

Using Hyperbaric Oxygen Therapy as an Adjunct for Disease Management

A Special Interview With Dr. Jason Sonners

By Dr. Joseph Mercola

Dr. Joseph Mercola:

Welcome everyone. Dr. Mercola, helping you take control of your health, and I have a repeat guest with us today, Dr. Jason Sonners who is the clinician who first introduced me to hyperbaric oxygen therapy. I've had a chamber for a number of years now. How many years did we first connect, Jason?

Dr. Jason Sonners:

I was just thinking, I think it's a little over two years.

Dr. Joseph Mercola:

No, it's got to be three. It's got to be at least three, maybe even closer to four.

Dr. Jason Sonners:

A lot.

Dr. Joseph Mercola:

Yeah, time flies when you're having fun. So interestingly, this is his passion, his life. His formal training is that of a chiropractor, but he's going back and this is why we're doing a follow up and he's actually getting a Ph.D, in hyperbaric oxygen therapy. So he's got to give us some great updates, especially in light of the intervention. Well, not at the intervention, but in light of what's been going on with COVID-19 and how it has and could be used as another form of therapy to improve the recovery from those who come down with this disease, so welcome and thank you for joining us today.

Dr. Jason Sonners:

Of course. Yeah. I'm happy to be back and love to share those updates with you and help just share this with your audience.

Dr. Joseph Mercola:

So today, we're going to talk about obviously, hyperbaric medicine and I think the best questions to start out with, for those who have not been exposed to it in the past is, what do you think its benefits are and what can it be targeted for? And maybe comment a little bit on its use in the use of infectious diseases. Then, we can talk about how it's administered and how one can find access to it.

Dr. Jason Sonners:

Okay. Yeah, I mean, there's a lot in that question. I'll start piece by piece but what I would say is this, every cell in our body requires oxygen to create energy, all the cells except for our red blood cells, basically. So our red blood cells are charged with the job of delivering oxygen to all the other cells who utilizes that oxygen for the creation of energy within that cell. A lot of – many chronic illnesses or many issues that people are experiencing in general in America or other industrialized nations, has a lot to do with decreased mitochondrial function, increased systemic inflammation, and a lack of the ability for cells to really generate the amount of energy that they need to perform healthy and optimally in whatever function that they have. So we use hyperbaric oxygen traditionally for these terrible and severe conditions.

Dr. Jason Sonners:

We often use it as a last result for, literally, right before an amputation surgery or potentially as a lifesaving mechanism for somebody with carbon monoxide poisoning or air/gas embolism. So, we only think about it traditionally to help save the life or limb of somebody in a really severe condition, but the mechanisms that are working for those folks are very similar to the reasons that you and I might consider using hyperbaric oxygen for, upregulating the oxygen levels inside somebody's body, which will help reduce the inflammation that many people are exposed to, increase mitochondrial function that many people have issues with and thereby increasing the energy that those cells are able to generate so that we can start to see a much more healthy, vibrant human as each other different cell types are starting to able to generate the energy that they need to function from.

Dr. Joseph Mercola:

That's great, so how would you phase or stage the use of hyperbaric medicine in those who may have come down with COVID-19? Because there were some interesting clinical trials, I think in New Orleans or Louisiana, for sure, where they had hyperbaric chambers center, they had at least half a dozen chambers, maybe more, where it was part of the hospital. It was really easy to integrate it and they had incredible success stories coming out of that. That was early on in the epidemic and I haven't followed it up since, but obviously the potential challenge of implementing hyperbaric medicine into this application is that you have to have a pretty rigorous disinfection process between patients.

Dr. Jason Sonners:

Yeah, so there was a lot of interest and conversations that were happening early COVID around hyperbaric. A lot of these patients were described as able to talk, able to breathe physically, just not able to saturate red blood cells. So the issue wasn't in the ability to breathe, it was in the gas exchange. If you really understand hyperbaric medicine, hyperbaric has no – we talk about pressure but you don't feel pressure on you. It doesn't change the pressure experience of how somebody's breathing, it doesn't force anybody to breathe. All it really does is it generates a larger pressure gradient so that when you breathe, you have greater gas exchange. So, it seemed to make a lot of sense early COVID that using hyperbaric for these patients would've been a pretty natural thought process to go into.

Dr. Jason Sonners:

I happen to be able to be a part of a lot of really interesting discussions in the U.S., but also with pretty prominent health figures in Spain, in Ireland, in Australia, people were looking at ways of trying to get large amounts of people access to this pressurized environment. At the time, people weren't flying, a lot of planes that were grounded. So people – airplanes are basically giant hyperbaric chambers, so there was talk about potentially even looking at, “Can we be using this equipment that's grounded and put hundreds of patients in at the same time and be able to pressurize?” Because to your point, you're either treating positive COVID patients or you're not treating positive COVID patients. You can't have a positive COVID patient at two and then have a negative COVID patient at 3:00 in your office you'd become your own basically super-spreading event.

Dr. Jason Sonners:

So they were looking at other mechanisms to try to get access to this. Now, for a variety of reasons, sometime that summer, those conversations seemed to calm down. I think the – as we started to understand the virus a little bit better, and maybe we started to see that the death rate from the virus wasn't as extreme as predicted initially, the intensity of the conversations of what needed to happen to help these patients seem to also diminish around them, and there are still some ongoing studies. To your point, there's one out of a Brazil. There's one out of Israel. There's one out of – I believe Spain. There was one out of Langone in New York and I think they were still doing one in Louisiana as we speak, still looking at the potential for treating positive COVID patients with hyperbaric and what the benefits or effects or helping to keep patients off of respirators and the like.

Dr. Jason Sonners:

Since then, what I would say is, for most of us who treat a variety of conditions with hyperbaric, there's been as much, if not, a greater interest now in looking at hyperbaric for post COVID, particularly for what's considered to be this long-haul COVID syndrome. So these patients who are left with either long-term neurologic consequences or long-term heart and breathing consequences or long-term increased inflammatory issues. So, there's been a pretty big movement in hyperbaric just to help support those patients. In these cases, I would never say that it's even a – it's not a treatment for COVID directly at all in those cases. It's really just, again, all the same mechanisms that hyperbaric can help a patient with in terms of healing tissue and reducing inflammation and rebuilding the immune system, increasing the white blood cell activation, again, with reactive oxygen species.

Dr. Jason Sonners:

All of these systems that hyperbaric happens to help with seems to also help create an environment that allows a lot of these long haul-type COVID patients to regain normal function.

Dr. Joseph Mercola:

Yeah. That makes sense. I mean, if it's really a powerful intervention for someone post-stroke, in fact, I can't think of a more effective intervention, acutely, than to get the person into a series of hyperbaric treatments. Then it would make sense that they should be able to recover for some of the incredible neurological damages done from the reaction to not only the illness, but the vaccines because that's another issue is recovery, not only from the infection, but probably more

cases would be the results of being jabbed with the COVID injection. So, as you were answering the question, it occurred to me that you are probably right that because of its complexity and its cost, it's not the ideal setup for treatment of acute COVID infection but recovery makes a lot more sense.

Dr. Joseph Mercola:

I mean, especially in life, because we have so many other relatively effective and inexpensive strategies that are widely available so that should be a first-line treatment, but assuming that one had access to it, I'm just curious what your thoughts are because clearly this is not going to be widely implemented. How effective would you rate it as a treatment modality in treatment of acute COVID?

Dr. Jason Sonners:

Again, so I think there's a few pieces. One is, it's not controversial, I don't think at all to say that one of the major mechanisms of hyperbaric oxygen is this upregulation of white blood cells' ability to fight infections specifically through the white blood cell reactive oxygen species mechanism. So it's been used for other infections for many, many, many years. It would make a lot of sense to utilize hyperbaric as a mechanism to improve your immune system's ability to fight an infection, period, that's-

Dr. Joseph Mercola:

And when you say infection, are you referring to bacterial, viral or both?

