Introduction and Guest Background

Welcome to another episode of the Telomere Summit. I'm your host, Doctor Joseph Rafael. I'm very pleased today to have with us Doctor Jason Saunders, to talk about hyperbaric oxygen therapy, a really interesting modality for affecting multiple medical conditions, as well as perhaps the aging process, which we'll talk about.

And, a little bit about how it has been shown in a study to improve telomere length and senescent cells. Fascinated with human biology and performance, Doctor Jason Saunders is always working to integrate new knowledge and practical experience.

In addition to his doctor of Chiropractic, he earned his diplomat of the Chiropractic Board of Clinical Nutrition and is diplomat of the International Board of Applied Kinesiology.

He is currently enrolled at the University of Miami School of Medicine, earning his PhD in Molecular Biology with a concentration in Regenerative Medicine.

Doctor Saunders published an Amazon bestselling book in 2020 entitled Oxygen Under Pressure, describing the science and benefits of using hyperbaric for a variety of indications, longevity and performance enhancements.

He is also on the board and faculty of the International Hyperbaric Association and the International Board of Undersea Medicine, lecturing at functional medicine conferences all over the country and certifying doctors and technicians in hyperbaric medicine.

Doctor Saunders and his wife, Doctor Melissa Saunders, are co-owners of Core Therapies Family Wellness Center, a multidisciplinary clinic in northern new Jersey.

They're also the owners of two hyperbaric clinics in new Jersey, but not as well as pot USA, a business designed to help practitioners obtain hyperbaric equipment, provide education, develop their business protocols, and earn their spot certification.

Welcome Doctor Saunders. Thank you. Yeah. It's, really great to be here. And, I love any opportunity I have to, you know, share some information on this topic.

So thanks for having me. You're welcome. Yeah. So why don't we start just a little bit about how you got into your interest in hyperbaric oxygen therapy?

I always like to hear the story of how people get to work that way. I know you're passionate about it. Just talking to you a little bit before the interview, so, love to hear about it.

Yeah. So, I mean, the short story is, I was a few years into practice, and, I was working on flipping a house, actually, as, like, a side project. You know, nights and weekends.

And, I was putting a new roof on the house, and I herniated disc in my lower back. Which led to a full neuropathy, a full drop foot in my right foot. Wow. And, so I was out of practice for, you know, a good few weeks.

My wife happens to be a chiropractor, so she was working on me, treating me. Most of the back issues had gotten better within about 3 or 4 weeks. And I was back to work, but I still had a full drop foot, left in my right foot.

And a year later, it still never changed. And 18 months later, it never improved. And so I was about 25 at the time. And I just sort of assumed that was my life.

How Hyperbaric Therapy Entered His Practice

And, you know, I was learning how to cope and deal with it. It was pretty devastating because, you know, my so my background is exercise physiology. I'm a chiropractor. I do a lot of clinical nutrition.

I thought I knew all the things I needed to know to help somebody like myself. And, you know, I just I couldn't couldn't figure it out. You know, fast forward about that 18 month time period.

I was at a at a show and they had a big vendor haul, and they had these hyperbaric chambers. I had no clue what it was. It looked interesting. And they were doing demos. So I asked the guy if I can try it.

So, I went in, I did about a 30 minute session. It was interesting. I didn't really notice much. And then I, you know, I got out, I started walking around the vendor hall, and in about 15 minutes I started getting, like, pins and needles on my foot.

And that was the first time I had felt my foot in literally 18 months at that point. So I started to think like, wow, am I feeling my foot because of this?

This chamber. So I went and I spoke to the, you know, the rep for a little while. Of course, he said, oh yeah, of course. Yeah, that's what it does. And I'm like, yeah, right.

You know, I'm from Jersey. Like I'm skeptical of everybody. So, anyway, so he agreed to, treat me. So I did about, eight hours worth of sessions in 30 minute increments over the course of four days.

And I left with about 15, 20% improvement in my foot. Wow. So, I bought the chamber. I had no intention of ever using it in practice. Honestly, I just I bought it for myself, treated myself for a couple months at home, and I had a 100%, full recovery in my in my foot.

From there, my stepfather had recently been diagnosed with, primary progressive Ms.. And he was starting to go downhill pretty quickly. And, you know, we were already starting to do a bunch of things like nutrition and other, you know, you know, in addition to some traditional therapies.

But, you know, nothing was really making a difference. And I thought to myself, I said, you know, just this is the pressure and it's oxygen, you know, couldn't possibly hurt.

I had a neuropathy. He has a neuropathy. They're completely different mechanisms. But maybe, you know, this was about 15 years ago. So there was, you know, there's not a whole lot of research today.

There was even less then. And so there wasn't much to support the concept, but I just thought, hey, let's just give it a shot. So we did a very aggressive, 40, basically 40 90 minute dives 40 days in a row is what we did.

I, like I call it dives. Is that is that what that it's, because, you know, they came about because of, compression chambers for the scuba. Yeah. So we still all refer to it as, you know, as a dive.

But now I know the lingo. That's cool. Yeah, it's, He had an amazing change. He had his gate narrowed, his balance improved, the swelling in his feet reduced.

He started getting feeling back in his feet. He started walking stairs again. Wow. They had to change his diagnosis to relapsing remitting, just due to the fact that he started having all these improvements.

And now it's 15 years later, he still uses the chambers, and, he's doing better today than he was even then. So, you know, there's there was at that moment, I said, we're missing something because, you know, again, my issue is very unique, has an issue as unique, but somehow it helped both of us.

And there wasn't enough data to support either one of those stories. And so that's when I really got interested in the

science and the research and kind of building it out from there.

Absolutely. Fascinating. So, you know that if that doesn't interest you in learning more about hyperbaric oxygen therapy, I don't know what's going to.

