Introduction to Molecular Hydrogen

Many research groups, including our own, have shown that when hydrogen gas is removed from alkaline ionized water, the therapeutic benefits are eliminated.

So we know conclusively, without a shadow of a doubt, that hydrogen is the Therapeutic Agent. Hydrogen doesn't last in the water forever. What about all of this pH water that people are selling at the grocery store?

That becomes largely a scam. Wow. Joining us today is Dr. Tyler LeBaron, scientist, educator, and founder of the Molecular Hydrogen Institute, bringing groundbreaking insights on the power of molecular hydrogen for human health.

When you drink hydrogen water, you can see changes in your breath and hydrogen exhalation within two minutes. I have seen in the functional medicine space that they do intravenous infusions of hydrogen peroxide.

Are you familiar of why they're doing that? Hydrogen peroxide as a strong oxidant, probably most people are thinking, OK, you put that in there, it's going to kill all the bacteria.

Instead, because a systemic reaction of the body's immune system and it up regulates your immune systems. Biohackers out there that do challenges, which is a seven day water fast.

What's your input on that. There's no amazing evidence that a seven-day fast is going to like totally induce a major stem cell production and transform your health and all this stuff, but the clinical studies are lacking with that.

How can like first responders like a firefighter benefit from molecular hydrogen? First off, Welcome to another episode of a healthy point of view podcast.

I'm your host Sam Tahata. And like usual, we're bringing experts from all over the world to talk about health, wellness, beauty, and mindset. Today we have a guest.

We're going to be talking about molecular hydrogen. A lot of you guys are hearing all these people talking. Oh, hydrogen tablets, you know, they're, there's snorting and sniffing hydrogen through the nasal cannula.

People have the hydrogen water bottles. And there's a lot of questions about that because you could go online, get a hydrogen water bottle for like 20 bucks.

And then there are other ones that are a heck of a whole lot more expensive. I think there is a reason why they're more. But today we're bringing the expert.

This is an expert who's not just selling products out there. He is behind the Molecular Hydrogen Institute. he is PhD, he's an educator, a researcher, one of the top gurus globally when it comes to molecular hydrogen.

Today we have Dr. Tyler LeBaron. What's up, brother? Pleasure to have you here. All right. Let's sort of welcome from the Lickvita team here at A Healthy Point of View.

Oh, amazing. Well, thank you. It's absolutely my pleasure to be here, absolutely. So, man, the guru behind hydrogen. And I know this not just because I read it on the website or something like that.

That's how I was introduced to you by a few people that I highly respect in the functional medicine space. One of

them was Dr. Christopher Davis, who's my business partner, interventional cardiologist, one of the smartest doctors I know.

where I actually met you is when he brought it up to me. We were at one of the Maha events, one the Make America Healthy Again galas, and someone, it was Anthony Lally, he said, hey, you have to meet this guy.

You might want to bring him on your podcast. And I looked at Dr. Davis, this is, Who is this guy? He says, no, he's the guy. And when Dr. Davis says he is the guys, you're the guide.

So how did you get into this whole molecular hydrogen? I want to know from when you were young, what was going through your mind when he says you know what, I'm going to go and study this.

Yeah, well, thank you. It is my pleasure to be here and talk about something I have been passionate about and researching for a long time since 2009. So over 16 years now.

Wow. And I guess from a young age, I've always been interested in health and longevity and wellness, even elementary school, learning that sugar is probably not the best thing for you and like, okay, we'll all stop doing that.

I'm always interested and pushing myself, exercising and just studying and learning about how the body works. Then in 2009, it came across, alkaline ionized water and later, as we'll talk about, discovered the real benefit is molecular hydrogen and even went to Japan and did research over there and been doing that ever since.

Wow. And that's going to be an interesting conversation talking about the alkalined water in what the benefits are from that. And so Japan, so there's a very soft spot in my heart for Japan because I studied Japanese for three years.

I've been to Japan. So I know a little bit. Nothing too crazy.

Tyler LeBaron's Background and Research Origins

When I went to Japan, I thought I was gonna be able to communicate a little bit better, and oh man, it's nothing like when you're learning it in grade school.

It's a lot quicker, you know, its different. So, Japan. One thing I know about Japan is they do a lotta research on clinical stuff, especially like clinical devices.

I participated in some of the research in one of my initial clinics that I had, doing mercury testing with some technologies they have. Why Japan? Well, that is where the research started.

And so in 2007, there was an article published in Nature Medicine, and that was done in Japan. I'll talk about that a little bit article, but Japan was…

It's interesting because that's even where of the alkaline ionized water industry mainly started, back in the 1960s, it was approved for human consumption.

But I ended up going to Japan in 2013 to do research at Nagoya University for an internship because I want to research molecular hydrogen and that's where all the research was coming from, was from Japan.

I mean there were a few places like here in the States and around the world, but Japan really was the epicenter of the top premier research. And are the people in Japan, and you might know the answer to this, are they actively utilizing hydrogen on a day-to-day basis?

A lot of people are. So there was a survey that was done actually before COVID. And about 50% of the Tokyo population was in some way or form or the other using molecular hydrogen.

Okay, so when you decided to go get your PhD, where did you go to school? What did he go school initially for? So, well, my background's in biochemistry, in my undergrad, and then I did a master's next year in sports conditioning, then my PhD was in physiology.

And so I've really been researching molecular hydrogen since, literally, I started my my underground in Biochemistry. Do you have actual published research under you?

Yeah, so that's one of the things that I've been very fortunate with is I publish now over 50 publications on molecular hydrogen. I just actually just the other day I got an email from Scholar GPS and I was rated as one the top 0.5% scholars in academia in these fields like oxidative stress and so on.

So I have been really active in publications and really doing the research and working with a lot of colleagues and I think it's exciting for me because I've been at this for a long time.

And when I first started educating about molecular hydrogen back in, well, I said 2009, but I started the Molecular Hydrogen Institute back on 2013, just as a website.

It wasn't a nonprofit then. But back then, nobody really had a lot of interest about my molecular hydrogens and nobody knew about it. Now it is all over the place.