Dr. Jason Sonners:

I mean, honestly, both. Some similar, but other different reasons but both. In addition, specifically in this context with regard to COVID, even in the less severe versions, we have a lot of people monitoring their oxygen saturation and still today, while we've been able to keep more and more patients off of respirators for a variety of reasons, oxygen saturation still seems to be an issue. So to improve a patient's ability to have gas exchange occur, especially in a time where there's a lot of inflammation and barriers that are getting in the way of normal oxygenation at the lungs, at the alveolar level, using something like hyperbaric to improve the pressure gradient, to improve oxygenation on the other side, that's still something that seems to make a lot of sense to me. We've certainly have helped quite a few patients managing this, who had access to hyperbaric, get through it.

Dr. Jason Sonners:

In those cases, in most of those cases, I don't think that that's about fighting the infection or curing the illness, it's about helping a patient maintain higher and more normal levels of oxygen while the body is going through this fight, so you're just supporting the system with the oxygen that it needs while the body is going through the infection process and then could continue that into the early stages post-COVID to help improve the recovery, the regeneration, the reduction in inflammation and all the other things that hyperbaric has the ability to help these patients with.

Dr. Joseph Mercola:

Well, that kind of speaks well to your belief of oxygen as a nutrient because clearly one of the complications of a COVID infection, mechanistically, is that it impairs your body's ability to utilize oxygen, to receive it and obtain it as a nutrient. So supplying it exogenously, externally would be a great support and really given your body the nutrition it just can't access because of the infection.

Dr. Jason Sonners:

Right. I mean, in theory, it's not like that's a secret. I mean, that's why we're using respirators in general, like we're trying to get that, but rather than just using a high-flow oxygen and sort of the exterior pressure of the respirator, we're pressurizing the gas itself because it's pressurized gas that leads to improved diffusion across the gradient. So, it's not that different of a concept, it's just potentially more effective.

Dr. Joseph Mercola:

Yeah, at a minimum of any clinician watching this or someone watching it [who] has a relative in the hospital that is being considered with a COVID infection, being considered for a ventilator, you've got to just vigorously refuse that intervention because it has, in the past, been notoriously associated with – they died, it was almost been a death sentence, if someone is put on a ventilator. Far better intervention would be hyperbaric. I mean, because that's going to achieve what the intention of going on a ventilator is supposed to do.

Dr. Jason Sonners:

Right. So there was a-

Dr. Joseph Mercola:

There's hasn't any technology on COVID, it just blocks the membranes in the lungs and plugs them up with liquid. It basically makes it impossible to get the oxygen through.

Dr. Jason Sonners:

Early on, there was a – I'm pretty sure it was in the Chicago area, have you seen the hoods they used with hyperbaric chambers?

Dr. Joseph Mercola:

Yeah. Yeah. We used to have one, one of the chambers.

Dr. Jason Sonners:

Okay. So, what they were doing was they were still only at the surface, right? They're not using hyperbaric per se, but rather than utilizing the more traditional ventilation, what they were doing is they're putting the patients in the hood and creating pressure in the hood. I don't know what pressures they were able to get to. I think you could probably get pretty close to like a 1.3 or 1.4 atmosphere, even in that hood alone. Since then, there've been a couple companies, I don't know how far they've gotten yet, but have been trying to create sort these higher-pressures hoods.

Dr. Joseph Mercola:

Many hyperbaric chambers.

Dr. Jason Sonners:

Right, just for those purpose, right?

Dr. Joseph Mercola:

Yeah, yeah.

Dr. Jason Sonners:

It's an interesting idea, it seems like that would make certainly again, more sense than other modalities that we've been trying.

Dr. Joseph Mercola:

Yeah. So why don't you give us an update of your journey since we last talked and what's been happening and what motivated you to get back to school and continue your studies in this discipline?

Dr. Jason Sonners:

Yeah. So I think, the last time we connected, I think I had just finished writing "Oxygen Under Pressure" and that was a great experience. You know, you've written quite a few books. So, it was a big journey for me, but it was well-received and we did pretty well there. At that point, obviously, all pre-COVID, we were seeing a great uptick in interest and the awareness of hyperbaric and we were participating in a handful of different either interviews or summits, or even online, or in-person conferences and having good opportunity to share so much of the information at hyperbaric with other doctors, with the public. As that continues to grow, there was – as you well know this. I mean, when I first started, I think about 14 years ago, the amount of research that was available on hyperbaric was negligible. At this point, it's grown a lot, but there's still enormous holes in the research.

Dr. Jason Sonners:

So many people asking so many of the same questions, things like, "What pressure is required to get the benefits that I'm looking for? How many sessions are required to get the benefits that I'm looking for?" At this time, the real answer to that is still, "I don't know." We know certain ranges, we know certain periods of time, but we really don't know that that level of detail. So, honestly, just being frustrated by reading as much as I've read and learning as much as I've learned and still not having those answers. Then, also, really generated through some conversations between you and I, I decided that if we were going to get those answers, someone is going to have to do the work. So, I decided that I should contribute to that process. So I applied to University of Miami, so their Ph.D. program in molecular biology.

Dr. Jason Sonners:

Then my focus is in specifically, regenerative medicine and I'm using hyperbaric as our tool for the research that we're going to be doing to really help understand the different pressure ranges and ultimately what effect those different pressure ranges have, and to be a little bit more, or

hopefully a lot more specific in terms of what our expectations should be, what types of changes happen over what periods of time, based on those different pressures and hope to at least be able to contribute significantly to answering a lot of those questions. So that was sort of the impetus to going to school. Now, school was supposed to be a mix of in-person and online learning, and I started in the fall right before COVID. So my first semester was that sort of hybrid and then, like most other universities, we ended up going fully virtual for most of the following year.

Dr. Jason Sonners:

So, classes are a great experience. It's different going back to school from this perspective, especially at this level, but there's so much to be gained, so much knowledge to be learned and I'm looking forward to being able to apply so much of this biology and genetics and epigenetics into the field of hyperbaric medicine and, and contribute my part to that.

Dr. Joseph Mercola:

So how does the study or the curriculum work? Is there a basic amount of courses that you need to take and get under your belt and then write your thesis, and have you selected your thesis and started on it?

Dr. Jason Sonners:

Yes, so there's an amount of base knowledge education and mastery in biochemistry and basic molecular biology, basic genetics. Then there's a course load that you get to choose from that help really a little bit more in depth with exactly what your topics are going to be. So I'm about two thirds of the way through the academic component. Once you're about halfway, you're allowed to apply for candidacy and start with your thesis. So I did write the thesis. I did have – I went through that whole process, that was approved and then I just spent the last few months writing the informed consent and the IRB. So the research itself has actually been approved as of literally about a week ago.

Dr. Joseph Mercola:

Well, congratulations. Maybe you can share with us what your thesis is on?

Dr. Jason Sonners:

Yeah. So there's been some great increases in, like I said, awareness and research in the field of regenerative medicine with hyperbarics, specifically, I know you're aware of the guys out of Israel that are doing a lot of that work. So, I really want to expand on that because I believe while we use hyperbaric for – traditionally, in traditional medicine, we use hyperbaric for these basically life-threatening or limb-threatening diseases. So, when somebody's next step is likely to be an amputation of a limb or potentially death from an infection, that's when hyperbaric is often introduced. Even in those dire circumstances, we seem to have great response with hyperbaric for those patients. So that being said, we've still been so slow, traditionally, to uptake more hyperbaric oxygen for – as opposed to these really acute and severe conditions for these other sort of chronic autoimmune neurodegenerative conditions.

Dr. Jason Sonners:

My thought process is the mechanisms of action of hyperbaric are the same, whether we're talking about gangrene and radiation burns and osteonecrosis, as they are for TBI and concussion, maybe MS or post-stroke, so many of these other conditions that we might be using hyperbaric for. If we really get a mastery of the mechanisms of action, we can start to apply those mechanisms across the board to understand. Clinically, we've seen hyperbaric work for so many of these other chronic illnesses. Issues that we don't have the level of research at this time to really support it the way we do, some of the more severe conditions. So if we could really hone in on those mechanisms and understand them better, and then get a better feeling for what point of time and what pressure settings do we require in order to get those mechanisms to start kicking in, then we can really, with more confidence, apply this therapy to these other conditions and have more consistent results in doing so.