So let's let's dive into, so to speak, a, a, sort of basic explanation of what it is and what, what one of the physiological principles behind it. And then after that, maybe we can talk about some of the primary indications for it.

And then we'll go from there. Yeah. So the, the sort of the easiest way to explain it, I think, is right now there's an atmosphere around us. You know, I'm in I live in Jersey.

I'm in Florida right now, so I'm at sea level. So our atmosphere has a pressure at sea level. We call it one atmosphere. So one atmosphere of pressure.

There's just enough pressure to allow my body to absorb oxygen and saturate my red blood cells virtually 100%, much to so 98 and 99% saturation. Right?

What we know is, if we go to altitude, let's say I went to Denver, all of a sudden we we say there's less oxygen at elevation, and really air is 21% oxygen no matter where you are.

Even at the top of Mount Everest, air is 21% or, sorry, oxygen is 21% of the air that we're breathing. But there's less pressure. So as you get away from the Earth's surface, there's less and less pressure, which means every time I take a breath in, there's less molecules of oxygen being, brought into my lungs, and then there's less of a driving force driving that oxygen, into my plasma for the red blood cells to pick up.

How Hyperbaric Oxygen Works

So most of us know this. We have an adaptation to that. The adaptation is ultimately, if I can't saturate my red blood cells enough, my body will start to make more red blood cells.

Now I have more, you know, more taxicabs to deliver all the oxygen my body's trying to deliver. So that's as we go up above sea level, as we go below sea level, which is really what we're trying to create in hyperbaric.

So the exact opposite is true as we start to go below sea level, we're increasing the pressure of the air or the oxygen that we're breathing. And ultimately, if you remember, you know, I don't know if fifth or sixth grade, chemistry or biology, you know, molecules move from high concentration to low concentration.

So as you can create a larger concentration of molecules in your lungs, there's a larger driving force to move oxygen from your alveoli inside your lungs into circulation.

Normally when we talk about oxygen delivery, we talk about red blood cell saturation. And ultimately what hyperbaric is really doing is sat creating the red blood cells. Sure.

But really it's super saturating the plasma. So under normal circumstances, our plasma carries very little oxygen, literally about 0.3ml per 100ml of blood.

But under hyperbaric conditions we can increase that 1520 fold. Depending on how much pressure we're using and what percentage of oxygen we're breathing.

And as a result, the the plasma, which is typically carrying such a little amount of oxygen becomes almost an unlimited reservoir, able to hold on to all this extra oxygen while you're inside the chamber.

And so that becomes important for three reasons. One is in a lot of cases where there's trauma or inflammation, whether that's post-surgical or chronic illness or post stroke or, you know, so many of these conditions, there's a

there's a breakdown in the micro circulation.

And so when there's a breakdown in the micro circulation, the red blood cells can't get from point A to point B and so the other side of that obstruction becomes hypoxic.

Well, if you're if you're dissolving oxygen in the plasma of the blood and bypassing red blood cells, you actually you don't need them to carry it anymore.

All of a sudden, as long as the fluid can get through those areas, oxygen can now get to those areas. And so we're able to oxygenate that tissue because of that.

The other thing that it does is that it because it's saturating inside of our blood when we get out of the chamber, it literally starts trying to come out of solution.

It literally will bubble up. So there's a certain distance that oxygen can normally travel away from a capillary to interact with either some cell or some tissue.

When you get out of a hyperbaric chamber, that distance, increases by about four times greater. So again, when you have these either these barriers of perfusion blockage or damaged, circulation or basically tissue hypoxia when you could have the oxygen travel further distances, you can really impact that hypoxic tissue and start really waking it up, and start regenerating that, that tissue.

That's like that's kind of like bar 101, if you will, in terms of mechanism. Sounds great. Yeah. So that's obviously why one of its primary uses is in wound healing.

There's that blockage to and in particularly diabetic wounds and things where there's poor circulation. So in terms of the we've talked about, the pressure is changing.

You know, there's a little bit more it gets a little bit more a little fancier in terms of the protocols, you know, are there different protocols for different indications.

Let's, let's, let's talk about some of the basic ones. We've all heard about the wound healing ones. But now we're hearing that, you know, people can do it for just general health.

They can do it for particularly cognitive function. I've heard. Is it can be beneficial for and what's the mechanism behind that. Yeah. So I mean, there's a lot to that.

One is I would say traditionally we use hyperbaric, let's say, insurance based indications in a hospital setting. We're talking about things like gangrene, osteo necrosis, radiation damage, necrotizing fasciitis.

You know, basically we're talking in most cases, we're, carbon monoxide poisoning. We're talking about literally life or death or, you know, life and limb threatening conditions.

And in most of those cases, hyperbaric is the last resort before either someone's about to die or an amputation. Right. And in a lot of those cases, even being the last resort of these terrible conditions, it seems to have an amazing impact on a lot of these patients.

So but the mechanisms that it helps with those conditions and the mechanisms of all the things I don't treat, you know, any of those conditions in my clinic, if I have a patient in need in that scenario, we we happily send them to wound care clinics to the hospital.

You know, we're not equipped for wound debridement or other things like that in our clinics. If you can get it covered, that's great. And I'm just as happy to send people into, you know, those clinics for that purpose.

But what's really happening is you're reestablishing the oxygen gradient, a lot of wounds because of poor

circulation, because of diabetes or, or just these chronic non healing wounds.

There's this breakdown of the oxygen gradient. That's what I was talking about with the pressure. And so when you can reestablish an appropriate gradient or even a larger than normal gradient and all of a sudden drive oxygen into that tissue, it's going to stimulate almost all of the same, pathways and, and what it is.

