with her. I couldn't stand to be in there. The toxic environment is just overwhelming. If you look at some of these hairdressers, they go on to develop neurological syndromes from this constant chemical exposure, so that's not a good example, but yes.

For if we look at what normal aging is, which is a DNA based process, and we now know how hyperbaric oxygen works, which is through gene expression and suppression, it makes all the sense in the world. That this can be done as an ongoing process, not only to combat our every day toxins, wounding, exposures and so on, but just potentially the process of aging.

Dave: Everyone listening to this does not want to get old. I guess we all want to get old as in terms of the not dying thing, but none of us want the diseases of aging that are associated with getting old. How often should a person be considering doing hyperbaric dive if they want to feel really good when they're old?

Paul: That question's not answerable yet.

Dave: Damn.

Paul: Yeah, but it's more age dependent. It depends on kind of like what's in your wallet, I mean what you've accumulated over the years. In terms of ongoing insults. The 25 year old guy who's been in contact sports all his life has had five concussions, this guy should have been doing it a long time ago.

For the average person, let's say the healthy young person who's got no cerebral insults if you will, I don't know if that's possible by the time you're 30. It's something that you would do maybe once a month, and it depends on how you feel from it. It'll bounce you up to a level where you will feel better, and you will sense that, and you can maintain that. When you drift off, your body tells you, you could accept more.

It's individually determined, just like you were talking about with the mice and diets. It's the whole secret of medicine today, personalized medicine.

Dave: How do you know if you're getting too much hyperbaric oxygen?

Paul: There are a lot of symptoms you can develop, but essentially you go backward. You start re-accumulating or expressing the neurological symptoms that you had before and the complaints. If you look at oxygen overdosing and toxicity, the constellation of symptoms is unbelievable. It can be all the way from severe fatigue to euphoria, hyperactivity, headaches, dizziness, visual sense, virtually any abnormality manifest as a nervous system symptom, a wide range.

Dave: We have this really interesting therapy that's good for everyone. It's really good for people with toxicity, chronic illness, degenerative diseases or brain injuries. If you do too much of it, you can have, I'm just going to call them wacky symptoms, because it's tough when there isn't a clustering of things like that. If you don't do enough of it, you can have the same wacky symptoms, right?

Paul: Well true, but it's kind of the basis of what you're doing also with Bulletproof. You're trying to get people to tune into their bodies, and how they feel, their symptoms. You have to turn yourself inward to do that. Once you're tuned in, you can now fine tune yourself to that plateau, and even rise from there. That's the same thing we're doing with hyperbaric oxygen.

Dave: Okay.

Paul: Oxy gene therapy.

Dave: All right, so then we're talking about how I'm I doing right now, which is the most important skill any of us can have, which is just noticing that and saying, "What did I do to cause that? Should I do more or less of that?" That's been kind of the core recipe for me on my path of being Bulletproof was just, even when I started this in the 90s, I just note that I was feeling really crappy or really good.

I'd make a note in the corner of my lab notebook that I was using for work. Just have a running thing, like what's going on now? What's going on now? What's going on now?

Until I'm like, oh, there's a signal in this. With hyperbaric treatment, so I try it once a week, I feel great. I try it every night, maybe I don't feel great. What about sleeping in a hyperbaric chamber, is that a good plan?

Paul: I don't think so.

Dave: Okay.

Paul: Nobody knows for sure, but one of the things, and you got on a little bit earlier about too much in overdosing. If we go back to the 1870s when Presley discovered oxygen or characterized it, I think he was the second discoverer. What he talked about was, the use of this if done too much, can burn the candle, essentially at both ends. The animal powers that it invests you with, can die out too soon.

Yeah, there's an over use, and the key to this is doing it intermittently. For instance, if you have a 911, well, I'm older than you. Let's say I had a 911 incident right now. I plop over and EMS comes out, and they try to resuscitate me and they slap me on a face mask of oxygen, they slap it on me and take me to the hospital. What used to be done is people are kept on oxygen for half a day, a day at a time, even longer. You will not get any of the same effects you get with hyperbaric oxygen.

The reason is, you have to stimulate and withdraw, so it's the intermittency of it. When you stay for long periods of time IE, sleeping overnight, it does not appear that you get that same result. There's not good data on that. I know Michael Jackson, it was publicized that supposedly he slept in it, and some of the professional athletes. I really don't think it's getting on the benefit that they can get if they just did it intermittently.

Dave: There's kind of two forms of hyperbaric treatment. One is, just pressure and the other one is, pressure plus breathing oxygen or pressure with oxygenated air. What happens if you're just playing with pressure on the body? I have a piece of gear at Bulletproof labs in Santa Monica in one of my house that lets me decrease pressure on the body, to go up to 22,000 feet elevation. Then come down to sea level and sort of rapidly cycle through different pressure things, which triggers nitric oxide and all.

That's removing and then re-adding pressure. What you're talking about is adding pressure right, and then removing it. What happens when you just do pressure without oxygen?

Paul: It's almost impossible to do that. The only way you can do it is in very carefully controlled lab experiments. What you're talking about, it's all on the same continuum, but I'm going to take it to the pressure side for a second. When you pressurized someone even with air, you are increasing the pressure of oxygen and that is bioactive.

You can't do the two separate from each other. Similarly, when you get into your altitude device and expose yourself to low altitude, you are also stressing your body with a low oxygen exposure. It's the combination of those things in either direction, that has been shown to activate and suppress genes.