Dr. Jason Sonners:

So a lot of the work that I'm proposing to do is tagging onto some of this work in regenerative medicine, where they were looking at, in some cases, a lot of the collagen and fibroblast and stem cell response to hyperbaric. Then, in a newer study that came out, I think it was actually in 2020 on the telomeres and looking at this potential, upwards of 20% increase in telomere length, especially in certain immune system cells, I want to build on that knowledge base. So what I'm doing is I'm creating a study that's going to have a lower pressure group and a higher pressure group, and we're going to be looking at a whole cytokine panel, so we can get to understand the mechanisms of the anti-inflammatory side. We're going to have a methylation panel so that we can start looking at the epigenetic effects of hyperbaric.

Dr. Jason Sonners:

We're going to have a telomere component similar to the telomere study that was done a year, year and a half ago.

Dr. Joseph Mercola:

That was out of Israel, right?

Dr. Jason Sonners:

Exactly, and we're going to start comparing, all of those metrics across roughly a three-to-six-month timeframe of treatment and over two separate pressure settings, to better understand which pressures are getting which effects and again, what period of time should we be expecting before we get the results that we're looking for.

Dr. Joseph Mercola:

Yeah. What pressures did you select?

Dr. Jason Sonners:

So I selected, on the low end, I selected the 1.3, 100%. Both are going to be 100% oxygens just to keep that consistent, but as you well know-

Dr. Joseph Mercola:

You're breathing that through a mask, it's not 100% in the chamber, right?

Dr. Jason Sonners:

Correct.

Dr. Joseph Mercola:

Yeah.

Dr. Jason Sonners:

Yeah. Most likely in the setup that we're going to do, we're going to use hoods just to increase the likelihood of getting a full, 100% dose, but you know that soft chambers are basically running at 1.3 and there's a lot of soft chamber use across the country and there's a lot of-

Dr. Joseph Mercola:

When you say 1.3, for those who don't know, that's atmospheres.

Dr. Jason Sonners:

Yes, the 1.3 atmospheres. In PSI, that's about 4.2 PSI, and we're going to run that against higher pressures at 2.0, two atmospheres, which is basically, 14.7 PSI, and a lot of this is because, listen, if soft chambers are effective and they work well, we need to be able to measure that and determine where they fit in this concept around hyperbarics.

Dr. Joseph Mercola:

Yeah, and make it more widely available for sure.

Dr. Jason Sonners:

Exactly, and if they don't, in other words, if across the board, we're talking about therapies and we're not comparing apples to apples in any way, shape or form, then we need to know that too, and we need to start being as specific as we can with, exactly what the expectations should be when we're using different pressures of different equipment.

Dr. Joseph Mercola:

Now, I suspect you've done a literature search and review before you've submitted of your thesis. Has there been any serious or significant studies done on the soft shell or soft chambers?

Dr. Jason Sonners:

So there's definitely, yes and no. There's nowhere near the amount of research in soft chambers as there are in hard chambers, the overwhelming majority of research is done at that 2 atmosphere range, which is why I'm choosing that as the upper end of the research that I'm doing in the soft chamber research, there is definitely some, there's some on sports recovery. There's actually some ongoing studies right now on hyperbaric for stem cell use that we're waiting for some of that published work to come out. In some cases, 1.3 as opposed to being used as a treatment arm in the research, 1.3 has been used as the sham group in the research and whatever the reasons for using it that way, maybe because the study team really thought that 1.3 wasn't

going to have an effect and it's a legitimate sham or potentially that we're trying to negate the use of 1.3 within the field.

Dr. Jason Sonners:

I'm not sure, but there are some great studies. There's a study that was done on cerebral palsy and 1.3 was used as the sham group and with a lot of people, you know this as well as anybody else. It's not that difficult to look up a study. You might read the abstract, you might read the results and you kind of move on from there. Very few people really start picking apart the studies themselves to really understand the design and what went into it, and how valid are the results that we're really concluding? So in this particular study, at 1.3, as being the sham group, there was a baseline test, there was a control group that got no hyperbaric at all. Then, within the sham group, there was significant improvement on the metrics that they were measuring. Then they had a 1.5 100% oxygen, which also had a good improvement and then, a 1.75, 100% oxygen, which had even a greater improvement.

Dr. Jason Sonners:

The issue in the study was that while all three of those groups improved, there was no statistical difference or enough of a statistical difference between the 1.3, the 1.5 and the 1.75. So, the conclusion of the study was, "therefore hyperbaric does not work for CP, although all three of those groups had significant improvement." So, because the sham group was not considered a treatment, that was the conclusion of that study. Now, the natural consequence of that should have been potentially redoing the study and creating a different level of what the sham should be obviously and what the treatment arms ought to be, but that was never redone. So as a result, there's this study that the results say, hyperbaric does not work for CP. Meanwhile, clearly what it means is we need more studies. It's just, as you all also know, studies are expensive.

Dr. Jason Sonners:

They take – they're very time consuming and you really have to have a large interest in trying to come up with the right answers to really put forth the effort and time and money to get that kind of work done.

Dr. Joseph Mercola:

Sure. So let's get into the mechanisms of action, because I find that intriguing. The general thought is that it seems to be relatively obvious is that if you breathing 100% or exposed in an environment of 100% oxygen and you put that in a pressure, you're going to deliver simply more oxygen to the tissues. So that's clearly a part, but that may not be the biggest reason why the benefit occurs. The last time I reviewed this, it has been a while now, I thought there was some speculation as to the degeneration of a molecule called HIF-1 alpha, hypoxia-inducible factor alpha, that is generated when you actually lower the pressure. So it seems that maybe much of the benefit occurs once you are getting out of the chamber and you reduce that because that catalyzes the generation of its molecules. So can you comment on that and give us your thoughts?

Dr. Jason Sonners:

Yeah. So in a lot of the work, I think over the last year and a half for me in terms of what I'm rereading, but also what I've been teaching in a lot of the courses that I teach is exactly that. I would say we don't have an exact number right now, but I might say something like, roughly about half of the treatment is occurring while you're in the chamber, being exposed to the pressure, being exposed to the oxygen and literally accumulating a surplus of oxygen because of the therapy itself. Then, the other half of the therapy is when you get out of the chamber that oxygen can no longer stay in solution. So it literally starts trying to bubble out of solution. As that happens, it's not inert, it's actually very active. So, as it's coming out of solution, it's interacting with all of our cells. As a result, it's triggering a massive cascade of events, cellular communication that seems to stimulate a multiple series of regeneration and anti-inflammatory, even within the reactive oxygen species themselves.

Dr. Jason Sonners:

So when we look at the first part, which is the dosage of oxygen a person is getting, which is really what hyperbaric medicine has been focused on for the last, however, depending on how long you want to go back in history and that's measurable, you could say here's a person, they were in a chamber, they were at this pressure, breathing this percentage of oxygen for this amount of time and you could literally calculate the theoretical dose of oxygen that that person was exposed to and should have been able to absorb. We've kind of just stayed in that mindset for all these years. There was a great paper, actually the same group out of Israel. They wrote this paper, it was called the "Hypoxia-Hyperoxia Paradox," and what they're saying is we know that there's amazing benefits of hypoxia actually.

Dr. Jason Sonners:

When you go into these states of hypoxia, to your point, HIF-1 alpha is stimulated and there's this entire cascade of cellular events that start to stimulate the stem cell responses, the collagen responses, the angiogenic responses. So one of the biggest ... I would consider hyperbaric to be this anabolic therapy. It's a therapy that stimulates growth and repair and so, VEGF, BDNF, PDNF, all of these growth factors are stimulated from hyperbaric but they're not stimulated from the hyper-oxygenation. They're stimulated from the process that your body is going through, as that oxygen is leaving your body, this hypoxic component. It's not true hypoxia, it's relative hypoxia, and that's the important thing to note is that once you've accumulated all this extra oxygen, your hyper-oxygenation component, as that oxygen is leaving your body, you're never truly hypoxic.