And hyperbaric happens to be very, what I would consider to be anabolic. It stimulates collagen and fibroblast proliferation. It stimulates stem cell proliferation.

It stimulates, brain derived growth factors, platelet drive growth factors. So a lot of these growth factors, collagen stem cells, it's very tissue regenerating, tissue repair and inflammatory control.

So when you start looking down all of the cascades of cellular signaling that occur with hyperbaric, whether it's osteo necrosis and gangrene or it's, you know, we'll talk later, telomere length Ms.

or post stroke, the mechanisms of what we're trying to stimulate are virtually the same. And what I would say is probably one of the biggest differences is.

Somebody with, carbon monoxide poisoning or gangrene, we are taking oxygen, literally to human tolerance. In other words, hyperbaric is a great tool. Oxygen is very healing, but you can take it too far and there's consequences.

Oxygen toxicity, central nervous system, oxygen toxicity, pulmonary oxygen toxicity. So when we're treating these life and limb threatening illnesses, we are taking people often very close to, you know, human tolerance of oxygen because that's what's required in those moments.

And what I would argue, and we haven't been able to prove this exactly yet, but I think one of the things that I would argue is we have a tool that has a very large range of pressures with, a large range of percentages of oxygen that we can use.

And perhaps the, the tool is consistently the same, but we should maybe consider matching the severity and the intensity right. The here's the severity and the acuteness of the condition.

Here's the intensity of the therapy. In these very severe and very acute conditions, we will want to be very intense in these more chronic and sort of, you know, chronic illnesses, the plaguing you know, so many Americans between autoimmune, neurodegenerative, you know, so many of these conditions, you know, we probably don't need to take them that far in order to get the same result.

And as opposed to a lot of acute and severe conditions where we're only treating maybe six times or 10 or 12 times, you know, these chronic illnesses probably require less intensity, but longer durations of care to really start changing, you know, their pathways and their signaling, you know, on a more long term basis.

As I mentioned, my stepdad has been doing hyperbaric for like 15 years. And this isn't something that, you know, we have figured out how to get rid of, right?

It's it's a way that we're managing it. Right. But we're managing it along with other things too, of course, but we're managing it pretty successful using that as a tool.

So, that's kind of a breakdown in my mind of how, you know, we can start thinking about some of these. Yeah, that's that's very helpful. In terms of the signaling you mentioned earlier when you when we were talking off of camera, about how, hypoxia inducible factor one alpha, I guess if one alpha is the terminology for it.

That's one of the main things that's induced.

Clinical Uses and Treatment Protocols

What are the how does that work and what are the other signaling pathways. Because again I think about oxygen also as being, you know, if you're talking about the extremes of oxygen as being a free radical, you know, generated rush to your body, you know, if Earth was 30% oxygen, we'd all be in a world of hurt.

But you're talking about transient levels of that. And that's that's the difference because it turns on a signaling pathway, and then we remove the oxygen.

How does that work? And how does that how does that feed into the kinds of conditions that you treat. And let's talk a little bit about what those conditions are.

Sure. So I would say that in the reading that I've been do especially, you know, the the research curve for hyperbaric was flat for about 100 years. And we're finally starting to make this turn.

And there's a few groups that have that have played enormous roles in that. There's a group out of Israel that's definitely played, you know, one of the largest roles in our understanding of hyperbaric for these types of issues, primarily.

And we'll talk more about them in some of their research. But, one of the things that we can say is that there's there's an actual physical amount of oxygen that people get.

So what pressure where they at, what percentage of oxygen were they breathing and how many minutes were they in the chamber. And we can multiply those out and create, a concept around a dosage of oxygen per session or per per protocol or per treatment protocol.

And that's, that's a dosage of oxygen. And the primary in my mind, when we're hyper oxygenated, some of the things that seem to be most stimulated from that would be mitochondrial function, upregulation of ATP, ATP efficiency, upregulation of fat burning or even ketosis.

If if somebody is kind of shifting in that direction, you know, making giving the, the eliminating the rate limiting steps in ATP production, you know, CoQ10 would be one of those cytochrome c, it could be one of those.

But oxygen is one of those rate limiting steps of ATP production. When we upregulate oxygen inside the body, we could really start turning the crank on ATP production, which, you know, that's that's where we're going to get cellular energy from.

So and that's systemic when we it's not like I can give that to your liver or your heart or your brain. You know, you have to breathe this in for this to work and it has to go everywhere when it does that.

And so any cells that are exposed to that upregulation of oxygen could start to have upregulation, ATP production. Therefore upregulation of of tissue and cell function because of that.

And we see that showing up in liver function, in brain function and and in performance in general. So that's the I call that the mechanical side. Right.

That's a dosage of oxygen and the and the and the machinery that's affected by the dosage of oxygen. On the other side is this cell signaling component.

And the cell signaling component is much less well understood at this time, although we're starting to, you know, be able to look at it from a, a cascade of events probably at this point, what I would say and, and this is even changed for me over the last couple years, but I would say that reactive oxygen species is probably the most important, cascade cell signaling cascade that we have with when it comes to hyperbaric and, and if one alpha and, if you look at the, the pathways of what happens, you know, reactive oxygen species has gotten a very bad rap, in, in functional medicine.

And, you know, from what the things that I've learned and the different things that I've treated patients for,

especially with chronic illness and other things like this.

And again, I can't completely prove this, but there's a great paper by, Angela Poche and Dominic D'Agostino. I think it came out in 2020 and comprehensive, comprehensive biology.

Maybe I could link it to this, you know, this conversation after the fact. But they talk a lot about the reactive oxygen species, the so there's exogenous reactive oxygen species, right.

EMF radiation, smoking, drinking, you know, stress in my life, all the things that are acting on me from the outside world. Right. And I would agree that those are things that are going to, you know, pretty well, you know, they cause lipid oxidation.