What brought that attention to hydrogen? Well, I think a couple of things that the research number one, because the clinical studies that we'll get into, has really shown that hydrogen is not just a fad and helps to differentiate that it's not the same as alkaline water.

There's a lot of misconceptions about that. And just the awareness, like in Japan, it's already very popular. And so that's making its way here into North America and you have important, you know, influencers, so to speak, and educators like yourself, helping people to learn about molecular hydrogen.

I've been educated about this for a really long time. So to me, It's really exciting to see now the industry starting to really emerge and a lot of people are showing interest in molecular Hydrogen, essentially using much of the research and publications that I have done to build this industry.

Now, I'm not, of course, the first one in this, but I was one of the early pioneers. And so I have connections and collaborations with the top researchers all over the world and that I've published papers with.

So for me, it's really exciting. The other thing about you, man, you're like a specimen. You're physically fit. You're in good shape. You kind of look like one of those guys that bend pieces of metal like if it's rubber.

Pretty jacked. So I know you're really in tune to your health and your body and everything else. I would only assume that you probably have done a lot of stuff when it comes to hydrogen with people that are physically fit and people who are performing at a very high level like athletes, right?

Yeah, absolutely. That was one of my first publications was actually looking at the effects of molecular hydrogen in for exercise performance. And there's now probably 20 plus clinical studies on hydrogen for exercises specifically, and even a meta-analysis.

So, meta analysis is the highest tier of evidence, well, one of evidence. And when you look at those studies, you see that hydrogen is able to help reduce fatigue, for example, help to improve exercise performance.

There's so many different metrics that you're looking at. But I think maybe just for the audience, maybe if we go back to the basics, just a little bit about when we're talking about molecular hydrogen because I don't want that to be a confusion or conflation between pH, because people hear hydrogen water and they think, pH, like potential hydrogen, and somehow that gets conflated to hydrogen.

Yeah, the first aid hydrogen peroxide. Or hydrogen Peroxide, right? And what's the difference between that? So

just to clarify, when we're talking about molecular hydrogen we are talking the gas that's used as an alternative energy source.

And so you have, the hydrogen is the number one on the periodic table of elements, and that hydrogen atom will combine with another hydrogen atoms to form the H2 molecule, or hydrogen gas.

And that gas is simply dissolved in the water. It doesn't stay in water forever. Doesn't attach to water or change the molecular structure. Just a gas dissolved on water, just like other gases can dissolve in a water and so eventually that gases comes out.

Its not instantaneous, but it's in that water Or you can take the gas and you could inhale it. And so it's another route of administration. So it has nothing to do with alkaline water, which is an important clarification.

However, going to what we talked about earlier, with alkali ionized water when you make that water or called electrolyze reduced water.

Hydrogen Water vs Alkaline Water

you'd use the process of electrolysis. And electrolyses, by definition, is the decomposition of water into hydrogen gas and oxygen gas. So you make hydrogen while you're making the alkaline ionized water.

Some of that hydrogen gets dissolved in that alkalin ionize water, so when you drink that alkali ionised water you sometimes get some hydrogen and that is what has been shown to be therapeutic.

and this is a crazy story because nobody knew that the hydrogen gas was the exclusive agent responsible for the therapeutic benefits of alkaline ionized water until really quite recently because these all these machines came out back in the 1990s super popular and some of these You know, and I'm fine throwing names out there.

There's one that it's Kagan. Yeah, Kegan. Is that one of those pH creating? Yeah. Exactly. It makes high pH alkaline ionized water. Right. And it just with the it has electrodes and anode and cathode.

The water goes through there, separates basically the two streams. You have alkaline water and acidic water. But it doesn't do electrolysis. With that alkalined water, you can see it contains hydrogen gas.

It has these bubbles. Like you could even take a lighter and hold it underneath the faucet. The waters coming out and you'll hear crackling sounds. That's because hydrogen was being produced.

And that's hydrogen. Yes. was not dissolved in the water. That's why it's igniting, right? If you see gaseous bubbles, that gas is just going to escape into the atmosphere.

It's not going provide any therapeutic effect. You want to have the gas fully dissolved into water and then when you drink that, you get therapeutic effects.

And the people who are familiar with alkaline ionized water they realize that this water is not stable. That if you store it for too long, if shake it or something, then the therapeutic benefits are eliminated.

And nobody knew why that was. They thought it was something like the water structure was somehow magically changed and it's just not very stable, or they thought that it had some other properties.

But it turns out it is just because hydrogen is a gas and goes out of the waters if your shaking it down. So Doc, hold on one second. This is for the listeners and viewers of our podcast right now.

So you already described that the gas can escape the water, no different than like the carbonation in soda, right? Soda, eventually you leave it open or something.

It becomes flat. So if people are getting the benefit of this alkaline water from the hydrogen, now hydrogen doesn't last in the world forever. What about all of these pH water that people were selling at the grocery store?

that becomes the question. That becomes largely a scam. And we know this so well because first off, if it's just alkaline water because the pH was elevated, it won't provide any therapeutic benefits because even if we subscribe to the idea that we need to alkalize our bodies or something, you cannot do that with alkaline water.

A teaspoon of baking soda will neutralize as much acid as thousands of liters of alkalined water at a pH of 10 because alkalin water is not a buffer and that's why you can take alkalinen water and just drop a pinch of lemon juice and it goes acidic.

And a lot of these early studies on alkaline ionized water, like cell culture studies, let's say, that cell media has to be a specific pH. So before they added the water they would neutralize the pH of the waters, but yet it would still have therapeutic effects.

Well, it obviously wasn't from the alkaline property. It was something else. What was that something? It's the hydrogen gas. But as soon as that hydrogen is removed from water, all the benefits are eliminated.

So there are several reasons that alkalined water can have benefits, but it depends on why it is alkalines. Let's go through them briefly for the audience.