Dave: Basically, whenever you compress air that contains whatever, 17%, 20% oxygen, when you compress that you're getting more oxygen per cubic centimeter, just because there's more air per cubic centimeter. You can also-

Paul: Exactly.

Dave: ... go into a chamber and then breathe pure oxygen on top of that, which has an amplified effect.

Paul: Right.

Dave: What if you don't breathe pure oxygen, what if you're just under compressed air, is that enough? Or should we all be breathing oxygen when we go into these crazy devices, so we can live to 180?

Paul: Well, again, it's all along a continuum and it's a matter of finding out what dose is best for you and your brain. Yes, there is unequivocal benefit to using compressed air, but not everybody responds to it. The idea is to try to dose that to your injury, your genetics, your anatomy, everything that's you.

Dave: You've talked a couple times around modifying genes.

Paul: Yes.

Dave: What does manipulating pressure of air do for gene modification? That sounds, I believe it just because we know your genes respond to the environment around you, but what evidence do you have? How does that work?

Paul: There's all sorts of evidence, and it doesn't actually modify the gene, it modifies the expression of the gene. The genes, we were taught in medical school, you just sat there until you had to reproduce. I mean once you were developed, it was all done, but in fact, I mean it is constant. Your chromosomes are being read, the genes transcribed and then translated to proteins.

It turns out we've got I think 19,000 protein coding genes. What's been shown is a single hyperbaric oxygen exposure to two point four atmospheres for our 60 minutes, turns on or turns off up to 8,101 of those. 40% of all of our protein coded genes can be turned on with a single limited hyperbaric oxygen treatment. What they've shown is the largest clusters of those turned on genes, are the growth and repair hormone genes, the anti-inflammatory genes, you're going to love that. The largest clusters of the turned off genes are the pro-inflammatory genes and the ones they code for programmed cell death.

Every time you go in a hyperbaric chamber, even with air or with oxygen, supplement it. You are stimulating growth of tissue, inhibiting inflammation and turning off cell death, to varying degrees depending on the pressure and the oxygen, because the gene sets are different with different pressures in oxygen. There's a mouthful.

Dave: That is a mouthful and it definitely change your gene expression. You can do it with diet, with temperature, you mentioned earlier hypoxia. I actually do intermittent hypoxic training and wrote about that in Head Strong, where I breath air with no oxygen for a little while exercising, which is not a fun experience. Then I'll breath pure oxygen.

You can feel the difference when you're playing with these gases in the blood. Everyone listening is like, "Okay, is this some other crazy bio hack I have to do?" I'm going to ask you like a real man in the street question. You have 150 bucks, you can get a massage, or you can do a hyperbaric treatment. Which one do you do?

Paul: Depends on whether you're ill or not. If you're not, and you don't have a problem, I'd go get a massage.

Dave: Okay.

Paul: You have to answer the question, what I'm I treating? If you're a young 30 year old person, healthy, active, eating a good diet, everything's going well for you, I don't think hyperbaric therapy of any type is necessary. If you've got something wrong that has caused some wounding to your body or central nervous system, you're going to need a block of 35 to 40 hyperbaric treatments, to try to repair that injury.

From there, you can then look at intermittency. For the average aging person, I'd wait until you get to the point where you're not feeling good, or you're starting to question. I'm not up to my, the way I used to be and that's the time I'd start intervening, but it won't be just one treatment.

Dave: You don't look at this as a preventative therapy, more as you need to have something wrong to really get the benefits?

Paul: No, I do, but in a preventive way, you're still going to have to do it in a maintenance fashion. Meaning, going in and getting a massage or a hyperbaric treatment today, and then coming back six months from now and trying another, you're not going to get any sustained benefit from that. It's something that, I mean, it's kind of like your Bulletproof diet in a way, but you don't have to do it quite as frequently. I mean that's a daily thing.

Dave: Got it. I definitely would say 48% of people under age 40 have early onset mitochondrial dysfunction according to some of the research in Head Strong. If one in two of us have a problem with the parts of our body that use oxygen and food to make energy, is hyperbaric going to be appropriate for that half of people under 40?

Paul: Yes.

Dave: Okay, got it. There's a case already even if you don't have blatant symptoms, but if you're not kicking ass and feeling great, then maybe is worth a try. If you feel amazing after the first treatment, that's a sign you maybe want to do more?

Paul: Exactly, but you've got to answer your question of why you're not feeling great. As you identify in your book, there's a wide range of insults that are assaulting your body every single day. From the air you breathe, what we ingest, the water we drink, the electronics, everything, and some people are more sensitive to that, just like they are to medications, the mouse diets et cetera.

If you're not feeling well, there's a cause. If it has involved wounding in some way, which the result of is the inflammatory reaction, then most definitely this therapy is for you.

Dave: Got it. This is a therapy that very few people have tried, and most people have heard of hyperbaric, but they don't really have a clue for it. You mention this magic number of 35 to 40 when Daniel Amen looked at my brain scan, he was like, "You should get 40 of these things." That's what I told my dad, just based on the abundance of evidence that something was going on.

Recently, a friend of mine who runs a large private jet company reached out and was like, "Dave, I think I have Lyme disease, something's not right," and got his lab data back. He actually had lots of shockingly exposure to chemicals and some other stuff going on, including a toxic mold exposure. Same thing, I'm like, "Do 40 hyperbaric treatments."