So they're going to destroy our cell membranes, our mitochondrial membranes, our nuclear membranes. They're going to create epigenetic and genetic damage.

These are terrible things. So I'm not giving them I'm not saying that they're not terrible. Right. It seems to be different when the reactive oxygen species is a normal release of mitochondrial ATP production.

And so as your ATP get upregulated or your mitochondria get upregulated, therefore ATP increases. We also get an increase in reactive oxygen species. But when it's endogenous in other words it's because the body is making it.

One of the benefits to that is it seems to massively upregulate our own endogenous, antioxidants. Specifically, superoxide dismutase goes up from hyperbaric oxygen, catalase and glutathione oxidase.

So we start getting an increase in endogenous, antioxidants to deal with the increase in reactive oxygen species so that not only could that be improving how well we tolerate it from a hyperbaric standpoint, but my argument would be, I think that there's evidence now to say that it's actually going to also help you deal with your external environment, because your body is now learning how to tolerate and upregulate its own defense mechanisms against that oxidation.

So it's like a hallmark effect, almost like like exercise in some ways and percent. I look at hyperbaric, you know, I'm sure a lot of the people that you're interviewing, we're all very interested in longevity and improving performance.

Just not not athletic performance like life performance. You're, maximizing, you know, human performance in whatever endeavors we have. There's no doubt that, that's the best word for it probably is this, you know, this hermetic effect where we can challenge and stress the body on a regular basis in different modalities, enough to get a stimulus, enough to get change, enough to get improved strength and resilience, you know, to the outside world and not so much that it breaks us, you know, that it breaks us down faster than we can recover.

Right? Exercise is great. You could also do too much of it, right? So if you're not getting enough or if you're doing too much, that's not going to serve you, there's this happy place.

And the more of it we do, the more of it we can handle and the more of it we do, and the more of it we can handle, the more we can start to tolerate the rest of our environment more effectively.

And I look at hyperbaric identically to that, you know, the same way I would with fasting or other dietary challenges or, you know, temperature, like sauna and ice baths and all the different modalities.

I use them all in my life personally, as well as recommending the patients. So I think hyperbaric fits that model, really, really well when it comes to that.

So that strikes me. It's very important that you have the right protocol for the right patient. To 100%. Right. Because if you have someone who's very sensitive. Right.

And we have I'm sure you do like we have these very over oxidized, very delicate, sensitive patient and we go and

blast them in the chamber at high pressure.

Could they have a negative response? Absolutely. Could we, could we expose them to more mild exposures of oxygen and then just build that up as their tolerance increases?

I mean, that's our approach. That's a lot of what we do in our clinic with regard to hyperbaric, especially for those, you know, for those patients. So and then lastly, is that the sort of the hip one alpha.

And there's so much that it does. But I think the best way to explain this is we know that there are many anabolic benefits to hypoxia, and there are modalities that help us, whether that's living at altitude so that we're creating a hypoxic environment, or we're artificially creating a hypoxic environment through other, you know, tools and modalities that are out there.

What that seems to do is that seems to stimulate F1 as well. It seems to stimulate VEGF. So we get a lot of the angiogenesis and the, the, the rebuilding of the micro circulation, which is great.

It also seems to stimulate other stem cell releases and growth factor releases. It's it's trying to improve our body's ability to, heal, recover and prepare for this, you know, lack of oxygen and to be prepared for when oxygen increases again and we can start you know, a big cascade of of recovery and regeneration in one of the studies, done, I think it was in 2019, it was called the hyper oxy hypoxia paradox.

It was that done by that same group of Frati, out of Israel. And what they were looking at was the differences between hypoxia and what's considered to be hypoxia with intermittent hypoxia.

But when you use hyperbaric, there's never actually hypoxia. It's all relative. So in the chamber you're hyper oxygen. You're getting more oxygen than normal.

When you get out of the chamber you're just going back to normal. Like sea level oxygen. But because you were hypoxic and the chamber was driving that oxygen into your body when you got out of the chamber, that oxygen wants to get out.

It's like a it's like shaking a can of seltzer and opening the bubbles have to come out. Right. But when oxygen comes out of our body, it doesn't just bubble up, it actually interacts with our body and stimulates.

But when oxygen rushing out of your circulation, it seems to stimulate either most, but potentially all of the same cell signaling cascades as hypoxia.

Here's the difference with with chronic hypoxic exposures, you get the off, you get the have one, you get the stem cells, you get the growth factors. You get a lot of that anabolic stimulation.

However, it appears to have a reduction in sirtuin activity and a reduction in mitochondrial activity. Right. Yeah. You get when you get this. Right. Right.

Because it's for the same reason that the individual increases mitochondria. So the as there's no less oxygen, mitochondria down regulate when you're getting this hypoxia, hypoxia from intermittent hyperbaric use you still get all of the same.

If one veg off stem cells growth factors all the same anabolic and regenerative qualities. However you also seem to get an increase in sirtuins and an increase in mitochondrial, not only efficiency in terms of how much oxygen you can make, we get an increase in mitochondrial density.

If you have enough repetitive exposure to hyperbaric, your body will literally replicate your mitochondria, thereby having more mitochondria to process that oxygen to make even more ATP.

And so there's an enormous mitochondrial benefit to repetitive exposures to hyperbaric. So you're an exercise

physiologist. You said you sort of started out with that, right.

I was just thinking about that when cyclists are training, you know, particularly tour de France type cyclists, they have the beginning of their season is all based training, you know, zone two type stuff where they're trying to build up mitochondria, and, you know, get more mitochondria biogenesis.

Cell Signaling, Hormesis, and Mitochondria

Are you saying that this kind of therapy could potentially be as effective as that, or someone if I would say, you know, when I look at nowadays, when I look at performance that way, you know, because you'll see people do a lot of breath work or breath hold or, you know, carbon dioxide management as well.