Number one, if it's alkaline because it went through a process of electrolysis and hydrogen gas was made and the hydrogen gases still in the water by the time you drink it, then that water could have benefits, not because of the Water itself, but because It contains dissolved hydrogen Gas.

All right. Another one. Sometimes if you add minerals to water, like let's say calcium, magnesium and other things. So a lot of times these minerals are like magnesium, carbonates or bicarbonates, and that is the conjugate base and it's going to raise the pH a little bit.

So often, mineral water is also alkaline. If you drink this water, a lot of studies have shown that, especially if you're deficient or something, that drinking water containing extra minerals like magnesium, calcium, I'm not talking about excessive levels, not like super high levels right, but just good normal levels that has benefits.

is beneficial to drink water that has minerals in it. Right, right. So, therefore, if you drink, water, that's alkaline, That has mineral, it's good for you.

Again, not because it has alkalines, but because of the minerals, Right? Right. Now, If it is only alkalined because you just added like potassium hydroxide or sodium hydroxides, you know, a little bit of that.

It's not going to provide you any of these therapeutic benefits. Wow. Our conversation is specifically focused on molecular hydrogen. And we published several articles, but one in particular is a comprehensive review article where we show throughout all the literature that many research groups, including our own, have shown that when the hydrogen gas is removed from alkaline ionized water, the therapeutic benefits are eliminated.

Right. So we know conclusively, without a shadow of a doubt, that hydrogen gas is the therapeutic agent. And now that we now know that, then other products can be developed that focus exclusively on increasing the therapeutical levels of molecular hydrogen in the water.

Where people can get even a greater benefit versus what they've been experiencing from the pH water? Yeah, exactly. Of course, there can't be therapeutic effects from alkaline ionized water if that hydro gas But that's the issue is sometimes that concentration is not high enough because if people are not maintaining their machines, like they don't clean them with citric acid and different things, the hydrogen gas does not stay dissolved into the water.

So Doc, what is, when we're talking about molecular hydrogen versus just hydrogen, or people, you know, use the word hydrogen water. What is molecular?

Yeah, so the world molecular has the reference to a molecule itself. So if we think about the water molecule, You have oxygen and you have hydrogen-hydrogen, right?

It's kind of looks like Mickey Mouse. That is a molecular. And as I talked about earlier, hydrogen is number one on the periodic table of elements, and the hydrogen atom alone has an unpaired electron, so it's not going to be stable.

It's always going react with something else very quickly. And it can react a whole bunch of other atoms or elements. So if it reacts with oxygen, it could form things like water, H2O.

There's two hydrogens and oxygen. If could react carbon to form hydrocarbons. That's going to be your glucose, your carbohydrates, fuel, gasoline, hydrocarbons, all of these things.

It can also react with, say, nitrogen and that's gonna give you things like amino acids or ammonia. Hydrogen can pretty much react to anything and it's got to form new compounds.

If it reacts… If it reacts with itself, if a hydrogen atom and a hydrant atom react with themselves, then it forms a Hydrogen molecule. So that's the molecular aspect.

It's a Hygen molecule or molecular hydrogen. And that is why our institute is Molecular Hydrogens Institute, because our focus is on molecular Hydrogen.

Right. The molecular just means that molecular level. On that small level, we have atoms that are bound together in covalent bonds. Interesting. Interesting.

I love it. So so when we talk about hydrogen peroxide. Oh, yeah. Right. Hydrogen peroxides, a lot of people when they think hydrogen, especially the lay person, they say, oh, I heard hydrogen Peroxide, you said that's my mouthwash.

They use it for first aid. Number one. Don't drink it, anyone who's listening. That don't go out there and just start drinking your hydrogen. Peroxide.

Well, let me explain the difference of what is hydrogen per oxide versus molecular hydrogen of. What we're talking about. Yeah, so hydrogen peroxide is totally different chemical species.

So if we think about water again, as I said, the chemical structure as we know is H2O. H-O-H, right? That's the water molecule. Hydrogen peroxide is h2o2.

There are two oxygens. That chemical structures is HO-OH. So that's hydrogen peroxide. There's additional oxygen that is attached to it. And what happens if you think about how that looks like in your head, HOOH.

What happens is that that bond between the two oxygen gets separated and now you have just OH and OH. That's the hydroxyl radicals. And these will destroy or kill and activate any pathogen that there is.

So it's really good for cleaning. It's a very strong oxidizer. so it is going to bleach things, you know, like a whitening agent or things like that also.

Right. Because it, that bond is readily broken. Whereas we're talking about like with hydrogen water, we just have normal water H2O, it always that just HOH.

We don't change the water structure at all. we just dissolve hydrogen gas, that H2 molecule gets dissolved into the water. So you said it makes things, cleaning agent makes it whiter.

That just kind of came to mind of like Billy Mays, make your bright spriters, white whiters oxy clean, right? Is that what's inside of oxi clean? Well, I don't know.

I remember those commercials, but yeah, it's probably not hydrogen peroxide, though. We'd have to take a look at it. Yeah, yeah. But it could be either a strong oxidant, that will do it, or something very alkaline, you know, could do.

Right, right. Hydrogen peroxides are strong oxides, so it will literally break apart what's called the chromophores that make up color.

Hydrogen Peroxide and Oxidative Therapies

And so if it breaks those apart, then it is going to lead to a bleaching agent, basically. Now with the hydrogen peroxide, I have seen in the functional medicine space that they do intravenous infusions of hydrogen Peroxide.

So when they're doing that, are you familiar of why they are doing it? I've heard about it. I don't know that there's a lot of clinical data and things behind that.

But I'd be very cautious about that but the idea behind it is that hydrogen Peroxide as a strong oxidant, right? Probably most people are thinking, okay, you put that in there, it's going to kill all the bacteria and everything.

But the hydroperoxide reacts very quickly. So it is not like going into the bloodstream and then not react to anything and magically find this hidden parasite or something and only react with that.

Instead, it's a very strong toxin and it causes a systemic reaction of the body's immune system and up-regulates your immune systems and probably that is what can get different metabolic pathways or cellular pathways as immunomodulator activated and that can then have those effects.