He just called me this week after eight of them. He's like, "Dave, I got my life back. My brain is working again. I'm over the hump. I've been struggling for almost a year and all of a sudden I feel better." To know that, that's available is cool. I got to ask you though and you may have an answer to this, when the average person, the average city says, "I want a hyperbaric treatment, do you know how much it costs? Something you're not at a hospital when you do it?"

Paul: In the private sector freestanding facilities, it's anywhere from \$150 to \$350. Generally, it's around the \$250 range, but it somewhat depends on the type of chambers people have. Usually if you've got the hard shell chambers that weigh 1,000 pounds or so, costs \$100,000 to \$150,000, you're going to pay a little bit more.

If you've got, we call them the portable Ziploc baggies, but the portable chambers soft sided, they are \$20,000 brand new or so. They usually charge much less.

Dave: Those are for clinical grade ones. I did the math when I first looked at this, and you can buy somewhat sketchy home units that go up to about one point three to one point five atmospheres for about \$5,000 coming from China. Whether they have BK in them, I have no idea, and you get up to the sort of prosumer level, you can spend \$8,000 to \$15,000 dollars.

When you look at that, okay, I need 40 sessions, that are going to cost me 200, like the breakeven's about they're. I often recommend to people who have it within their means is, buy a \$10,000 or \$15,000 chamber. Use it until you're done and then sell it on the used market, because they don't depreciate that much, so you can actually save money. More importantly, you can go in there, after work or before you go to bed, and the

accessibility to do 40 treatments doesn't require that you drive to a facility 40 times. Is that good advice or are people going to like cook themselves at home?

Paul: No, no, they won't. That is good advice. There's a little more nuance to it, but yes. The other thing about it is, that if you buy it on the used market, you don't need a doctor prescription for it. You get a new one, you need a doctor prescription. It's an FDA doctor prescription device.

You touched on something else there that I also wanted to mention, which is where this could be used for anybody, is in performance recovery.

Dave: Yes.

Paul: If you are out and doing a very vigorous exercise, you are going to have some degree of anaerobic metabolism. You will build up oxygen debt. This, especially the oxygen component of it, can literally erase that oxygen debt, but you need more the oxygen part of it. Just compressed air isn't going to quite do that. It can help, but it's only going to give you about a 28%, 30% increase.

Dave: Then, if someone's going to do a really heavy workout, or they just finished an iron man or a triathlon or even just have a weekend workout. If you're going to wake up the next morning with sore muscles, is it just a good idea to just hop on in if you've got one in your living room?

Paul: Ideally, you'd like to go in right after your workout, because that's when your oxygen debt is maximal. You can treat the breakdown metabolic products before they are in the tissue and cause their reaction, if you can say. The achiness and soreness of the next morning. Even if you did it the next morning, it's still going to help.

Dave: Are you still going to build muscle and put on the mass or get the aerobic, cardiac adaptation, if as soon as you exercise you hit it with a ton of oxygen?

Paul: It's not a ton, but I mean we're not going to the levels that we're usually doing in the hospitals. It's actually an intermediate level. The answer to that is not completely known. I can only tell you that from people who are using for performance recovery, they are not seeing a decrement in performance. In fact, this is allowing them to function at a higher level and in a sustained way.

Dave: There are a lot of pro athletes who listen to Bulletproof Radio. I've heard from a whole bunch of NFL teams, who have gone Bulletproof and reached out. They could potentially use this. There's a lot of other people from a variety of sports, they can use this after sports, but especially in something like football, where you hit your head a lot, should you be in hyperbaric before you go out on the field or just after?

Paul: If you go and use it before you go out on the field, it can actually have an exhausting effect on you. In other words, it's going to, it potentially can energy deplete you a little

bit. The best example of this, if you go to Sports Illustrated in '95, I think the summer issue of August, they had the story the Vancouver Canucks.

They started using hyperbaric oxygen that season for injuries. They ended up with the least lost ice time of any NHL team that year for injuries. They were back on the ice playing, performing. Next year they thought, wow, this will be good for performance. They started using it that way, with workouts, after workouts, but it was indiscriminate, and they didn't have the same effect.

If you read my book, I talk about Bill Romanowski. Bill Romanowski in 2001 was exhausted, and he's allowed me to talk about this. He's been on the radio about it multiple times. He called up, and you know he was using many different things for performance enhancement, but he was on to a lot of the metabolic stuff and the workout and the diet long before anybody was. The NDA had some other things.

The point was, halfway through that season in Denver, he was so exhausted, he didn't think he could finish. He called them and he said, "I'm using the hyperbaric oxygen and what's wrong here?" He was using it before his workouts and thinking that this is going to enhance performance. What it did, it just exhausted him.

I turned it around and I said, "You need to do this after your injury, which is right after that Sunday game or after injuries in practice." Well, he went on to play the rest of that season, played I think another one there. Got traded to San Francisco and then to Oakland. He finally had that tearful retirement.

The reason was, he couldn't get hyperbaric oxygen in the Bay Area once he got transferred. The concussions caught up to him and then that was it. The point was, it didn't work for performance enhancement in the way that you were thinking about it. It's for recovery after performance and injuries.

Dave: I could hug you for saying that. The number one performance enhancer is a recovery. I see this ...

Paul: That's the next Skype. The next Skype thing is to hug you and doing it.

Dave: Skype hug, right.

Paul: Yeah.

Dave: Sort of emoticon. This is something ... I've worked with a good number of CEOs or hedge fund manager types. They're like, "I'm on top of the world. I control a billion dollars, and I have this massive company, and I'm going to do the [inaudible 00:27:27] iron man, naked, backwards. I'm going to fly all over the world in my jet."