Right? So I think all of these things become important. And so, you know, in my own performance, I've done a lot of work, trying to improve my tolerance for carbon dioxide.

Right. So I'll do certain work under more hypoxic conditions because that improves our ability to deliver oxygen. Right. Most under normal circumstances, resting circumstances.

You and I, right now, we only utilize, like, 25% of our oxygen carrying capacity inside the red blood cell, right? You know, moderate exercise. We'll look at maybe half extreme exercise.

We're looking at, you know, maybe 80% of that oxygen. So how well do we get the oxygen when it gets to our you know, you know, when red blood cells get back to our lungs, how efficiently or how effectively can we deliver that oxygen to the working tissues in the working cells.

And we can train that through hypoxia. We can train that through intense, you know, interval type training. We can train that through, working at different elevations and altitudes.

But could we also become hyper toxic, right. And continue to improve our ability to collect that oxygen and deliver that oxygen and improve our mitochondrial biogenesis and density?

You know, so not any one of these, in my opinion, you know, and for athletes that we work with, not any one of these is like the one, you know, people people compare let's say you I don't know if you're familiar with, exercise with oxygen therapy.

Right. So usually high intensity it's usually on a cycle. And you're let's just tell us for our listeners what it is just briefly. Yeah. So it's exercise with oxygen therapy.

And so what you're doing is you're usually using a bike, but it could be any aerobic type exercise. And ultimately what you're doing is you're going through different bouts of again hypoxia.

So you'll be breathing through a mask of oxygen, getting a lot of oxygen at certain times a percent. And what's that. What percent usually like 94%. You know, it's usually very high.

And then so and then you'll cycle through different intensities of exercise and you'll cycle through different percentages of oxygen. So you'll have this relative hypoxia.

Hypoxia on the oxygen delivery side. And then you'll have this increased intensity on the interval side. And what you're doing is you're you're playing with supply.

And demand is really what you're doing. And you're teaching the body how to extract as much oxygen in from the environment as possible and deliver as efficiently as you can, you know.

And so the things you can do with what I love you. What? It's not hyperbaric, it's what it has a great place. It has an absolute value. And in performance it's an amazing tool.

And that's a very different thing than hyperbaric, which is saturating your plasma far beyond what red blood cells can carry. In other words, with you, you still need your red blood cells primarily to be the oxygen delivery and carrying source.

Hyperbaric is literally free floating oxygen. There was a study in 1948. I'm sure they'll never be able to do it again, but they basically took pigs. They drained all of their red blood cells.

They replaced their entire blood volume with like a saline solution and put them at three atmospheres in the hyperbaric chamber. And they lived perfectly well.

Yeah, that's what I was thinking about. You know, people, people get, during cardiac surgery or any major surgery, they get pump head because they don't get enough perfused.

They got to run the low blood pressure. And that's just not enough. You know, with the atherosclerosis in the carotid and the rest of the brain. If they did those surgeries, you know, hyperbaric chamber, that probably wouldn't happen.

So there was a moment, I think it was in the 50s. There was a moment where they were starting to do more of these, like, open heart surgeries in a pressurized surgical suite.

And it was just too expensive. And it sort of got, you know, they moved on pretty quickly. But to your point, I think that that's, you know, that's a great point.

I think that that would, improve the, the condition certainly for the patient and for the I mean, honestly, I would imagine to improve the conditions for the work said, well, you know, keeping everybody more alert and ready to, you know, focus them pretty cool.

So what kinds of, conditions and what what do you specialize in treating in your multiple, centers and in practice? So, I mean, we started because a lot of my patients initially were more musculoskeletal type patients.

I got into this because of a neuropathy from a disc injury. So naturally I just I started seeing those types of folks a little bit more in the beginning.

With our clinics now and in the clinics when I, when I help another practitioner start a hyperbaric center, let's say inside their, their existing clinic, I really try to get people not to specialize.

In other words, if you get really good at the tool, you can really help so many different people with so many different conditions. And it's not like hyperbaric, you know, it gets a bit of a bad name, almost like it's a cure all.

I will be the first one to tell you. I mean, I've studied this inside out, upside down. I live it, I breathe it, I teach it. This does not cure anything.

It's. That's not the point. It's. It's not a cure for any of the things that we treat. Oxygen is just such a foundational, you know, the way I view it, because of my background, maybe in nutrition, like, it's, you know, it's a, it's a, it's a nutrient.

It's a, it's a cofactor nutrient. It's it, it's, it's, you know, solute cells require oxygen for function and for a variety of reasons, call it chronic inflammation or toxicity or injury or whatever.

There are times in our body where we're we're relatively hypoxic in certain tissues or cell types. And if we can stimulate this upregulation of oxygen into the body, it's safe, it's very noninvasive.

And it can it can make the difference between turning a patient from, you know, going down this, you know, this chronic, you know, inflamed road and and just start to shift that momentum back in their favor.

So again it's not going to cure it. But it's such an important piece to the management of and the repair and the regeneration of tissue, of all types.

You know, that it allows us to really not focus and to help so many people. So we see a lot of neuro sensory hearing loss. We see a lot of radiation burns from, let's say, radiation from cancer treatment.

But they're not they're not bad enough to be covered by insurance, neuropathies of all kinds, from diabetes to disc herniations to carpal tunnel or other, you know, neuropathy conditions, neurodegenerative people do very well.

So the Ms.. Alzheimer's, the vascular dementia, these people, especially if you catch them early, these people respond very quickly. Lyme disease C diff H pylori.

So certain infections that are anaerobic, similar to gas gangrene or necrotizing fasciitis, there's a we haven't even talked about it. But there's an entire immune system upregulation that occurs from hyperbaric.