So if people were going to try to use these types of oxidative therapies, it is probably even a more important idea to use something like molecular hydrogen, which helps to balance out that strong oxidative effect with its unique selective antioxidant effects.

Interesting. When it comes to molecular hydrogen, are you able to infuse any type of water with molecular hydrogens? Of course. So would you be able to technically put it in a 0.9% sodium fluoride?

Yeah, exactly. Yeah. It's just saline. And there are studies where hydrogen-rich salines is used. We've done studies in animals, for example, with hydrogen rich salin, and you can inject that.

Infuse it directly in? Yes. There's not like a metabolic disturbance or like an osmolarity? Not at all, because hydrogen gas is not an active osmolyte, so it doesn't alter the osmolarity of…

Because hydrogen gases are more considered what we call a penetrating solute, right? So when you look at osmalarity, you have penetrated and non-penetrating solids, and so, it's more important to maintain the tonicity of the solution, that it is the osmolarity of a solution.

Both are important. Sorry. I said the other way around. The tonnicity, of this solution isn't really going to change because hydrogen gas is a penetrating solute.

But it's a very small gas anyway, so it really is not even a matter of question at this point. But hydrogen gas is very natural to our bodies. When we are healthy, we eat a healthy diet.

We naturally produce hydrogen from our microbiome. So a health microbiomes produces lots of hydrogen. That's just a natural thing. the healthier you are, the more hydrogen gas you tend to produce.

This is the correlation. The Japanese centenarians, they tend produce higher amounts of hydrogen and gas than people who are younger and don't live to become centenerians, right?

You have other correlations like people with Parkinson's disease and Alzheimer's and other problems. They also produce, They have also have less hydrogen producing bacteria than who don' have those conditions.

So a lot of important correlates about the amount of natural production of Hydrogen and Gas. And then when we eat a healthy diet that contains fibers, we are going to produce more hydrogen gas.

So hydrogen gases are already something very natural to the bodies. And it's like I mentioned, it has selective antioxidant properties, which means it is not going just radically induce a reductive stress or something.

It's very much the opposite than any conventional antioxidants. Not like your typical glutathione or vitamin C or other antioxidants. Yeah, I was going to ask that.

Like, you know, we always hear is we live in such a toxic world, right? So we're talking about eating foods that are high in antioxidants, a lot of different berries.

But then you have the other antioxidants. Vitamin E, glutathione, ascorbic acid, vitamin C is an antioxidant. So how does that really differentiate between molecular hydrogen?

Yeah, in several critical ways. Number one, many of these antioxidants don't even get to the location that they need to in order to be effective because they're large and their pharmacokinetics, their dynamics are not able to get the site of ROS or reactive oxygen species generation quick enough.

So, for example, you take something like, let's say, vitamin C. So vitamin c, that's number one, it's more water-soluble, and so it is not going to really protect very much in the cell membrane area because it water soluble.

That's why fat and water don't. Mix, right? So instead you need to use a different antioxidant, vitamin E, that's gonna be in the cell membranes. But then vitamin is not gonna do a lot of protection in a plasma, in water soluble area.

So hydrogen gas, however, it dissolves into the plasma and it has a higher solubility in cell membrane. And so it's going to protect both areas. Okay, so there's one thing.

Then if we think about how quickly hydrogen and gas can diffuse into tissues. When you drink hydrogen water, You can see changes in your breath hydrogen exhalation within two minutes.

So it's reaching your brain and other organs within 2 minutes basically. Because hydrogen gas is the smallest molecule that's going to penetrate the intestines.

It goes to the liver and it goes through the heart and then it gets pumped to lungs and you see the exhaling of hydrogen. So its distribution of how quickly it's getting to target tissues is very rapid.

Another point is, once hydrogen gas gets to the cell membranes, it is able to penetrate the membrane very easily and reach subcellular compartments like the nucleus, the mitochondria.

All these other areas, they can easily get through the membrane. Whereas other antioxidants, like vitamin C, will say it can't do that very readily. Because vitamin c, it cannot penetrate the cell membrane all by itself.

Or, well, can, but it has to go through a membrane transporter. There are specific transporters to bring that in because vitamin is a larger molecule.

It's charged at that pH. So it's cannot get through the membrane, whereas hydrogen gas can just zip right through. We can penetrate these membranes, including the inner mitochondrial membrane very easily.

Right. And if we also look at the size dynamics, so vitamin C weighs around 186 grams per mole. So if you have a mole of vitamin c, it'd be 185 grams.

Whereas hydrogen gas, if have the same amount, is only going to weigh 2 grams, and it's orders of magnitude lighter. The things that dictate bioavailability are things like the size, the smaller it is, easier it can get into the cells.

Hydrogen, Antioxidants, and Cellular Homeostasis

Well, hydrogen gas beats everything on that case. It's charged. Hydrogen gas is non-ionic, so there's no charge to it, it's neutral. Whereas other things that are charged, like even a sodium ion or potassium ion, Those are just one element, right?

But they're charged. And because they are charged, they have a hydration sphere around it. Because of that, it can't just enter the cell membrane. That's why you can have ion gradients.

They can just go through the cells membranes. There's specific ion channels, like this potassium channel, a sodium channel. Everyone has their own specific…

channel. But with molecular hydrogen, it can just diffuse right through the cell membrane or go through channels. And then also its polarity. Well, water is a neutral molecule, but it's also polar.

That's why it has that Mickey Mouse shape. It's a polar molecule. So even water, that cannot go through the cell membrane. That's why water and fat do not mix together because water is polar.

So water, for water to enter the cellular membranes or into the cells, it has to go to protein channels like an aquaporin. Again, hydrogen gas doesn't have to do that.

On all of these points, Hydrogen gas has higher bioavailability and higher diffusivity than anything else. It just rapidly penetrates following its concentration gradient and through Brownian motion.

So the difference then is, OK, now we get to the cells. Well, then how is this different than, say, the antioxidant actions of vitamin E, vitamin C, glutathione or something?