You're like, "You know what's going to happen is, you're going to hate your life, because you're over training given all the other things in your life. Then, like let me see, how's your sleep?" "Oh I don't really sleep anymore." "How's your sex life?" "What sex life?"

You're like, "Well, you have symptoms of over training, so recovering better might matter," which is awesome that you just said that, given your medical background and all. Thank you.

Paul: My pleasure.

Dave: The other thing that you bring up here, that's missing from our conversation around bio hacking in general, is that, what to do when really matters. To help solve that problem at Bulletproof labs here in Santa Monica, we have a whole bunch of these technologies that enhance recovery or enhance performance.

We've developed protocols based on our understanding of the mechanisms of action, and say, all right, what do we think we should do when? We're taking the data and then feeding it through a machine learning algorithms. We'll get to the point where we can measure where you are, look at where you want to go and then basically recommend do this and do this, but don't do that. If you want some other result, do this other thing.

I think this is like the very cutting edge of bio hacking. We're starting to think, based on that data and just based on the Nobel Prize this year, there's a circadian rhythm to almost everything. Like yesterday, I just saw a study, there's a circadian rhythm in red blood cells that's served by potassium not by mitochondrial genetics. No one ever noticed that and there's one for magnesium.

Paul: Right.

Dave: Is there a circadian rhythm in the body for oxygen? Should we do hyperbaric in the morning? Should we do it at night? What works best?

Paul: Don't know. It's a great question, but yes, our entire body sleep cycle, everything is rhythmic and happens in spurts and cycles and so on. There may be a better time to do this, but it hasn't been explored. You've got to realize, this therapy started in 1662. What I'm telling you about oxy gene therapy or the effects of pressure and oxygen on gene expression with hyperbaric, has just been known now for eight years.

I'm serious, we are in the infancy and what I didn't tell you is, what they've shown is that, the effects of pressure more have the effects of suppression of gene expression, where the oxygen expresses the genes. As you go higher, the overall numbers of genes decrease. What they've shown is, there are different pressures, different oxygen levels and you're active fading different gene sets.

We are just in the infancy of finding out how to modulate this, let alone time it, with respect to circadian rhythms. It's now been mainly for injury, preconditioning and so on, well really early.

Dave: How did they do this in 1662?

Paul: It was just a pressurized chamber with pressurized air. A little belt, it was an enclosed apparatus called the domicilium and they pressurized it with a little bellows device. He could also depressurize it by just changing the valving, so it was a hypobaric and hyperbaric chamber.

Dave: You fast forward like 300 and something years and I've basically got a similar setup downstairs, but instead of having a servant pump the bellows, I have a turbine.

Paul: Exactly.

Dave: Yet the more things change, the more they stay the same. I thought it was cool for a while till this interview, but now I'm just, I'm antique. All right, just a random question, do you have an antique version of one of those in your office?

Paul: No, I don't.

Dave: You would if you could, right?

Paul: That's exactly right.

Dave: There are probably aren't any surviving ones, would be my guess.

Paul: No.

Dave: One thing I didn't mention and I should have mentioned in your introduction is, that your book is called 'The Oxygen Revolution'. It's relatively technical, but you go through hyperbaric oxygen as epigenetic gene therapy and what you think it's going to do for our nervous systems and for medicine.

For bio hackers, medical professionals and just interested people who don't mind getting a little technical, it's a really powerful look at what really is happening inside your body. I enjoyed your book and you mentioned it, I just didn't mention the title of the intro.

Paul: Well, thanks.

Dave: 'The Oxygen Revolution' is where you can get to learn more about your book. It's fascinating that given the medical background and a genetic twist, you're looking at this stuff. How does genetic expression change in something like traumatic brain injury or PTSD? Have you looked at that and what the changes of those genes would be like with oxygen?

Paul: I haven't.

Dave: Okay.

Paul: We're right at the initiation point for that. I mean there is a lot of work on gene expression after traumatic brain injury. What I've looked at, is from the standpoint of a wounding process. As you probably know our brain is composed primarily of gray matter and white matter, gray matter where the neurons are the densest and the white matter is all the cable connecting track.

Almost all of the injury, at least in mild traumatic brain injury, is to the connecting tracks, the cable, which is, as you well know 63% fat or so myelin and very fragile. They're long tracks, just like fiber optic glass table. When the brain is shaken, the torque effects break those and damage them. Those are the microscopic wounds of traumatic brain injury, such that what you end up with is decreased bandwidth. Those are the targets, those little wounds of hyperbaric oxygen.

It turns out and we haven't published the study yet, we've got the data, I shouldn't pre-announce it, but we did a study on a major college football team. What we have found is that, various genetic markers are given off with concussion, that are markers of acute concussion. That recede as the patient recovers from it.

Our next step is going to be to look at hyperbaric oxygen effects on that. I've already treated the patients, we've done this for 30 years, acute concussion, subacute, chronic, severe, doesn't matter, all traumatic brain injuries, severalties and phases. This is the most effective therapy for it and it's dramatic.

Dave: Assuming that these lab tests become available and affordable, then people who ... By the way, 90% of us I would say as adults probably have traumatic brain injury. At 40 years of sense and neurofeedback facility that I started from more executive cognitive increasing stuff, we just see this over and over.

You can see it in the 24 channel EEG pattern, and these are highly functioning adults, who are running companies or actors or whatever. It's not that they're broken, it's just that there's capacity that their brain routed around. You can train the brain to do that, but if you got injured 10 years ago, are these markers still going to be somewhat elevated, or is declining?