Whether it's helping your white blood cells to fight the infection or reducing the inflammatory cytokines, there's there's a few different ways that it helps to, you know, modulate and balance the immune system.

Let's talk about that. I mean, yeah. Unless you have want to go more because that's, a lead into the, the study I want to talk about. But, and I'm sure our listeners, because, you know, it's about telomeres, it's about senescent cells and the immune system, which is, you know, immuno senescence, what happens with hyperbaric oxygen and, the immune system.

Yeah. So, so one of the mechanisms and some of these mechanisms, what we try to do, especially when we're teaching these courses, these like, you know, like certification courses for hyperbaric technicians or medical docs or, or chiropractors or naturopaths that are trying to get into hyperbaric the mechanisms of the there are 14 indications that are considered insurance based indications.

I covered a few of those earlier. Those are the those are the conditions that have been studied in unbelievable amount of detail. And those mechanisms we understand really well.

And what we really try to do is say, are these mechanisms also applicable for these other conditions that we're looking at? In other words, we may or may not have a study to exactly explain how hyperbaric helps ulcerative colitis as an example, but it does seem to help these patients a lot.

And maybe, you know, chronic external non healing wounds have similar pathology to chronic internal non healing wounds. And if the mechanisms are similar perhaps it would make sense that because it helps heal these kinds of wounds and ulcers it might kill these kinds of wounds and ulcers as well.

And so we try to really take our time to understand the mechanisms as well as possible. So one of the mechanisms is it decreases, white blood cell aggregation, like when, you know, as it starts to attack an area of, you know, inflammation for whatever reason.

Another thing that it will do consistently with white blood cells is it increases white blood cell reactive oxygen because of that upregulation of reactive oxygen species.

So it gives our white blood cells more of the tool that they need to actually fight the infection, especially for viral infections and things. So we get an upregulation of white blood cell activation to to fight infection.

And then there's there's an enormous amount of data to show its effect overall, on inflammatory cytokines.

Immune Effects and COVID Applications

So reducing the inflammatory cytokines, the TNF alphas but also up regulating our own our body's own, endogenous, anti-inflammatory cytokines. And so we start to get this regulation of, of inflammation inside of our

body.

As a result. Now, so you were sort of leaning towards that, that study on telomeres. Yeah. One second that I just just popped in my head. So then with all that, you just said, has it been looked at in severe Covid?

So, for the people who care about it enough. Yes. There were there were these enormous conversations. So there are a few ongoing studies right now. One in Israel is one out of Germany.

There's, I think, one in Chicago, one out of New York, one out of Brazil and one out of France that are still looking at hyperbaric for like active Covid cases early on, when nobody knew what it was or how to treat it or, you know, and I'm from Jersey, so like in the New York area, I'm like 15 minutes outside New York City.

You know, they were, you know, bringing in you know, the ships and opening the Jacob Javits Center to treat all those patients. And, you know, and nobody knew what was going to happen.

And, you know, a lot of these patients ended up on ventilators. And a lot of these, you know, I think 86, 87% of the patients on ventilators end up dying.

And one of the conversations that arose from that was, you know, so many of these patients potentially it wasn't so much of a breathing issue, as much as an oxygen, delivery issue, right, a gradient.

So due to the damage of the, the Numa sites and the inability for the gradient to be established to drive the oxygen from the outside world into circulation, and, if there's one thing that hyperbaric oxygen does is it maintains and creates these gradients that absolutely drive oxygen through, you know, even a lot of inflammation and tissue damage.

And so, there were conversations early on that I was a part of with, you know, in, in Spain, in Ireland, in England, in Australia, they were looking at, because nobody was flying.

So people started to talk because airplanes are basically giant hyperbaric chambers. Right. So this idea that we could put all these patients inside of all these grounded airplanes or make use of, you know, generally speaking, hospitals, a lot of hospitals have multiple chambers.

They could treat 15 to 20 people at a time. And they're they're generally very underutilized in the first place. So could we start opening up these chamber facilities or these airplane hangars or whatever to start driving that process?

And so there was an enormous amount of interest. And then, you know, as Covid progressed, it seemed like, you know, the the interest sort of waned. Other, you know, other treatments, you know, medical, right, for managing Covid instead of, you know, and so as the intensity of the scare, I think for most of us, waned, as did the interest in pursuing that.

However, that being said, A lot of us have been using hyperbaric, for post-Covid recovery also, and there've been a few papers coming out on that because a lot of these people are stuck in chronic, inflamed, you know?

Right. Modes, they have different neurologic issues, whether it's, you know, from brain fog to the continued loss of smell and taste or, you know, so there's so many or just this, you know, consistent, breathing issue or energy overall.

And so there's been a great response to, hyperbaric for a lot of these longer Covid cases that they seem to do very well and they do well pretty quickly.

Very interesting. So that yeah, that's, let's move along to, the study because ultimately, my my real question is sort of a relatively healthy aging adult who's seeing some decline in cognitive function and, and overall performance, etc., you know, should they be entertaining a protocol with hyperbaric oxygen therapy and, and I guess, the study

out of Israel, which you're going to talk about, sort of address that, and I'd love to hear what you're about the, about the study and then your thoughts on it and the stuff that you're going to do to follow up on it.

Yeah. So in general, what I would say is, Again, if we just look at mechanisms because right now we don't have the research in the detail and the quantity that I would like to have this conversation.

But if you look at the mechanisms of how hyperbaric improves the speed of tissue repair and tissue regeneration, and you look at the aging process and the generation that occurs as we age, and even if it's low grade and chronic inflammation, that just sort of, you know, for a lot of folks that aren't necessarily taking the best care of themselves, the healthiest people, you know, and those things are wearing out over time.