And that's where things get really interesting and really sets things apart even more. Let's talk about it. First off, hydrogen gas is selective. In other words, it only can reduce or go after the most damaging or toxic free radicals.

Can you overdose on hydrogen? No, no. No. You just keep on dosing and get higher and higher, and then there's just a diminishing return to the benefit.

Hydrogen gas does not store in the tissues. So it's a gas, you just excel it out. After 30 to 60 minutes of drinking hydrogen water or stopping inhalation of hydrogen gas everything goes back down to baseline.

Okay. so you cannot overdose on it. And you get to a certain level that once you surpass the therapeutic threshold, maybe there's some concentration of dose-dependent effects.

But eventually, you just get diminishing returns. So there is no concern about overdosing with molecular hydrogen. And like we talked about, if there were, then does that mean we should stop eating fiber and stop having a healthy diet because we're going to produce more hydrogen gas?

That doesn't make any sense. All the studies show the opposite, that the more hydrating gas you naturally produce, the healthier you are as well. And this goes to the selectivity because when it comes to antioxidants, it is a good question.

Can you overdose with antioxidants? And the answer is absolutely. Categorically, you can. And we have seen this many times in many clinical studies and animal studies.

We have emerging mechanisms to explain why this is. But just to put this in perspective, You can see a number of clinical studies where they had to stop the study before even completing them because those taking high doses of these synthetic conventional antioxidants were dying and getting cancer faster than those on placebo.

Oh wow. This is very well-documented and very known. And people can make the argument, oh, that was just

synthetic or this or that, but the fact is they were still reducing compounds, they're still antioxidants, and they still exerted this antioxidant activity.

So there's a lot of variables going on. What we have to remember is the body is needs homeostasis, okay? Just as oxidative stress, too much of that is harmful, you also do not want to have reductive stress.

And aging and disease is associated not merely with oxidant stress but also with reductive stress it's actually a disequilibrium. It's a dyshomeostases, it is a redox dysregulation.

That is the real root cause of all these conditions. And so by just taking a bunch of antioxidants, maybe you're helping some areas of oxidative stress, but you are literally exacerbating the other areas that reductive stress as well as converting many of these antioxidants into pro-oxidants that further exacerbates the oxidant stress that the pathology is already inducing.

the secret sauce, like dosage-wise, because I would think that some of these other antioxidants are still important in some sense, right? 100%. So it's really the combination of both.

Yes, well, and that's the thing. With these antioxidants, you don't want to get too high of a dose. And also, these anti-oxidants are not merely just radical scavenging passive antioxidants but they have unique a biochemistry in themselves that have unique effects.

They have signaling effects and that also can create problems if they're too high. Now, I'm just, so I am really trying to separate why hydrogen gas is not like these conventional antioxidants.

This is why you cannot overdose with it. You cannot overdose with molecular hydrogen because hydrogen is not merely a radical scavenger. In fact, if you put hydrogen gas in the same compartment as important free radicals like nitric oxide or superoxide or other ones, there'd be no reaction.

Hydrogen gas does not have the reductive capacity or power to neutralize those free particles. Unlike, say, vitamin C or vitamin E, those would neutralise those oxidants.

Hygiene gas cannot do it, so there's no reactions. Furthermore, hydrogen gas, its key, it's intelligence is because it activates your body's innate antioxidant systems.

It activates what's known as the Nrf2 pathway, and this is your bodies own ability to produce its natural antioxidants. The NRF2 is a transcription factor, the one that gets activated, regulates over 200 cytoprotective proteins and enzymes in the body.

That in turn, when it's activated, gives you that antioxidation, detoxification, these phase two enzymes that your body needs for overall protection. So, hydrogen gas regulates all of this at the perfect homeostasis for your cells.

Is there other things that help activate that? Oh, 100%. But see, this is also a differentiation. So you take something like sulforaphane or other molecules that can activate Nrf2.

That is wonderful. It's fantastic. But there are also powerful NRF2 activators and they're indiscriminate. Because if you put this in cell cultures, you can see the high hyperactivation hyper activation nrf 2 is not good and in fact cancer cells and other Pathologies can hyper activate nRF 2 and protect themselves and evade your immune system evades cell death and cause a whole bunch of cellular problems Because it's hyper activated going back to the reductive stress hydrogen gas doesn't do that.

In fact, we see many studies where In the disease condition, the NRF2 was pathologically up-regulated, but in the hydrogen condition NRf2, was down- regulated, closer to control levels.

So, hydrogen gas is not unidirectionally altering these pathways in only, you know, unide directionally, just one way. It's regulating things. it's helping the cells go back to homeostasis.

So we see the protective effects of hydrogen and gas by bringing these pathway, the activation of these enzymes, back home to homostases. Oetophagy is another good example of this.

Obviously, autophagy can have a lot of benefits. There's this autrophagic cell process that's clearing out the senescent cells and organelles that aren't working very well.

This is really important. And as we're aging and with a lots of inflammation, we have less autofagie that is going on. By fasting and other methods, you can increase autotophage.

But if you have too much autothagia, then you suffer autophasic cells death. That's obviously bad. Those are the Senescence cells. Well, autophagy is the first attacks the senescent cells first.

But you can start having too much autophygy where you're not only attacking those senestent cells, you are also killing healthy cells. Normal cells! I mean, if you fast for too long, Yeah, that's probably not a good idea.

It's not good a idea, like you're literally going to destroy even the healthy cells because they don't have anything, your body doesn't the have the sustenance that it needs to maintain, right?

So that leads me to, you just triggered a question here. So there's something big and a lot of people are doing it. There's biohackers out there that do challenges for people to do this as well too, which is a seven day water fast.

What's your input on that? I mean, if you do that, you will create too much autophagy in some areas, right? I think it's a good, potentially mental challenge.

I did a five-day water fast. Hold on, but was the water molecular hydrogen water? I did use molecular hydrogens. And I would recommend that if people want to do this, they should probably use it during that fast.