Dr. Jason Sonners:

It's just, you're losing the extra oxygen that it doesn't gain, but the cell signaling factors that respond to traditional hypoxia are also seemingly responding to this relative hypoxia. If you look at that paper, which is a great paper, it seemed to delineate this, with hypoxia alone, you will still get VEGF which means you'll still get a lot of angiogenics, so the rebuilding of the endothelial lining, the creation of a new micro-circulation bed, all this capillary regrowth will happen from hypoxia. You'll get these stem cell releases, so this potential for increase in regenerative nature of cells. You'll get this increase in the HIF-1 alpha, as we were discussing. But if you're chronically hypoxic, you're also going to get a downregulation of sirtuins and you're going to get a downregulation of mitochondrial function.

Dr. Jason Sonners:

Sirtuins could play a great role in things like, cell cycle life, getting cells out of cellular senescence or kicking them back into active life, or literally apoptosis, killing that cell so that we can replace it with a new stem cell, or even the genetic and epigenetic repair mechanisms, a lot of that has to do with sirtuins. So we don't want to downregulate those, we want to upregulate those, and then also-

Dr. Joseph Mercola:

This hypoxic induced sirtuin inhibition, sirtuins by the way, are longevity proteins, for those that don't know. Very important to health and longevity, but are you suggesting that it's the relative hypoxia or it's the hypoxia that you might want to experience in a low oxygen environment clinically?

Dr. Jason Sonners:

Yeah. Good question. No, this is specifically an actual hypoxia.

Dr. Joseph Mercola:

Okay.

Dr. Jason Sonners:

So in a low oxygen-

Dr. Joseph Mercola:

That's what I thought. This is like, you get the benefits with hyperbaric, you get the benefits of hypoxia with none of the downsides, none of the sirtuins inhibitors.

Dr. Jason Sonners:

Not only not having the downsides, it's the total opposite, right? So in actual hypoxia, you get the VEGF, the stem cells and HIF-1 but you lose sirtuins and mitochondrial function.

Dr. Joseph Mercola:

Right, right.

Dr. Jason Sonners:

With intermittent hyperoxia-hypoxia, the way you would get through hyperbaric, you still get the VEGF, you still get the HIF-1, you still get the stem cells, but not only do you not lose the sirtuins, you actually get an upregulation of sirtuin activity. Not only do you not lose the mitochondrial function, you actually get an upregulation of the mitochondrial function and even increased mitochondrial replication. In other words, your body will actually replicate mitochondria and will get an increase in mitochondrial density in the tissue to make sure that the body is using the oxygen as efficient as possible. So exactly, to your point, you get all of the benefit of hypoxia and all of the benefit of hyperoxia, simultaneously. So, it seems to be-

Dr. Joseph Mercola:

The third point is now the downsides of the hypoxia that you would in a normal environment.

Dr. Jason Sonners:

Exactly.

Dr. Joseph Mercola:

Yeah, which is like, that's just incredible. I didn't really understand until you explained it, so thank you, so really important distinction.

Dr. Jason Sonners:

Yeah.

Dr. Joseph Mercola:

And the other thing I didn't really, wasn't clear on was, I knew that hyperbaric therapy was an oxidative therapy, it's an oxidative intervention. Somewhat similar to ozone, maybe we could talk about that in a little bit.

Dr. Jason Sonners:

Sure.

Dr. Joseph Mercola:

I wasn't sure how it did and you – how it manifested that and your explanation of having the extra oxygen that was infused into the tissue slowly percolate out and being available as obviously in oxidative stress. I mean, there's no question. So, with that in mind, most of the programs I'm familiar with suggest that using a really selective potent antioxidant approach is really great, and my favorite of course, is molecular hydrogen because once it's on board and you have it loaded, like an hour charge before your intervention, that if indeed your body does perceive – your body, not your mind but your body perceives an oxidative stress that requires some antioxidant intervention, it will make the antioxidants itself, glutathione, SOD, catalase, all of these things that you may need. So what are your thoughts on using molecular hydrogen or other antioxidant interventions?

Dr. Jason Sonners:

So, another great question. I'm going to go a little further into that first.

Dr. Joseph Mercola:

Sure.

Dr. Jason Sonners:

So there was another great paper done by Dominic D'Agostino and Angela Poff, I think back in ... it was either '17 or '18, looking at hyperbaric oxygen, but also specifically looking at the reactive oxygen species or the free radical component of, "What are the benefits or consequences as we upregulate or as we increase the amount of oxygen into the body?" As the cells and the mitochondria start to uptake that oxygen producing more energy, there is a natural consequence,

if you will, where this byproduct of free radicals being released as a part of normal cellular respiration. I'll say that, I think in certain ways, while excess free radicals is obviously consequential to ourselves, especially like cell membranes, lipid peroxidation and protein degradation.

Dr. Jason Sonners:

So really, it could destroy cell membranes, mitochondrial membranes, nuclear membranes, genetic material, so there are many consequences to all of this excess free radicals. At the same time, it's a normal response to cellular respiration and our bodies have their own intrinsic mechanisms for dealing with some of this excess free radical, to your point, things like the superoxide dismutase, catalase, glutathione pathways. So there seems to be a distinction that we should make. One is that some of the free radicals our bodies are exposed to come from the outside world in. In other words, radiation, smoking, air pollution, the list goes on and on. So we need to have a robust, intrinsic ability to tolerate these free radicals with our own antioxidant system, but in excess, we could be getting too much free radicals and we could be depleting our own systems in which case supplementation should certainly be considered and used in a lot of those cases.

Dr. Jason Sonners:

Now, on the flip side, we look at hyperbaric oxygen as this tool that theoretically has all these great effects, but one of those consequences would also be considered this increased in free radical exposure. There seems to be a very big delineation between a body that's exposed to free radicals from the outside world, from our environment versus a body that is exposed to free radicals that it's creating on its own. One of those distinctions to make is that through the use of hyperbaric oxygen, even without supplementation, through the use of hyperbaric oxygen exposure and the increase in free radical production from mitochondrial ATP production, the body itself, assuming it has the right raw materials, will actually increase its own superoxide dismutase, catalase and glutathione pathways.

Dr. Jason Sonners:

Which would, number one, it would help make you more resilient to hyperbaric oxygen, but number two, would also help make you more resilient to all the other free radicals that we're potentially being exposed to by our environment. So, I would say two things, one, especially with patients who are what I would consider a little bit more fragile when it comes to oxidative stress. Those people, I would tend to not over-oxidate to begin with, so I might start at a more gentle protocol with hyperbaric with them, and I'm likely to want to start quickly upregulating their own system, getting the right supplementation for improving their antioxidants, intrinsic antioxidants systems themselves or even other like the seleniums and vitamin Cs, like other extrinsic supplementation for antioxidant benefit.

Dr. Jason Sonners:

Then, slowly improve, as their system improves, their tolerance for reactive oxygen species, we may not need as much of that, or if we're going to be using high-dose hyperbaric oxygen for a period of time, like you said, we might use things like certain SOD precursors, or certainly molecular hydrogen has also actually through conversations with you, it becomes, one my most

favorite also antioxidants that we use and we'll do somewhere between a 45 minutes to an hour before exposures and start loading people with the molecular hydrogen as a mechanism to reduce the consequences. There are benefits, in other words, reactive oxygen species on its own also helps stimulate hormone balance, helps stimulate cell repair by themselves. So there's, like anything else, and I'm sure you would agree, there has to be this balance. We could over-oxidate, somebody too, right?

Dr. Jason Sonners:

We don't want to quench all the free radicals because free radicals are a very important signaling molecule for so much cellular activity and at the same time, we want to be aware of the fact that hyperbaric does increase that, and we want to make sure that we're not over-exposing somebody out.