And, you know, with 100% confidence, I would say that, the use of hyperbaric, again, doesn't have to be at human tolerance. Maybe there's, you know, some lower pressure range that would be appropriate for these people.

But, you know, consistent use of hyperbaric to upregulate mitochondrial function, to upregulate cellular and tissue performance, to help regulate tissue repair and tissue regeneration, cellular regeneration.

That alone, there's enough indication that that seems like that makes a lot of sense. You know, when we start to look at, let's go, let's go to the telomere.

So when we that was a particular study that where they, you know, our understanding again, and, and feel free to jump in and correct me.

Telomere Study and Aging Research

But, you know, telomeres are a great indicator of, something's happening. Right? So what is that something? You know, I don't know that all those answers are there yet, either.

But what we say is, you know, in general, these telomeres are these they're caps, they protect our genome. And when we have shorter telomeres that's associated with shorter cellular life or, you know, increased chances of senescence and other issues associated with cellular decline.

And when we have longer telomeres, that's associated with more of a youthful cell that's got a better chance to continue to have a very thriving and active cellular life and replicate properly and, you know, pass its genetic material down from cell to cell.

And so there's this idea that telomeres as they shorten are associated with the aging process. And I'm sure that that's true. I don't know that we know all those details.

And in general, a lot of us have looked into like, what are the things that we can do to decrease the rate that they shorten? There hasn't been a lot of work to say, what could we do to increase their length?

It's consistently been, what can we do to slow down? You know, again, we have this mindset like we're we're all on this degenerative pathway over time. And what can we do to slow it down?

You know, it's it's only now where a lot of us are really saying, well, wait, can we take that even further? And let's not even slow it down. Let's start turning it backwards and reversing the process.

Right? Yeah. And so this one particular study came out and, I think November 2020, and they were looking at hyperbaric oxygen. So they were using higher end pressure like two atmospheres of pressure, 100% oxygen.

They did, five sessions a day for a month, took a month off, did another five session today for next month, 90 minute sessions. And they were measuring telomere length on, five sessions a day.

Sorry, five sessions a week. Did I say five sessions a week? Monday through Friday? Sorry. Monday through

Friday, five a week for four weeks with four weeks off and then five a week for four weeks.

And so and they were they were measuring T helper cells, cytotoxic T cells and B cell telomere length. And they found an increase. So not only did it not decrease, they found an increase of a minimum of 20%.

Increase in telomere length across all three cell types. To take that one step further, they were also looking at cellular senescence. So, you know, senescent cell being a cell that's, you know, no longer functioning properly, not going to replicate, often leads to other inflammatory issues, especially in nearby cellular function.

And so what they found was that there was a peak somewhere, but depending on the cell type, between a ten to a 30% decrease in cellular senescence. In other words, a lot of these senescent cells have two choices.

Well, three, I guess they could either remain the same for a period of time. They need to get kicked back into action so that they can start to become normal, functioning, healthy cells again, or they need to be killed.

You know, if we have to kill these cells off so that we can have a stimulus to, you know, to send in stem cells and replenish those cells and, and, and, and improve, you know, this, that cell cell type performance.

And so in this, in this particular case, they saw a 10 to 30% improvement. And in other words, moving those senescent cells back into, normal, active, healthy cellular living.

So that's an enormous step. I would say those two factors were enormous steps. They also were measuring, cognitive, factors. And that group in general has done multiple tests on the aging population and cognition.

And we have seen changes in performance and changes in cognition across the boards in different age bracket, with different, levels of potential early stage or even moderate stage, you know, neurodegenerative disease, and pretty much across the board, we see very favorable effects in cognition, in aging populations with the use of hyperbaric.

Yeah. I mean, it was a very impressive study. And I would love to see it repeated. I think you're going to try to do that, with, your next endeavor. Yeah. So.

So I ended up wanting to go back and, understand all these mechanisms a little bit more in depth. So, you know, I went into, a PhD in molecular biology, some about a little more than halfway through that program and, just starting my IRB process right now and hopefully starting the research in the next month or two, what we're going to be doing is we're going to be looking at similar markers.

So we're going to be measuring cognition, and we're going to use, similar system as the folks in Israel have been using for that. We're going to be measuring telomere length.

We're also going to be measuring, methylation panels through, through diagnostic. We like their work a lot in terms of also understanding aging from a totally different angle.

And I can't say at this time, you know, there's there's reasons that I like that, in terms of the epigenetic signaling, maybe more than telomeres or not.

But at the end of the day, I want to I want to also help all of us understand this regenerative medicine concept and cellular aging. And and so I think comparing having more studies that compare telomere stat status and methylation status together, I think will help fill in a lot of those, gaps for for many of us, and then we're also going to be looking at just other blood markers, but in particular like a pretty robust cytokine panel.

So we can measure inflammation, cognition, methylation and telomeres. We're also going to do this against two different pressure ranges. So we're gonna have a mild pressure and and a higher pressure because in our field right now, there's still a lot of, I don't know, arguments, the right word, but, disagreement, disagreement on what amount of pressure is required to get what responses and over what period of time. Nobody knows these things.

In other words, the telomere study came out and every single and I thank them for that, that there was an amazing, piece to bring awareness to hyperbaric.

Every center that I support, and there's probably 30 or 40 of them across the country right now, literally for months, 2 or 3 months, had endless phone calls.

Hi, I heard you. You can grow my telomeres by 20%, you know. Is this true? And when can I start? And you know, and do you do the Israeli protocol? That's always the question.

Do you do the Israeli protocol. And so my question, you know, it's a legitimate question 100%. And in my mind I'm like, do we need to? And I don't know that. I'm not saying that we don't.