Paul: Potentially.

Dave: Wow.

Paul: Potentially. Likely different markers. There are acute phase, there are the subacute phase, and there are chronic marker. What's happening is, that at, just like the inflammatory reaction, at all phases of the inflammatory reaction, there is different gene expression re-modeling. It can go on for years, so you can measure different things all the way along.

The original injury you can not completely get rid of, and this was shown in 1980 by a neuro psychologist, who took college students. One group who had, had mild traumatic

brain injury, two to three years before. Been knocked out unconscious, definition, mild TBI awakened and two to three years later completely asymptomatic, top of their game.

They matched them to a controlled group, never had a concussion. Tested them with cognitive testing, the two were identical. Took them in an altitude chamber to 11,800 feet, retested them. The ones with the previous concussion showed a 10% to 15% reduction in performance. What it told you is, they had lost reserve capacity.

The injury was partially still there, they'd accommodated it, but you could bring it out during stress. Just take that to where it needs to go. Sleep deprivation, overuse, exhaustion, chemical effects, drug effects, lower altitude, you name it.

Dave: This is a core resilience play, which is really cool.

Paul: Yes.

Dave: Wow, okay. That's really powerful. Does this mean that if someone has a really hard time going to altitude, that it's a possible indicator of either a brain injury or a mitochondrial disorder?

Paul: Unquestionably. What you're doing is a stress test on them. Like we do with cardiac stress test, altitude is a hypoxia and low pressure stress test for the body and brain. Many of these brain injured people, in fact, I'm sorry.

Dave: No, keep going, this is great yeah.

Paul: I'm getting carried away, but, all right, if you go back to the advent or initiation of hyperbaric therapy in the United States, it was in 1918, Spanish flu epidemic. Dr. Orville Cunningham from University of Kansas City Medical School, was in Colorado over the great Gorge. He was just thinking down and thinking how at altitude, people with neurological syndromes and flu and so on, did much worse. What would happen he thought, if we increased the pressure, that is what started the application in the Spanish flu epidemic. It was just pressurized air.

The whole point is that, with low altitude and hypoxia, neurological disease does not do well. Many of my patients can tell you that, sea level they go to altitude in Denver, Colorado, they come back and they say, "Wow, that wasn't a very good trip."

Dave: I went through this as I was recovering from my own chemical induced brain damage. This was toxic mold chemicals and a bunch other stuff. I used to not handle altitude that well, but I like altitude mountaineering. I did some climbing in the Andes, it was really hard. You feel like death.

When I was in the Himalayas in 2004, I was somewhat recovered, but I was still feeling wrecked at 18,000 feet. That was when I had my first yak butter tea, that was the genesis for the Bulletproof coffee idea. Five minutes after I drank it, I'm like, what just happened? I feel great. I feel like myself again. I understand now there's some

mitochondrial stuff around what's going on in the water and there's all sorts of potential mechanisms.

Since then, I've looked at okay, what brings me back. I'm very resilient at altitude, because I train for that stuff now. What brings other people back, ketosis and I've had a bunch of people tell me they take keto prime, which is the last step of making ATP before you recycle food. They do a relatively high dose of that at altitude and like within a few minutes, oh I feel like myself again.

When I'm on airplanes, I do that or if I'm feeling altitude and I'm at a high city exercising or something, I notice I can enhance it temporarily. Is there a reason you might consider taking mitochondrion enhancers before you hop into hyperbaric oxygen? Or should you use those in place of it?

Paul: Possibly, but I don't know that anybody has done it. It just adds another variable. You said, when people come to see me I try to do one variable, which is hyperbaric oxygen to keep everything else the same until we find out how this affects them. If you did something like that, well if you charged at the mitochondria and we know that part of the activity of this is at the mitochondrial level. In fact, you just pulled, I just turned to write a little note to myself as you were mentioning the mitochondria and your chemical experience.

In fact, hyperbaric oxygen, there are studies showing that it is active at the mitochondrial DNA level as well. If you know, the oxygen level in the mitochondria is zero to one millimeters of mercury, now you can imagine what even a little more can do. Yes, I'm supposed by adding some octane fuel enhancer like you're talking about with keto prime or something else beforehand may really juice it up, and actually change the dose of hyperbaric oxygen that you would need. Maybe you'd need a lesser dose.

Dave: Oh how cool. I don't know that I have a good data to know whether I got the right dose yet, but next time I hop in the chamber, I'm going to take a full stack and see if I grow new arms or some sort of red kryptonite thing, that'd be fun. All right.

All this room for experimentation, I'm frustrated because it takes a long time to do clinical studies, but I'm hopeful that, what we can do with machine learning and essentially enough people report enough experiences, we can probably get a signal from the noise without having to go down all these clinical pathways. Which then generates enough signal to justify a clinical study, where we spend tens of thousands of dollars or hundreds of thousands of dollars to figure out, should you eat your spinach before you do hyperbaric, because it might matter, but we just don't know.

Paul: Well, unquestionably. In fact, what we're doing right now in all of the social media and so on, if you look 1998 I wrote a book chapter in the very last part of it was, that this all needed to be on the internet. That this would facilitate worldwide dissemination of information that has previously been locked up in cloistered in doctor libraries and medical libraries.

Now look what's happening, maybe you've seen with that drowned child I treated last summer. It is all over social media, the families that are putting the information together on what works, what doesn't work, the problems these children, it just amplifies the dissemination of it. To where now you can pull this information and get signal above noise, much easier.