Dr. Joseph Mercola:

Yeah, no question. This is why molecular hydrogen is such a favorite of mine because by itself it is not an antioxidant. It does nothing to reduce oxidative stress independently. Its byproduct reactions where it stimulates the NRF2 pathway and causes your own body to make its antioxidants, if your sensors determine that it's needed because if it's not needed, nothing happens. So it seems it has a built-in failsafe mechanism and from your experience, because – this is only from academic intellectual perception, but I don't have any clinical interaction to confirm that, have you noticed – do you have seem to notice that as a benefit where compared to someone who would take high-dose vitamin C or combine it with glutathione directly intravenous or sublingual, which is forcing the body to have this increase in antioxidant capacity, that it may not need. So, it shuts down the beneficial free radical signaling molecules, definitely, as you talked about.

Dr. Jason Sonners:

I would say there were – earlier on, and not even that long ago before I started using molecular hydrogen, I might have assumed somebody to be a little bit more sensitive to the antioxidant or to the oxidation than they were and I could see that using a more standard approach to actual antioxidants could have a negative effect, but even so could just prevent some of the benefits of what I'm trying to accomplish with the hyperbaric oxygen, could interfere with that and they wouldn't get the full benefit of that system. Since using molecular hydrogen more as that mechanism, we haven't seen that at all.

Dr. Joseph Mercola:

Okay, so your clinical experience confirms that.

Dr. Jason Sonners:

Yes.

Dr. Joseph Mercola:

It's good to know. So another interest I have is exercise and it's one of the things that impress me with you because you're quite a physical specimen, there are very few people I've had to my house who aren't as good as shape as you are. I appreciate that because you're seeking to teach

people how to be healthy, and if you aren't yourself, it's somewhat hypocritical. So you have a keen interest in personal fitness. So along that lines, we know that autophagy is a really profoundly useful and powerful longevity intervention. One of the ways I personally seek to activate that is by fasting for a minimum of 16 and in the winter, it's sometimes 20, 22 hours before I eat my first meal and exercise in that fasting phase, usually right before I eat because that further depletes the glucose or the glycogen in your muscle tissue, which continues to even further increase the autophagy activation.

Dr. Joseph Mercola:

But then, I'm wondering, recently I've been doing that strategy and then following that, before I eat, so I do the exercise and I go right from the exercise into the hyperbaric chamber. So I'm wondering what your thoughts are on that sequence and integrating the hyperbaric as part of an autophagy activation strategy.

Dr. Jason Sonners:

That's really interesting. I don't get that one as often.

Dr. Joseph Mercola:

You don't? [inaudible 00:45:30]

Dr. Jason Sonners:

I love it and I did enjoy our workouts together. I'd love to do that again. It's not often I get such a big challenge on competitive pull-ups like you showed me. So, I would say a couple things, some people use hyperbaric oxygen from like a performance standpoint, let's just say, while others are looking at it more from a recovery kind of standpoint. Now, I mentioned earlier that a lot of the mechanisms of hyperbaric are really anabolic for the audience, meaning rebuilding, regenerating, stimulation of growth, tissue growth repair, etc., cellular repair. Whereas fasting is very catabolic. The autophagy is a particular purposeful breakdown of certain cellular components or cells on a whole, especially-

Dr. Joseph Mercola:

Not just certain, damaged ones.

Dr. Jason Sonners:

Right, like underperforming and damaged cellular – right, because if we can clear out the garbage, it helps to stimulate the likelihood of stem cells coming in to repair, cover and regenerate the proper tissue types. So, I love the idea, number one. I think it takes time, obviously for people to go through the process. Some people, as they start fasting or other things, they have dips and energy while their body is trying to deal with changes and fuel sources and the like, and so there might be a moment where people going through that, the exercise in a fasted state might take some time to get used to, but I think most people that we've worked with, I'm sure you have the same experience, once you get through that process, exercising in the fasted state actually far exceeds your capacity to exercising in a fed state, in many ways.

Dr. Jason Sonners:

I find that especially for fuel and endurance and muscular endurance, especially and I would absolutely agree that exercising in the fasted state dramatically upregulates the effect of autophagy as your body is required to find even a greater fuel source during this time where you're expending even greater energy. So I think that that's a great combination to improve the process of autophagy, as well as the ability to create energy from, let's say from body fat and from creating ketones and the like. That being said, you then want to go into this fed state. You want to clear out the garbage, you want to break down the [inaudible 00:48:20], the dysfunctional cells. You're trying to clear out the garbage and then create space to bring in the new.

Dr. Jason Sonners:

I think that that's where hyperbaric would fit that model. So, you're re-feeding, so your first meal I'm sure is obviously very nourishing. It's probably relatively high in fats and you're refueling the body to now start this, "Okay, now we're getting fuel. Now, we're going to recover, regenerate and heal the tissue that we just broke down." And because oxygen or hyperbaric oxygen specifically is so stimulatory and anabolic in that capacity, I think you're literally – at the end of the day, all the food we eat, I mean simplifying life, but like the food we eat that we're going to use for energy, all breaks down into NAD or FADH₂ and then, we combine that with oxygen to create ATP, cellular energy. So, you're going to refuel properly with foods that are going to be very energy-dense with good-quality fats. Then, you're going to oxidize those fats with, hyperbaric up with extra oxygen, right?

Dr. Jason Sonners:

So, as a synergistic effect to help refuel the cells to now upregulate their performance. Hyperbaric oxygen would play such an amazing role in helping to improve the performance of that cell, who's now being refed to function properly, to heal and regenerate.

Dr. Joseph Mercola:

All right. Well, I've got some questions on that, but I just want a clarification first because I love the fact that you're getting a degree in molecular biology, because that literally is my favorite discipline, but it's my understanding when we eat the foods, it doesn't break down to NAD or FAD, it breaks down to coenzyme A, structurally in the units of coenzyme, which are then converted with assistance of NAD and FAD to ATP.

Dr. Jason Sonners:

Right, actually, that's why I said, I was simplifying life a little bit.

Dr. Joseph Mercola:

Okay. All right. Yeah. Yeah. Interestingly, just aside, before I get to my question is that there's a lot of focus on using NAD as a supplement, primarily based on Sinclair's work when he was at MIT (Massachusetts Institute of Technology) and with Lenny Guarante's lab that showed that the benefit of NAD is not primarily in this process in the cellular respiration, but as a sort of a catalyst for that, but as a support and they actually fuel for a variety of different enzymes of which sirtuins would be an important one, but certainly others. So if you don't have enough NAD, you can deactivate the sirtuins as much as you want or it's not going to work. So that

becomes, how do you activate NAD? Well, many people now, including Sinclair himself are really into these NAD precursors and now, I assume another precursor, in them and in our nicotinamide riboside.

Dr. Joseph Mercola:

I don't think, and I'm actually going to be speaking to a Ph.D. from the UK, Nicola Condon, Dr. Condon, soon – actually next week, I think or two weeks – about this because she's of the similar belief, and that really you can take the precursors, but they're not as good as actually the exercise and specifically exercise in a fastest state when you just really are ripping it. I'm not talking about doing some yoga. I'm talking some really hardcore resistance training, and that will activate these enzyme called NANPT, which is the rate-limiting enzymes for NAD, and it puts it through the roof, literally 10, 20, 30 times higher than you can possibly ever get with precursor supplementation.

Dr. Jason Sonners:

Yeah, and I think I've played – I don't know if you have, I've played around with quite a few of these different derivatives.

Dr. Joseph Mercola:

Yeah, I stopped them. I don't do it anymore. I just do the exercise.

Dr. Jason Sonners:

I'm interested in – you know me, so like I'm interested in, even just in my own life, just experimenting to see different variations, and do I see any of those changes? And I think that I'm sure there's room for it. I'm sure there's a place for it. I would be surprised to find out that it doesn't do anything. At the same time, if all you did was NAD precursors or even NAD IVs but you weren't doing the work on the diet and you weren't doing the work in the exercise, I don't know how much any of these things are going to change your story. In other words, the way I view it, is that our bodies have the capacity to do amazing biochemical transformations based on the exposures that we give them, but I don't believe that there's any biochemistry that really can occur without the proper sequence of signaling, that is how we were designed to function.