Because molecular hygiene can help to regulate autophagy. So it can induce autrophagies in the cells where they SHOULD have autofagie. But it could actually suppress autphagys in cells that don't need to undergo that.

It's a regulator of all of this. And so, I'd be careful, just as a point of health or whatever, there's probably not… There's no amazing evidence that a seven-day fast is going to like totally induce the major stem cell production and transform your health and all this stuff.

There are a lot of antidotes and things out there, but the clinical studies are lacking with that. But if people want to do that, and there can be some benefits, even going more ketogenic and getting your body to adapt to the ketones, Yeah, I think that's a great benefits there, but you do run the risk of losing a lot of muscle, for example.

So you just have to be wise about how you're doing it. Okay. That's good to know. So obviously we've talked a lot about what molecular hydrogen is and the difference between other type of waters that are out there and what it's doing inside of the body.

I wanna go into talking about some of different people that you've seen benefit from molecular hydrogens. And I want to start off with the athletes, people who are very active.

Because I'm starting to see a lots of that of people doing molecular hyrdrogen therapy. for like the recovery, for the performance. And earlier you were talking about fatigue.

Now this is a different fatigue than just like, you know, like adrenal fatigue or someone who's just fatigued because they have other types of issues within their body.

I think you're meaning more of like fatigue while they're playing the sport and they are getting extra tired very quickly. So what are some of the benefits that these professional athletes, or they don't even have to be professional, anyone who's playing football or any other kind of sport, what're the benefit from actual hydrogen water?

So there's a number of very important points that I wanna make. But one of them, I want to talk about the safety of hydrogen for sport athletes. Because it's not a banned substance.

It's, you know, not going to get tested or whatever with this. it is something natural your body already produces from the gut microbiome. So like water and mustard, they don't test for…

Exactly. There's no way. Like, so you ate some fiber and so now you have naturally produced more hydrogen gas, right? Right. And it's completely safe, so it is not harming your system either.

It is something that is natural and safe to your body. Now, when it comes to sport athletes, especially elite athletes. One of the very important factors that one has to consider is, is this supplement going to hurt me?

Is it going impair my performance? And this is a major problem with many Athletes, they're trying to get that cut, that cutting edge, right? Just a little bit of competitive advantage.

So they are open to trying a whole bunch of new things and often they do that to their own detriment.

Fasting, Autophagy, and Recovery

And let's just talk about a couple of those and separate why this is so different from molecular hydrogen. So, we've talked about antioxidants. And people take extra antioxidants because if you're exercising a lot more, you are creating a more free radicals.

Right. Therefore, if we have more radical, then you'll have slower recovery, and on and so on. So it makes logical sense. Take more Free Radicals, what does the data show?

The data shows that by taking antioxidants, not only do you slow down recovery, but you blunt the exercise training adaptations. You actually impair mitochondrial biogenesis.

So after say 8-12 weeks of training and taking all the antioxidants there are no increased in mitochondria that you otherwise would have had because these antioxidants were basically blunting that.

you don't have the increase in insulin sensitivity or a glute-forward translocation. And a number of other biomarkers that you see from muscle biopsies that would otherwise see or that occurs in the control group, but you don't see that when you're taking these high doses of antioxidants.

But people still take those all the time because they're trying to get that competitive advantage and they are thinking logically, we should take this because mechanistically it makes sense.

Same thing with inflammation. We know that high levels of inflammation are going to prevent you from recovering. That chronic low-grade inflammation is going make it so you're not going about to activate your mTOR as well, let's say, you won't do as much protein synthesis, You're growing your muscles and getting the strength gains.

You really need to get rid of that inflammation for your body to fully recover and repair. So what's the logical solution? Take anti-inflammatories. And what does the clinical evidence show?

That that impairs exercise performance or it impaires exercise adaptations. So now, people who are taking these anti-inflammatories, you don't get as strong of an anabolic signal for muscle growth and muscle strength and recovery.

It actually prolongs the recovery and you and don t get the adaptations you're looking for. We also know that right after, with the inflammation and all the other swelling that's going on, one of the quickest ways to help decrease that is to do cold plunges.

And so this was recommended forever, right? As soon as you're done with your run or whatever it is, you are lifting

your weights, take your cold plunge, put your arms, your legs or a cold bath and get rid of that inflammation, and you can speed up your recovery.

What does the clinical data show? I just saw something like yesterday on social media that some new data came out about that where it actually decreases muscle growth.

That's right. Is that true? Yeah, it's true. But it is not new. Data that has been known for a long time. OK, It's just most social-media influencers back in the day, let's say they're just they are just posting like whatever they whatever their coach told them to do back when they were in school or whatever.

Right. Instead of keeping up with the data. And this has actually been known for quite a while that it's going to be problematic. Now, there's still some benefits, but probably not doing it right after you exercise, right?

And different things. So, yeah, as you're blunting, you are doing a cold plunge or whatever right at your exercise and you preventing the blood flow and the in with the good, out with a bad and all this kind of stuff.

You're actually slowing down your recovery. Wow, yeah, you know that makes sense because your body's shunting that blood back to your core. It's not even getting to the muscles at that point.

Yeah, exactly. Right. So you have to be really careful when it comes to athletes. Just because there's a mechanism to explain why there should be benefits doesn't mean it's going to result in clinical outcomes.

A clinical outcome is a summation of hundreds, it is not thousands of mechanisms. And this is a major problem, I think, with social media or marketers in general is they'll say, hey, look, inflammation is bad.

This is anti-inflammatory. Boom, take it. And just hit these mechanisms on and on. But the clinical outcome is the opposite of what they're claiming. That's what we need to focus on, what is that clinical data actually say?

And that's how we know safety and efficacy. Now if something works and has clinical outcomes, it's going to have a mechanism behind it also. So when it comes to molecular hydrogen, what does the clinical data say?

And I want to focus on first off, It does not impair exercise performance. This has been very clearly demonstrated in so many different models and clinical studies.

What kind of data are you guys pulling to come up with that information? So animal studies and human studies, and performance studies. Do you guys feel like a VO2 max?