Dave: If someone had a non-specified brain injury or like something happened, I had a surgical procedure or I got in a car accident. Or in other words, I don't really know what's going on, but something, I got a virus, something happened, I don't really know the full diagnosis. Is it a good idea to say, "You know, maybe you should hop in a hyperbaric chamber and see if you feel better," just without knowing, which is kind of the stuff that goes on social media. "Hey, try this if you're feeling like crap," and nothing seems to work. Or would you maybe reserve that as there's more risk than reward for that?

Paul: No, depending on dose and pressure in oxygen and so on, that isn't an unreasonable approach. In fact, it is reasonable. Now, that is the basis upon which hyperbaric oxygen was criticized for literally centuries now. People didn't understand how it worked and as people started using it for more and more things and people stop and say, "Wow, this helped me," and benefited, the lack of explanation by the scientific community was the downfall.

In fact, if you look at this, we answered your question for a full 10 years. From 1989 to 1999, we did a 10 year study, where we looked at any brain based neurological condition regardless of diagnosis. Many of them, they were uncertain of the diagnosis, and we indexed it to the functional brain imaging. All we wanted to know was, is this hyperbaric therapy acting like a generic drug for repair of brain wounding. That's what we test.

In fact, we didn't know for certain what many of those diseases were or how they manifest. Lo and behold, it worked for quite a few of them. Your approach and your idea is not unreasonable.

Dave: Wow! All right, that blows my mind. It's certainly something that I would consider along with a bunch of the other bio hacks. We don't really know what's going on, but it's probably foundational with energy metabolism. Hyperbaric oxygen is one of the many ways of attacking that system.

Now, what about other things you can do while you're in there? I've definitely used like light sound goggles and I've actually rigged up a system to let me do red light therapy with a variety of different devices and wavelengths, infrared as well inside the hyperbaric. Do you think that there might be a basis for using some of these other simulators of mitochondria, while you're under pressure?

Paul: Most definitely. It's just nobody's really tested it and it's hard to get good information and good data on it. The only thing you've got to be careful of, we've got to really address this, is the whole safety issue. If you're using oxygen from a concentrator by mask or nasal cannula, there's usually not much leak.

Fire hazard with oxygen, especially under pressure starts accelerating at 23 and a half percent above, so room air is 21%. As you start getting up in oxygen levels, none of those fordable chambers have been tested for an enriched oxygen environment. If you struck electronics in them and you've got a significantly elevated level, which is hard to do, but sometimes people rig them up in a way that they do that, you're getting into a little more risk. Any static electricity spark can be a problem and so on.

In general, using it the way that you are probably not, there's not much of a problem. Combination therapy ultimately is the way to go. I describe this as a foundation biologic therapy upon which we add these other things to enrich it.

Dave: I guess my strategy of smoking in the hyperbaric chamber to reduce the risk is not a good strategy?

Paul: Generally not.

Dave: Darn. From what I've seen on the home chambers that go to one point three atmospheres or one point four atmospheres, even with the 10 liter per minute oxygen that you might breathe, as long as you're not putting off an ignition source right next to the oxygen, the fire risk is quite low. It's safe to have an iPad or some other low voltage electronic device and you're unlikely to set it off.

When I've done the hard chamber that's got two atmospheres breathing a lot of oxygen, you go in there wearing static free robes and there's no electronics inside, because there are facilities that have literally blown up because of that.

Paul: True. Usually in the hard shell chambers the vast majority of more compressed on oxygen, and you have to be extremely careful. In fact, there have only been two chamber fires in the history of United States hyperbaric medicine. One of them is just what you described jokingly. We had a commercial diver down here in Louisiana, who was doing his surface decompression on oxygen in the chamber and smoking.

While he had the mask on doing the pure oxygen free flow, but he was smoking the cigarette. The concentration built up. I think what happened was it burned the cigarette so fast, got onto the sheets, pretty soon they had a fire and that was it. No.

Dave: One of my favorite YouTube videos that they asked a bunch of engineering college students, they had a contest. See who could light the barbecue the fastest, so that the chemistry students come out with liquid oxygen and they light a little tender source and pour the oxygen on the grill. Within about 10 seconds, the entire barbecue itself is a pile of slag.

Okay, when you apply that high action, high fire, you might not like what happens, so thank you for warning people who might be doing this just to be aware of that.

Paul: Right.

Dave: Next question for you, multiple sclerosis, Parkinson's, ALS, Alzheimer, talk with me about what hyperbaric does for people with those conditions.

Paul: Wide range of variability. As I talk about my book, I've treated a good number of Parkinson's patients. The only published experience with success is a kind of unusual protocol that were used by the Italians. Where they gave oxygen for just 10 minutes at a time, then a two minute air break, where they breathed air and it was oxygen, air, oxygen, air like this.

They claimed results in certain subsets of patients, like vascular causes, stroke causes of Parkinson's versus other groups. Parkinson's it still hasn't been sorted out. ALS I can tell you my experience has been very poor if done just by itself. You have to combine it with other therapies.

One of my patients, where he got hyperbaric through some colleagues first and then contacted me. He's name is Kim Cherry and people can go to his website and look at. This guy is an amazing story, but what he's combined is, hyperbaric oxygen, ozone therapy-

Dave: Oh yeah.

Paul: ... diet and a variety of other things. He is now, I want to say eight years out from diagnosis, playing golf two to three times a week. He is beating the odds. People have tried to call him a fake and all this other stuff. I know the guy. I have met him. I examined him. I've looked at all the data. I helped him. This guy is for real and it's combination therapy. That's ALS.