Dr. Jason Sonners:

In other words, exercise would be an innate activity that our – we would put our bodies through this challenge, it goes back to that hormetic effect, right? I don't know that you can create enough hormesis with the single ingredient mega-dosed in your body without all of the cascade of events of signaling that are required to actually kick it into gear and tell your body what to do with it. That being said, I think if you probably had the right signaling and were doing the right exercises, and then you added some of those precursors, you could probably magnify the approach, but I think a lot of people also get stuck in trying to manipulate the biochemistry without actually doing the work required to stimulate the right-

Dr. Joseph Mercola:

Well, there's two compounding variables that interfere with the optimal analysis, and one is the fact that as you're younger, like someone like yourself, you have pretty high NAD levels

intrinsically. It doesn't start decreasing until you're 50, 60s and 70s, when it hits the dirt. I mean, I'm talking 90%, 95%, 99% lower levels, your age. So, it's not a clinical issue for the most part and then secondly, perhaps more importantly, is that it's almost impossible to commercially ask, to determine what your NAD levels are. This is a research lab only test. There is no – you can't go to any lab or mail order company and expect to get an accurate NAD test. It's not going to work. It's highly perishable, incredibly difficult to analyze, biomolecule. So that's part of the problem, and if we can measure our NAD levels we could like blood glucose, this would be a non-issue, we didn't know the answer a long time, but right now, we just have to rely on sort of speculative science.

Dr. Jason Sonners:

Right.

Dr. Joseph Mercola:

So, anyway, getting back to the fueling sequence with hyperbaric. I understand that hyperbaric is an anabolic response, but do you think it's better to go in there in a fed state just right after a meal, which is a bit of a problem because obviously, we got pressure and you can put, pressure in your chamber in 3 or 4 atmospheres. You got a lot of pressure on your epigastric area. And it becomes uncomfortable, but I'm wondering, do you think it's better to be fasted and then eat right after or eat right before?

Dr. Jason Sonners:

So I'll still focus on the fact that I think that the majority of the benefits or effects of hyperbaric happen to be in the anabolic approach, but I will also say that there's a few studies that look at hyperbaric and autophagy and I think that part of that has to do – I mean, that's like not something that's been explored anywhere near enough, but potentially some of this upregulation of reactive oxygen species and the body's ability to just start kind of either kicking cells into – from senescence back into active life or deciding that, okay, I've tried to upregulate this cell, I can't, so we're going to go to apoptosis and kill it. There does seem to be this side benefit of even potentially increasing autophagy with hyperbarics because of that function.

Dr. Joseph Mercola:

There are some studies that support that. I thought it might, I didn't know that.

Dr. Jason Sonners:

I think that because also the benefits of hyperbaric are for hours, even after your session to – again, I know you don't love the analogy, but I still look at oxygen as a nutrient of some type. I look at that as you're refueling your oxygen, and then you're going to eat shortly after that session anyway, to me, that's still within that same-

Dr. Joseph Mercola:

Same frame. Okay. It's kind of like eating protein after you work out, you don't have to do it like three minutes after you finish your workout and you can do it within hour, but you got to do it.

Dr. Jason Sonners:

Exactly right.

Dr. Joseph Mercola:

At some point, close to the-

Dr. Jason Sonners:

Close enough. Exactly.

Dr. Joseph Mercola:

Yeah. Yeah. Well, that helps a lot. Thank you for expanding on that. So, those are the burning questions I had. So, since we've last spoken, what are some of the exciting, I mean, we went over some of the basic, what are some of the exciting new areas that you've uncovered or learned recently?

Dr. Jason Sonners:

I mean, there's been a few things that I think that we've done just for the profession that have been really meaningful. One of which is, I've taken — Over the years just to learn more for myself, I've taken numerous courses in hyperbaric medicine, trying to learn from those who know as much about this topic as anyone else, particularly there's a gentleman, Dick Rutkowski down in Key Largo. He's 93, I believe and he teaches a 40-hour hyperbaric course. I'm sure he's forgotten more about hyperbaric than potentially I'll ever know. I look to these people to learn as much as we can, to help continue further in the field. At the same time, there are so many people interested in applying hyperbaric oxygen for the things that you and I are talking about today.

Dr. Jason Sonners:

There's virtually been no mechanism for practitioners to learn what I would consider to be more of like a functional medicine approach to hyperbaric. So over the last, probably about a year and a half ago, I started writing curriculum, similar curriculum that you would expect in any intro to hyperbaric course in terms of — there's no difference between, the science is the science, the mechanisms of action are the mechanisms, the history is the history. The difference becomes how we apply the tool to different conditions or for different people in different ways. So, I put together a curriculum that I would've considered to be, basically the functional medicine hyperbaric curriculum. I went to a particular organization, the International Board of Undersea Medicine.

Dr. Jason Sonners:

It was a gentleman, Dr. Joe Dituri, who runs that organization. They certify diving medic technicians. They certify medical doctors in hyperbaric medicine. They've been certifying people in hyperbaric medicine for 25 years. That organization was actually started by Dick Rutkowski, back in the mid '90s, I believe. So, basically he, Joe Dituri and I really came together and between the materials that he had and the materials that I was writing, and we formulated this functional medicine/hyperbaric clinician course, and we've been teaching it now for the last year. Really, the goal here is because, hyperbaric, unfortunately, even with all the work that I've been doing and that you've helped with, and so many other contributors, for patients to access

hyperbaric medicine right now is still very, very difficult. There are nowhere near enough clinics or competent practitioners applying this the way that it needs to be applied.

Dr. Jason Sonners:

So, a big push for me, and even for the research that I'm doing is just to help create that awareness that gets more doctors excited about it, that want to actually use it in their practice. So, this has been an attempt to really improve the education so that people aren't just going to hyperbaric courses to learn about wound care. While I think that that's still critically important, for folks who are practicing in that way, a necessary tool, we needed courses to help practitioners like myself or other people interested in the regenerative side to be able to learn how to apply it that way. So, we now have a mechanism for that. There is a course that now exists that I teach a few times a year to actually get people on the same page. I'd say the majority of this last year, other than, getting through school and writing the thesis, has been on developing that course and really promoting that course. I think we've certified about a 125, 150 practitioners and technicians specifically on the functional medicine side of hyperbaric use.

Dr. Joseph Mercola:

Terrific. So what are most of these clinicians using chamber-wise? Is it soft shelves or the hard shelves?

Dr. Jason Sonners:

So it's a mix. A lot of – more and more people are – some docs, they're just nervous still getting into it, it seems so foreign. So that's, a big part of what we're trying to do and the mission of the International Board of Undersea Medicine is just to simplify hyperbarics because I think a lot of doctors are still – there's so many myths, there's still so many conceptions around hyperbaric medicine that doctors are nervous to really implement it. So in trying to simplify it, trying to make it easy, but still respect, obviously the nature of the field, I think more and more people are open to utilizing the therapy. I think a lot of home use is still almost all soft chamber. In the clinics, we're seeing a pretty good mix of soft chamber and hard chamber. I think that we're seeing that the hard chamber can grow in a way that's very safe, that's very effective and that helps the clinicians feel good about what they're offering while keeping the patient safe, but also improving the percentage of effectiveness that they can have while doing that.

Dr. Jason Sonners:

At this time, I still see a pretty big mix between soft chamber use and hard chamber use in those. A lot of those doctors are either DOs or MDs or chiropractors or naturopaths. They're either getting into more of a functional medicine base in the first place, just looking for other natural approaches to the same things that they were treating. I think hyperbaric just becomes like a natural interest of supplying the body with a fundamental ingredient and it's so necessary for cellular performance. It just seems to make sense to start implementing a tool and a modality like that into a setting where you're trying to help overall reduce inflammation, that's a chronic issue across industrialized nations. You're trying to just improve energy production, cellularly. So, it becomes a natural interest for a lot of these doctors to include it in their practice.

Dr. Joseph Mercola:

You've provided a lot of great information, Jason and indications, well, actually, before we go into this question, why don't we expand on the potential indications where someone might be interested in using hyperbarics as an intervention, then we'll go and discuss how someone can find a place to get this treatment.

Dr. Jason Sonners:

Okay. So what was the first one?