Yeah, that was one of the first ones I looked at, the VO 2 max for example. But just some important mechanistic studies really quick to really explain how we know the safety on this.

When you take, say, vitamin C and you exercise, you can actually see a decrease in mitochondrial biogenesis, or at least it's not upregulated compared to exercise alone.

With molecular hydrogen, that's no the case. In fact, molecular hydrogens appears to act as an exercise mimetic, and may even see increases in the mitochondria biogensis.

Athletic Performance and Exercise Recovery

Okay, so this is a very powerful finding that we can see if it gets translated into long-term clinical research because it takes time for the mitochondria to go through all these processes and have this.

But this very important to really showing that hydrogen is not impairing exercise adaptations. whether from inflammation, free radicals, mitochondria, or so on.

In fact, a number of these studies that will point to like one clinical study, they looked at fatigue and the ability to

continue exercising after bouts.

But I'll just explain quickly. They did isometric knee extension exercises, so basically just at full maximal voluntary contractions, right? So this is basically a machine, and you do as hard as you can, you'll do a leg extension, okay?

And you're gonna do like 50 of these. Every one is gonna be as high as can. And eventually, forced production will go get lower and lower, lower lower right.

But the group that drank the hydrogen water, they were able to maintain a higher force production over those repetitions. Now, when they looked at some other biomarkers like oxidative stress, inflammation, The levels of oxidative markers in the hydrogen water group, this is going to be an interesting finding because we just talked about how free radicals are actually what mediate the benefits of exercise adaptations.

free radicals are produced, the free radicles tell the mitochondria in the cells, hey, make more, do better, be better get stronger and so on. So if we neutralize these free-radicals, we don't get those benefits.

That's why antioxidants, one of the reasons why anti-oxidants often negate exercise performance benefits, because they're eliminating the mediator, they are eliminating a messenger, reducing the freeradical.

So, what hydrogen? What do we see? Do we a decrease or what? We actually see often an increase. We see a mild increase in the free radical production initially.

Only initially in an acute phase. And then it goes back to baseline faster. So it's a faster recovery. It's almost like they got a better workout. and had more of a training stimulus, but not so much that results in cell damage or muscle damage, just more exercise stimulus and then a faster recovery.

So we can see the same thing with inflammation. Sometimes interleukin six levels, a good marker of inflammation will be a slightly higher in the acute phase and it goes back down quicker compared to the control group.

So these are the biomarkers we're seeing. And what are we seeing phenotypically or the endpoints of exercise performance? We're seen things like the increase in the endurance, for example, a decrease in amount of fatigue.

In the study also, They exercised at around 70% of the UO2 max and measured lactate production and they found that in the hydrogen water group, they were lower lactat levels.

And this is important because lactay production correlates with Fatigue. Okay. So because what happens when you're, if you have an elite athlete and they're going to go run, let's say, an athlete marathon runner and you are going have them run like a six miles per hour, they could do that all day long.

There's no problem. But you take somebody who's not of a very good shape and have him run at a 6 minute mile pace, They're gonna be tired after, you know, maybe even 400 meters.

Maybe they won't even do that. And they'll have really high lactate levels. Whereas if you measure lactating the other, the marathon runner, You don't need to measure a lactated level.

I mean, of course there's some, but it's very low, right? And the reason why is because the Marathon runner has such high functioning mitochondria and high cardiac output that they're able to make all the ATP with their mitochondrion.

So they don't have to rely on what's called glycolysis to make the ATP. And it's during glycolosis that lactate ends up getting produced. Okay. So when you see like in this example where the group drinking the hydrogen water had lower lactat levels, it is potentially indicative that they had higher mitochondrial function.

And therefore, they're able to maintain the same high level of exercise but use aerobic respiration or mitochondrial oxidative phosphorylation as opposed to glycolysis.

So there is a higher level performance. It could also be indicative that they had faster lactate recycling. Right? So these are really good indicators that hydrogen water is improving exercise performance.

And this, by the way, was done in elite soccer players, not just untrained athletes. There's actually a number of, we just published another article, too, in an elite athletes, so.

When they're drinking the molecular hydrogen in water, Are they drinking it throughout the physical activity or are they just like loading up on it before the physically activity?

Yeah, loading it up before. Because like if they're gonna run 30 minutes at a lactate threshold or something, they are not gonna be like sipping water throughout.

No, it's the process of drinking the hydrogen water for 24 to 48 hours before or preferably weeks and months before Just keep on feeding your body. Yeah because hydrogen The molecular hydrogen can alter gene expression.

It has these effects at the genomic level, and so you have better cell signaling, better cellular adaptations, improved mitochondrial function. all of these long-term benefits happen over time so that we start to see greater and greater benefits.

All right, so now you just created this segue when you started talking about gene expression and all the signaling. Now I wanna go ahead, because what you're talking there, when we don't have good gene expressions, now we're talkin' about disease formation.

Right. So how does this actually play with now people that potentially could be having an autoimmune disease develop or a neurological disease to develop?

How does the molecular hydrogen take a part in that? Yeah, so we see again from animal and clinical studies, but again, a lot of this initial data comes from animals studies.

But when you take certain animals and let's say they have a genetic mutation that's going to make them very susceptible to cognitive impairments, they're going, you know, Alzheimer's.

And now you have one group that drinks hydrogen water and the other group, that drink normal water. Then you your control group the wild type mice, right?

And what you find is that the genetically susceptible mice to cognitive impairments that drink hydrogen water never develop cognitive impairment. They're almost the same as the wild type mice.

Okay. It's a black and white difference. And we see this in, like even in Parkinson's disease, there was a study actually at Nagoya University where I was at, and you can, basically an injection of 6-hydroxy dopamine, which is a neurotoxin, it kills the dopinergic neurons and that's going to induce Parkinson disease.

But the drinking of hydrogen water prevented the development of Parkinson' disease And this was an animal study. Is it safe for animals to have the same hydrogen and water that I drink?