For the other two diagnoses you mention Alzheimer's, in the Townsend letter, in April, it's published in March will be the first Alzheimer's case treated in the US. It's one I treated in 2001. I showed to Congress. I've treated nine Alzheimer's cases now and I've had good results with seven of them.

Yes, very, very encouraging and I think you may have seen this. The Israelis announced a mouse model of Alzheimer's just this last week, and they showed a 40% reduction in taupe protein in the brain and a significant reduction in inflammatory markers in these mice, with an improvement in their behavior.

The last one, MS, I can just tell you, highly controversial, but it works. You just have to get the right dose. My wife is the best example. You have met her. If she was here today, you would never know she's had MS for 17 years.

Dave: Wow!

Paul: She walks, talks, dances, skis, she is the heart and soul of my office. She's a nurse and she came on to this in an unusual way, working as a hyperbaric inside nurse and attendant in Santa Fe, New Mexico. Didn't know, she started feeling fatigue, but going in

the chamber, she'd breath oxygen for the last half of the patient treatments as she was accompanying them.

Now when she came to New Orleans and then Hurricane Katrina hit, stopped getting hyperbaric treatment until later, fell down, had a concussion. We saw the MS lesions on MRI and I've been treating her for another 10 years now, and she's doing great.

Dave: Wow! That's just, that's adding resilience to the system.

Paul: Yes.

Dave: Do you give her ozone treatments too?

Paul: She's had some, but I don't regularly do it.

Dave: Got it.

Paul: Well, I take it back. She does some intermittently. Yes, she combines it.

Dave: I'm really happy that you mentioned that, ozone therapy is really controversial in the US anyway. In Russia and in Cuba and in places, well it works better than drugs and it's cheaper. We didn't have the drugs anyways, so yeah we use it. I'll just state categorically, I wouldn't be sitting here today the way I am if I hadn't had access to ozone therapy.

I recovered from a lot of the brain toxins using self administered dose. For people with toxic mold, Lyme disease, chronic chemical exposure or just weird infections that won't go away, it's like a complete game changer. Different mechanism of action, but it's another oxygen therapy.

Paul: Correct.

Dave: I don't know how to stack it with hyperbaric. Any thoughts? I know that we don't have data, but understanding mechanisms of action the way you do, would you say the ozone therapy far away from hyperbaric? Would you do it first and go in? Would you do it after?

Paul: You'd literally have to try it. The way to do it is, do one or the other. Get the treatment benefit and then let yourself drift for a little while and find out how you do. When you start getting a recrudescence of symptoms, add the other therapy and see what its effect is. Then later, you can look at combining them.

You'll be able to kind of gauge how much of it you need to how much of a symptom response. I do this just exactly as you have done it. I have patients keep diaries. They don't have to be long detailed ones, but I have them make symptom problem list. They can even make a little graph with it, the one to 10 scale.

These analog scales have been shown to be extremely reliable. As you know it's the basis for pain therapy, yeah, but that's another subject. The whole point is, they can follow their symptoms and try to fine tune themselves.

Dave: Very, very cool. You're open minded to these things.

Paul: Oh yes.

Dave: It's kind of rare. When I've worked with a lot of medical professionals, especially outside the realm of functional medicine, where there's sort of patient self reporting and we'll try it and see if it works, it's a different mindset. Whereas, it's the do no harm part of the Hippocratic Oath, it seems broken, because you should be willing to do a little harm if you get a huge benefit and the patient's in control.

You seem like you've adopted that in the way you think about it. How did you do that? What's different about you than many other colleagues who simply wouldn't be that experimental?

Paul: I was very open minded when I went to medical school, and I decided I knew nothing, I wanted to learn anything and everything. In our very first quarter, we had a course called issues in healthcare and it was taught by the assistant dean of Public Health or the dean of Public Health, School of Public Health.

He brought in attorneys talk about the first malpractice case that just got settled. They brought in some of the sex change operation. They brought in all sorts of people that brought up issues in healthcare. One day we had this one older doctor had gone to Hopkins undergraduate, Hopkins Medical School, trained there, was faculty. Now he was semi retired and the title of his talk was 'The Importance of a History and Physical Exam'.

One third of my class didn't even show up. By the time this guy was 15 minutes into it, one third of the rest had gotten up and walked out right in front of him. It was the rudest thing I'd seen in four years, but his message was the most powerful of anything I learned at that medical school, which was, all science and hard science inside.

Dave: Yeah, school.

Paul: It was, that if you listen to patients, they will tell you what's wrong with them. By the time you're done taking a history from them, if you don't have a very short list of diagnoses to choose from, you failed. You need to go back and start over again, and when you combine it with the physical exam, you ought to have a good idea what's wrong with people.

That stayed with me and was reinforced time and time again to the point where I realized, look, I can't practice medicine unless I'm willing to listen to people and to go one step further. What you're talking about is listening to people and looking at them, is actually the foundation of allopathic medicine that we don't want to admit, or is not

admitted. It's all about writing prescriptions, drawing to add lab values and looking at MRIs and so no, it's not. Those are confirmatory.

I mean they can help in some ways, looking at exterior stuff that you can't put your finger on, but the reality is, how do I determine if you're sick? When you come into my office and I don't have that MRI and I don't have all that blood works, it's coming back in a week or however long, I look at you.