Dr. Joseph Mercola:

The first one was, if you could list in as much detail as you care to go into the primary reasons why someone would want to use hyperbaric therapy, like in my mind, it would be stroke. I mean, that's like the first thing that comes to your mind, as soon as you hear, that they happen, get them out of there, they go straight to the chamber. Traumatic brain injury, would be another big one, even post MI, anytime where there's post ischemic reperfusion injury. Why don't you give us your list because it's more comprehensive?

Dr. Jason Sonners:

Sure. Yeah. So, I mean, I think the list of potential uses for hyperbaric I think is a very long list. What I would say is that in the U.S., according to the FDA (Food and Drug Administration), we have 14 indications that we use hyperbaric for. I would say-

Dr. Joseph Mercola:

These are ones that insurance will pay for?

Dr. Jason Sonners:

Correct, and again, that's things like radiation burns, osteonecrosis, osteomyelitis, gangrene, certain diabetic neuropathies and non-healing wounds. The list of potential uses of hyperbaric outside of that list, I mean, there's roughly over 100, what's considered to be internationally recognized indications. Some of that gives it bad press, like as if hyperbaric was a cure-all. What I would say to that is it's not at all. In fact, I don't believe that hyperbaric by itself really cures anything. All it really is, is providing the body with a foundational, again, nutrient, if you will, or molecule that virtually almost all the cells in our body requires to function. We're just giving it in surplus, creating an excess reservoir of oxygen to improve that function. So, who can benefit from that? I think the list is very long.

Dr. Jason Sonners:

Let's talk about, it has an amazing role in neurologic issues and/or neurodegenerative issues. For all the same reasons, whether it's reducing inflammation, there's literally neurogenesis through brain-derived growth factors, so BDNF release. There's a lot of nerve and brain potential for regeneration. We know that, we can get an increase in mesenchymal stem cells, but we also know that we can get an increase in central nervous system stem cells as a result of proper hyperbaric utilization. So between its rebuilding of nerves and brain tissue, it's increased in central nervous system stem cell activation the reduction in inflammation, the rebuilding of the microcirculation around nerve, right? So the nerves and brain, the brain is, what, 2% of our body mass, uses up over 20% of our oxygen. We know how metabolically active the brain is.

Dr. Jason Sonners:

So, any type of neurodegenerative or traumatic brain issue (TBI), be it concussion or other TBI, or even post stroke, having that excess reservoir of oxygen to help promote the healing, literally as soon as humanly possible, that seems to have an amazing effect for so many of those neurologic neuropathy, post-stroke and neurodegenerative conditions. An entire other category of potential improvement would be within the majority of autoimmune conditions, similarly, for the inflammatory reduction, for the balancing of cytokines, for the stem cell activation, for the healing, for the collagen regeneration and the fibroblast, the soft tissue regeneration. So just to help reduce the consequences of the inflammation, and then again, to regenerate the tissue around it. Most autoimmune, be it from MS, through potentially lupus, through RA, MS.

Dr. Jason Sonners:

So many different autoimmune conditions that would respond favorably to hyperbaric. Any type of blood, either blood loss or potential ischemia, so whether that's, again, back to the ischemic stroke or potentially an MI where you're having an ischemic heart issue, but in order to lessen the reperfusion injury, but also to help promote the healing and the re-oxygenation of the tissue to help repair and regenerate after an event like that, again, the quicker we can get to it, the more impact we can have, any type of ischemia situation would improve, includes things like, even birth trauma or with CP. All similar potentially in that vein.

Dr. Joseph Mercola:

CP being cerebral palsy, for those-

Dr. Jason Sonners:

Correct. Yes. So, a whole other category of potential use would be, what I would consider to even be either wellness or longevity or regenerative type therapies. At the end of the day, we're all exposed to traumas throughout our life. We're all exposed to toxicity throughout our life. We're all exposed to injuries that didn't heal properly or surgeries that never healed properly. As a way to have an ongoing therapy in our life that helps to continue to promote a reduction in inflammation, an increase in growth repair, regeneration of tissue, a rebuilding of the micro-circulation for gas exchange, so that we can deliver oxygen to the cells in need. All the same mechanisms that we would talk about, the very severe conditions that are traditionally insurance-reimbursable all the way through chronic illness plaguing, so many of us, our family or loved ones in the U.S. and other industrialized nations, all the way through sort of this, wellness, recovery and regenerative type therapy, the mechanisms are all the same.

Dr. Jason Sonners:

We're just applying the tools slightly differently to help match the intensity of the therapy to the severity of the condition. We can utilize the principles of gas exchange in various ways to help so many different types and various types of conditions. One condition or subclass that I left out, that we should talk about, we talked about it in the beginning is again, from the immune system standpoint. So whether that's upregulating your ability to fight infection through increasing white blood cell activation through the reactive oxygen species mechanisms or we use it for anaerobic infection, bacterial infections all the time. Even traditionally gangrene or necrotizing fasciitis, I mean, one of the main reasons that hyperbaric works in those severe conditions is those bacteria

are anaerobic. They don't live in high-oxygen environments. So we know that putting a patient in a high oxygen environment massively decreases that bacteria's ability to function, potentially helps to kill that infection, helps to block the toxicity of that infection, helps to break down the biofilms around that infection.

Dr. Jason Sonners:

So, hyperbaric becomes an amazing tool in the capacity of immune system balancing and/or ability to help fight infection.

Dr. Joseph Mercola:

And along those lines, other cells that don't respond favorably to excess oxygen would be many types of cancers. So, especially if you're in the process of treating them with metabolic therapy interventions, like Dr. Thomas Seyfried, Boston College advocates and Dominic D'Agostino has done a lot of work in that area too, in the use of hyperbaric intervention as a synergistic strategy.

Dr. Jason Sonners:

Yeah, absolutely.

Dr. Joseph Mercola:

For many cancers. All right, so big question is lot of good reasons to use it, so I'm wondering how frequently do you use hyperbaric?

Dr. Jason Sonners:

That is a question I get a lot. So I would say that I basically do about two hours a week on a regular basis. I happen to – I travel a lot as you know. I'm lucky because most of the traveling that I do revolves around hyperbaric, which means there's usually a chamber wherever I'm going. So I like to utilize hyperbaric with travel quite a bit, whether it's while I'm traveling or certainly when I come home. So I might – when I'm traveling, I might use it a little bit more than that. My typical routine is roughly two hours a week and then, three times a year, I create a 30-to-40-hour protocol that-

Dr. Joseph Mercola:

I did not know that.

Dr. Jason Sonners:

Over like a six- or eight-week period. So, I sort of have gotten into a rhythm now of when that is in my life, but three times a year, I go through a pretty significant protocol, similar to what I would use when initiating a treatment protocol for a patient and all the other times of that year, it's usually about two hours a week.

Dr. Joseph Mercola:

Interesting. So what is the logic behind that three times a year intervention? That's more than once a quarter-

Dr. Jason Sonners:

Yeah.

Dr. Joseph Mercola:

Actually, it's a little bit less than once a quarter?

Dr. Jason Sonners:

It's a little less than, yeah.

Dr. Joseph Mercola:

Yeah. So I was really curious, it surprises me. I'm sure there's good reasons for it.

Dr. Jason Sonners:

I haven't done the research on it yet, but maybe I will. My understanding is based on this. We know that in general, a session or two, any session could be helpful, but for the real reasons that people do hyperbaric one or two sessions, three or four sessions, it's not going to ever cut it. The main effect of hyperbaric is really achieved through the cumulative effect and the increasing and decreasing, the wave of hyper-oxygenation back to normal oxygen levels, but creating that as we talked about the hyperoxia-hypoxia type paradox. So anytime you go in a chamber and out, even though my – let's just say I did Monday, Thursday as my routine, you would still have some amount of that wave, but that wave, the space in between those waves would be pretty big. When you do a protocol similar to like what I would do for a patient, so let's just say, four to six hours a week for eight weeks, the frequency of those lines up and down of hyperoxia-hypoxia are way – the space in between them really shrinks and you get far more signaling to occur.