I'm just saying do we need to in other words. Well, that's important question because that could use protocol. Right. Exactly. So could you do a less aggressive protocol over a longer period of time and get the same result?

Could you do a lesser intense protocol and just not get 20%, get 10% and be happy with that? Could you could you do a more, a higher intensity and get 50%?

You know, nobody knows the answer to these questions. I'm not going to go to all of them. You know, I love to say I would answer all these questions, but I want to at least be able to contribute to the understanding of these mechanisms so that we can start putting together.

What I really want is, as we're measuring cytokines, different pressures over a different period of time, this happens here, this happens here, this happens here.

Methylation panels. This happens here. This happens here. Right. If we hyperbaric has been around for over 350 years in various capacities, but it's been more or less a, a treatment tool since, you know, the building of the Brooklyn Bridge, basically.

Okay. And it's built out from there. It's been around a long time, and it's still something. These questions have been unanswered for far too long. And now that the therapy is gaining the recognition that I think it finally deserved in terms of a role that it could play not only in sickness but also in wellness and regeneration.

We need to the people who are involved in this really need to step up and start answering these questions. And I give the guys out of Israel a lot of credit because they are so far out of the box.

And they are they are cranking out a few studies a year on really important topics, and I'm just trying to contribute my little piece to that puzzle, you know, which is great.

I think you're taking the right tack to, it's been a great and been a long conversation, but I think there's just a couple more things. If you have a couple more minutes, I'd like to answer the issue of the sort of soft hyperbaric, smaller chambers versus the big ones that the Israeli studies were in.

And I know earlier you mentioned to me that it's a matter of, you know, you get some hyperbaric in those doors just a little bit for the, you know, what people might want to go try and, and also should would somebody who is normally cognitively aging sort of have a benefit.

You know, I mean, I can tell you that patient mind that went to the Israeli chambers, totally normal 55 year old and one of the main things he noticed was an improvement in his sharpness.

You know, he did it during Covid because he had nothing else to do.

Soft Chambers, Practical Use, and Closing

It might as well might as well grow some telomeres and sharpen our brains. Right, exactly. So, you know, so what's

the relative merits of those? And, you know, is there, you know, is it worthwhile?

You know, again, there's not a there's not a whole lot of, detailed double blind, controlled studies in a lot of these cases. What I can tell you is like, when I had the neuropathy issue and my first, my stepdad was like my second patient, let's say after me, all that work was done in a soft chamber.

So it certainly does something. And we use soft chambers in our clinic. For the first handful of years that we did hyperbaric, we sort of graduated into using higher pressure because we started getting more complicated cases that really needed more, robust of, therapy.

So I would tell you that there's just there's a there's a pretty wide range if you're pretty healthy and you're basically just trying to use oxygen as a, as a nutrient, you know, soft chambers with a little extra enriched oxygen.

I mean, that's still offering you somewhere around 30%, 60%, you know, even up to two times more oxygen than what you're getting right now. So it's not like that's not a lot.

Once you get into like the two atmospheres at 100% oxygen, you know, you're looking at, you know, nine times 15 times, 18 times more oxygen than what we're getting right now.

So it's a I mean, even more and more. So I think what we're going to find, and that's part of the the hypothesis for my study is, you know, we need to start understanding the therapy in a way where we're trying to match the like I said earlier, we're trying to match the intensity of the therapy with the severity of the goal.

So if you're basically healthy and you're not really needing a whole lot, you know, a soft chamber or soft chamber with enriched oxygen can offer you an enormous amount of value.

As as you start transitioning into having bigger issues or longer standing issues or more severe issues, we need to start thinking about at what point do we have to transition to a higher chamber?

At what point do we need to start increasing the pressure beyond, you know, higher, higher amounts. But I hope like, you know, this time my plan would be this time next year, we have a pretty at least a good understanding for the study that we're doing.

And I'm using this study as really as a pilot study, hopefully to get funding from interested parties enough to do an actual larger scale version of the study that I'm doing for, for the PhD.

Well, I mean, it's there's a whole bunch of other questions I'd love to ask you. I know if you stop by over an hour of your time, and, my pleasure. Yeah, I know it's been really fascinating.

You, you know, explaining things I think really clearly, obviously have a passion for this, this field. Did you want to just mention, you know, where your clinics are, how people can get in touch with you and, and other social media stuff?

You might want to let folks know for sure. So our main when it comes to hyperbaric, I mean, business is it's called H bot USA. So HBO Hyperbaric Oxygen Therapy by usa.com is our main website.

Our clinic is new Jersey H bar, and we also have Pennsylvania H bar. And then on H bar USA, there's a locations page where people could start seeing the different locations that we've helped, you know, train these people, certify these people, or we have like business not business relationships, but like we help coach them and build protocols for them.

And you know that we're all basically offering a very, similar type of service to the patients that are that are looking for that. And then, like we were saying earlier, I'm also on the faculty for International Board of Medicine, IBM for short, but IBM teaches, you know, these 40 hour CME courses in hyperbaric medicine, diving medicine.

And then we have this what's really now considered to be a functional medicine hyperbaric clinician. So people who are doing hyperbaric but for off label use, the way that we do, we now have a certification program just specifically for those people because that's a whole different, you know, same mechanisms, different thought process and understanding those cellular cascades and how to utilize hyperbaric to really build in that.

So so the course that we offer is certified through International Board of Undersea medicine. I'm on their faculty for that. And so, you know, we offer those courses basically for 4 or 5 times a year.

Well, fantastic. You know, it's been really a pleasure talking to you, Jason. I, look forward to meet you in person at some point. I'm sure at one of the meeting, you're right across the across the river.

So, maybe I'll pop over and get myself some kind of an answer. Yeah. Anytime you want to come by and be happy to have you. All right. Thanks very much again. Of course. Thank you.