I look at your face and your eyes and your body language. Are you sick or not? What you're telling me, that is the whole basis of clinical medicine, the Hippocratic Oath and so on. I've just taken it to another realm here by being able to see this in people's facial expression, and that's the way I dose them.

Dave: Well that, it's profound and that's a message that I hope all of the medical professionals and soon to be medical professionals listening are really taking to heart. I see it a lot in functional medicine, the kind of doctors who are willing to sit down for an hour or two in a first meeting, to really get an understanding.

I'll never forget one of the people, one of the doctors I interviewed in moldy, the documentary about water damaged buildings and toxic mold. She's a physician and she basically said, "Look, in medical school they teach you, if someone has more than three or four symptoms, they're hypochondriac and they're probably lying to you." I'm paraphrasing and you shouldn't believe them. You should pretty much give them antidepressants, like they're a nutter.

I just remember this doctor when I was fat and nothing worked. He looked at me and said, "Maybe should try and lose weight." I'm like, "No kidding. I've worked out 18 months, six days a week, an hour and a half a day, the weights not coming off. I don't eat anything." You could just see it. He's like, "Liar." Clearly this guy's giving me Snickers bars as soon as he leaves the office. That was really frustrating, and that was a three minute conversation, where that L word you used, listen.

You learn this, because you had a monumental lecture from someone who made a huge difference in your trajectory from just one good piece of advice that stuck. Wow, that's cool.

Paul: It's the single most important thing I got out of medical school. What you're talking about there unfortunately has been the plague of so many women.

Dave: Yeah.

Paul: Women are so sensitive, because of the hormonal cycle they go through, they're very tuned in to their inner feelings. They also lodge more complaints as a result. When things are out of whack, guys, it's like a diesel. They put it in forward and they go. It's not too nuanced for a lot of men.

Women are just finer sensitivity and those complaints often have been looked at and termed as hysterical, and women get very easily written off. It's been a problem, but you've got to listen to people.

Dave: It's been a problem and it's also a gift. Women are better bio hackers than guys, because they notice stuff before we do on average.

Paul: Right.

Dave: I know guys who are more sensitive and women who aren't sensitive, but if you close your eyes and look at a specific gender, generally speaking, yeah, I felt a difference, because there's always a difference versus for guys. There's a difference, but it's more subtle, and we often end up just ignore it, because we wanted to eat.

Well, this has been a really fascinating conversation and I'm eager to hear your answer to our final question, which is, based on your whole path, and not just your medical expertise. Just what made you focus, what made you want to change the game in your industry and be nominated for these awards and write these books and just make the difference you've made.

Based on that path, if someone came to you tomorrow and said, "Look, I also want to perform better as a human being. I want to change the game." What are the most important pieces of advice you'd offer someone like that?

Paul: Well, there are three of them and the first one is, the secret to life I believe is balance. It's hard work. It's hard play. It's loving relationships. It's exercise, diet. It's a spiritual life. It's a balance between all of these things, and the people who can achieve balance like the Greeks did and what they preach are the ones who do the best. It's kind of like the Temple at Delphi and the Oracle, everything in moderation.

The second thing is, go natural. Everything we need to make us healthy, happy and so on is right here on earth. Manmade substances, the whole hubris of the idea that we're going to make something, that interacts with the unbelievable complexity of our body, and have no side effects and give us cure of a complicated disease, is just fantasy. Go natural, which leads to the third thing, which is, use the healing power of the natural power of oxygen and pressure to correct disease processes in our body. If you can, we can cure disease, improve our quality of life and live longer at our maximum potential.

Dave: Beautiful, what a profound answer. I find that having done almost 450 episodes of Bulletproof Radio now, I never know what someone's going to say, and it's intriguing to see. You've led a very powerful path in your life, where you, I'm just going to say, went off the reservation and that you're not doing what most doctors do.

By virtue of that, you've had a bigger impact, because you're bringing light to something that really matters and has brought applicability, but that hasn't been properly explored. There's some mindset that does that. Thanks for sharing what worked for you there.

Paul: My pleasure.

Dave: If you'd like to learn more about Dr. Paul Harch's work, you should read his book called 'The Oxygen Revolution'. Paul is there another place, a URL or something that you'd like to send people to, who'd want to learn more about your body of work?

Paul: HBOT.com and oxygenetherapy.com.

Dave: All right.

Paul: Are probably the best sites to ...

Dave: O-X-Y-G-E-N-E therapy.com, got it.

Paul: HBOT.com.

Dave: HBOT.com, awesome. We'll put all those in the show notes. If you come to the Bulletproof blog, you'll be able to get a transcript of all this, if we went through it too fast for you. Or if you were like me listening to something like this on two or three X the normal speed, so we sound like chipmunks, that's okay too, we've got your back.

If you liked today's episode, you know what to do. Head on over to Amazon, and if you want to know more about hyperbaric oxygen, so you can have more resilience or maybe treat one of these many things we've just talked about, read Paul's book, 'The Oxygen Revolution'. It's worth your time and this is something that belongs in our sphere of bio hacking and isn't there yet today.

If you like his book, go to Amazon and take about 10 seconds and leave a review. When you do that, that's a huge way for you to show gratitude, which raises your oxytocin levels and makes you a better person. Also, as an author, I can tell you, that based on his life's work, Paul is going to care that you did that.

Likewise, if you take a minute to leave a recommendation for one of the Bulletproof books like Head Strong, same thing here, I read those reviews, I see them and it actually matters. Thank you for taking a second to go do that. I look forward to seeing you on the next episode.