Dr. Jason Sonners:

I do believe that I – while I often lecture and I'll say about half of the treatment is the time in the chamber and about half of the treatment is when you get out, my real belief at this time based on the research of that I've been reading about, I would probably even say maybe 75% of the treatment is actually getting out. So the amount of frequency that you can create that hypoxia-hyperoxia, I think makes a big difference. So to create those lump sums periodically throughout the year, a lot of the things that we are looking for, the stems cells, the growth factors, the BDNF, the PDNFs, the micro circulation rebuilding, the immune system activation. We know that this 20-to-40-hour window is really where a lot of that occurs. We don't have the research to support the idea that two hours a week over the course of a year would get the same response as six hours or five hours a week over the course of a month.

Dr. Jason Sonners:

So, until I have the research to support that, I still think putting these very particularly, spaced protocols throughout the course of the year really helps me maximize the benefits that I'm looking for with regards to it.

Dr. Joseph Mercola:

It potentially could be overkill though, because it seems like at some point you're going to reach an asymptote or equilibrium where you've reached the most benefit you could possibly reach, and I would've thought if anyone could reach it, it would be you, because I don't know anyone personally who does more hyperbaric treatments. So anyway, it's something to explore on. I'll definitely have to cogitate them, reconsider that because I've got a chamber and I do it only an hour a week just, primarily because of time restrictions, but an hour a week. The chamber I have is one of the few in the world and you know which chamber that is, that actually changes the pressure midway through the treatment. So you get this drop in treatment. So you had mentioned your body can't sense pressure, but it's just like, it really can't sense acceleration once you've achieved a static speed.

Dr. Joseph Mercola:

So when you're depressurizing or pressurizing, you're going to sense that big time, no question. Once you're at pressure, you really don't notice it, unless you've got some problems with your ears.

Dr. Jason Sonners:

Right.

Dr. Joseph Mercola:

Anyway, the difference is that halfway through my treatment, it drops down. I usually get treated about 3 atmospheres and then I drop down to like 2 or 2.1 for the rest of the treatment. It seems like there's a relative hypoxia during that drop.

Dr. Jason Sonners:

Definitely.

Dr. Joseph Mercola:

Rather than the one-hour treatment, it might be equivalent to a two-hour treatment because of that.

Dr. Jason Sonners:

Yeah. I think that, two of the things that we're working within our clinic, and we support a whole bunch of clinics around the country. We talk about creating a wave of pressure throughout the course of a session and also creating a wave of oxygen. So we'll have people – we used to take, in certain conditions, you're taking air breaks where you go from 100% oxygen to 21% oxygen on purpose. The reason that that was initially instituted was really because it helps decrease the likelihood of oxygen toxicity. However, there seems to be a therapeutic effect. So, not only will we create a wave during the session of pressure, we'll create a wave of what percentage of oxygen somebody's breathing in that time. Again, because I think more of it has to do with the cell signaling that occurs than the physical dose.

Dr. Jason Sonners:

If all we cared about was the physical dose, we would stay at 100% oxygen as long as we possibly could, at the highest pressure we could tolerate to get the most oxygen absorption. I don't think that that's where the majority of benefit exists. I think the majority of benefit exists by every time your pressure changes or your percentage of oxygen changes, which is really both changing the pressure of oxygen, you're stimulating HIF-1 alpha. You're changing the reactive oxygen species load. You're signaling those sirtuins. You're signaling a hormetic effect. So, every time you get those changes in pressure or the changes in presentative oxygen, you're improving the rate of ... I picture them as switches, every time you change them, you're flipping that switch on, off, on, off, on, off.

Dr. Jason Sonners:

I think it's the amount of times that you stimulate that switch, that's going to create the benefits that we're looking for, more than the physical dose of oxygen over time.

Dr. Joseph Mercola:

Yeah. Intriguing. Intriguing. So we've given people a lot of resources now and one of the most important ones, if someone has been really catalyzed to seriously consider implementing this as their own personal protocol or for a relative, how does someone go about finding someone, because one of the complications, as you had mentioned earlier, there's 14 indications that are covered for by insurance. Unfortunately most of the hospital chambers will refuse to treat anyone unless they have one of those indications, so those centers around. You have to find a private one. So why don't you go through the challenges and the resources that people would – the hurdles that people would have to overcome to find a center or center or treatment center.

Dr. Jason Sonners:

Yeah, so like you said, it isn't the easiest thing to find and usually, if you do a typical search online, the wound care clinic near you and the hospital near you, they're going to show first, and the unfortunate thing, like you said is those phone calls are often dead ends. It's not that the technicians there or even the doctors there wouldn't want to treat them per se, but you can't have dual fee schedules. So, you can't charge an insurance company \$2,000 to \$3,000 an hour and then charge a patient \$200 to \$300 an hour. So, in general, these clinics just tend to not treat off-label conditions, period. What I will say is, taking a look at their websites can give you some pretty good insight into like what types of things that they're looking at and what types of things that they're treating.

Dr. Jason Sonners:

Like I said, we did initiate this certification course. So, a lot of the clinics that we've certified so far we've posted. So our main website is HBOTUSA.com. We have a locations tab there, so not all of them but many of the centers that we've trained and certified those folks and their clinics are listed on that for people to clinics that would function similarly to the way that I would function in the clinics that we own on the East Coast. So, that could be a good way to find some people. Otherwise, like you said, it's an online search, and it's digging through a little bit just to see that a center that focuses on TBI and concussion, a center that might focus on neurologic repair and recovery or a center that is a more functional medicine-based center, those are going

to be more likely the places that are going to consider treating people for all the different things that you and I have talked about today.

Dr. Joseph Mercola:

Yeah and the treatment dose or course or regimen should be about 30 to 40 treatments, and what should the average center – I mean, let us know the range. What do you think the typical range is going to be around, so people have an idea what to expect?

Dr. Jason Sonners:

Yeah. I think the national average is probably around \$175 an hour. There's definitely places that are closer to like \$500. There's a few places around the country that are closer to even \$80 or \$90, but I think the national average is probably pretty close to around \$175 a session, especially, if you're buying them in packages the way it's usually done, 10 sessions, 20 sessions, 40 sessions at a time. Trying to make it a little bit more affordable for people to have access to them.

Dr. Joseph Mercola:

Okay, good and then, you've written a book. We've done a previous interview with that. Maybe I'll throw that interview in this page so people can have access to it because most people can't find our old interviews now, unfortunately, after YouTube destroyed all of them. So what was the name of your book? And we can put a link to that in-

Dr. Jason Sonners:

Yeah, the name of the book is “Oxygen Under Pressure.” Also, it's still available on Amazon too and then HBOT USA is our main website. We do still have a YouTube channel for now.

Dr. Joseph Mercola:

No, I don't think they're going to take you out. I heard a story. I was watching a podcast this morning. This one physician had a Twitter account, never posted one tweet, never, was blank empty account and they banned him for-

Dr. Jason Sonners:

Just for thinking, just for thinking something.

Dr. Joseph Mercola:

Just for thinking something. It's like, how insane can you get, but I don't think there-

Dr. Jason Sonners:

I saw your Substack, right?

Dr. Joseph Mercola:

Yeah. Yeah. We're in Substack.

Dr. Jason Sonners:

Is that like a reasonable transition for video content?

Dr. Joseph Mercola:

Yeah, it's through a PMA, a private membership association, which affords us a tremendous legal insulation from and protection from the forces that would take us out permanently. So there's a great risk and threat to what we've written in the past and people don't perceive it, but it is. This allows us to do it. It's this long and slow painful process because we have to carefully vet and review everything that we've written in the past to make sure that it can't be used against us and that we still, but with that revision and putting it on private membership side, I think it's working out really well. It gives people the opportunity to access the old information.

Dr. Jason Sonners:

Yeah. That's huge, I thought.

Dr. Joseph Mercola:

Yeah.

Dr. Jason Sonners:

It's got to be-

Dr. Joseph Mercola:

All right. So this is great. I look forward to connecting with you in person at some time in the near future and keep up the great work.

Dr. Jason Sonners:

Thank you, man. You too.

Dr. Joseph Mercola:

All right.

Dr. Jason Sonners:

We appreciate you, more than you know.