It's the the thing. Yeah, exactly. So I could just give it to my dog? Yeah. People do it all the time. And there are studies like, you know, there's been studies in mice, rats, dogs, horses, cows, a whole bunch of different species.

It wouldn't harm my dogs in any kind of negative way? No. The research shows that it's good. You know? That's a good idea. Nice. Yeah, just to get them to drink it before the gasket that's right.

That's the only that the difficulty right is because when they're it's as often like in the animal studies You know, we'll like with pigs for example the other ones, you know We'll do like an oral gavage or some sort to make sure we're controlling for dosing and concentration, right?

Right, very interesting. So so One of the things you mentioned is ATP production from mitochondria, which obviously we know those are powerhouse cells inside of our body, and that's what helps produce energy.

So you guys have noticed through actual data, clinical data that it does do that. Yeah. And I mean, with clinical studies, you can't actually measure in any correct way the amount of ATP that's being produced in the mitochondria.

Because that is the subset of the organelle and trying to measure all that. There are some MRI studies or whatever. but we can see that those are the effects that are happening.

One, we have mechanistic data in in vitro cell culture studies where applying the molecular hydrogen we see the rejuvenation of mitochondria. We see activations of various complexes. We have increases in ATP production, measured ATP reduction, right?

We have increased in oxidative phosphorylation, increase in oxygen consumption. All of these are indicators of mitochondrial dynamics and improvements to the mitochondria, right?

And then we relate this to what we're seeing in the clinical studies, and we are seeing, you know, improvements in, let's say, cognition, or improvements and brain connectivity, lets say.

Or improvements, in exercise performance, improvement in mood and anxiety. So all of these also are indicative that yes, it's probably an energy situation that's going on.

And what type of data are you getting for the cognitive? Are you doing like neural feedback or brain mapping or anything like that? So it depends on the study, but a number, and it's dependent on condition.

So for example, there was a study using inhalation of hydrogen gas following post-cardiac arrest syndrome or cardiac arrest. And often there are severe neurological consequences that happen after a cardiac address because it kind of like mimics like a stroke basically.

And in this study, it was actually just published in Lancet, which is one of the top premier medical journals there are. They used hydrogen gas, 2% inhalation of hydrogen, gas compared to conventional therapy alone.

And when they added the 2%, hydrogen and gas there were a couple important findings. Number one, that after three months, the group and the hydrogen group, their survival, the survivability after three months increased by 20%. A relative 40% increased survival compared to the standard alone treatment.

And then they looked at the other endpoints like neurological function and that was also significantly increased and improved compared the standalone therapy.

So, and there was another clinical study on cerebral infarction or stroke. And it was 10 years after that 2007 Nature Medicine publication.

Neurological Protection and Brain Health

And maybe just talk about this because it's very powerful the study in Nature medicine that the researchers took and made a stroke model basically cutting the blood supply to the brain.

The middle cerebral artery occlusion is just occluded that artery. And of course, that's going to cause like a stroke and then they let the blood go back and when that happens, you get this reperfusion injury.

So it's an ischemia, which is when there's no oxygen rich blood there and there are perfusion injuries. And so all that oxygen, rich, blood goes back to the brain and it caused all this inflammation, neuroinflammation, oxidative stress and so on.

And in this study, they had one group that was, you know, normal, one control group and then of course another group had the stroke model and another that had hydrogen.

And they used 2% hydrogen gas and that means all the air they inhaled, 2 percent of that, was hydrogen Okay. These are people that had a CIA, you're saying, not the TIAs.

Yeah. Well, and to be clear, this wasn't an animal study. This was a rat study, yeah. And then I'll jump to the other one, the clinical study but so this study in rats, when they administered the 2% hydrogen gas, there was dramatic benefit to preventing the brain damage induced by this stroke.

And they could take the rat brain and you can slice it and then you could die and see what parts of the brain were dead and which ones were okay. And you don't have to be an expert.

You can literally see with your own eyes the drastic difference between the 2% hydrogen gas and the other group. The hydrogen gases significantly protected the brains from this oxidative damage, from the ischemic reperfusion damage.

And ten years after that, it was a clinical study, and it on cerebral infarction. And it a randomized study and about 50 subjects in total, 25 in each group.

But they compared it to Adaravone, which is an approved medical drug, And they used inhalation of hydrogen gas. In this study the inhalations of Hydrogen gas was as effective as and in some cases more effective than conventional treatment.

Oh, wow. In improving the stroke ratings and the number of cognitive assessments they did, like the MRI assessments and things. So these are real clinical studies that have been published looking at these things And I feel like hydrogen has been kind of hiding, you know, which it is a small molecule.

But you don't say there's such tremendous benefits. And, we're talking about brain right now. So so it's leading me back to the whole athletes with like TBI, the traumatic brain injury.

I would only assume that there is tremendous benefit there as well, too. Yeah, absolutely. And that's something that is being investigated as we speak with another group that I'm aware of.

We actually published a study earlier on the potential effects of hydrogen for TBI. It makes a lot of sense for so many reasons. The neuroinflammation, the oxidative stress, hydrogen gas, being able to penetrate the blood brain barrier easier than anything else.

drink hydrogen water, you can inhale hydrogen gas, and you protect the brain. Everybody drinks water already, or everybody can just inhale just hydrogen and gas.

So there's a lot of interest from all sorts of sport athletes and teams that are really looking seriously into using molecular hydrogen as a preventive therapy as well as you know after something has happened to also be using it and there's a lot of really good animal studies showing the protective effects of hydrogen gas on TBI as Well, are there any people that should avoid molecular hydrogen?

It's it's possible. There's always a possibility. It just the contraindications seem to be very low. In terms of clinical studies, there is no known contra-indication from a clinical perspective that has been shown.

And these are, you know, 200 human clinical study has done, over thousands of subjects. There are no obvious adverse effects. Typically, the adverse affects in the placebo group are just as much, if not more than what's in a hydrogen group.

Now, theoretically, there are some potential concerns. For example, if you have an H. peloria infection, helicobacter pelori, that is a bacteria that feeds on hydrogen gas.

And so the concern is if your drinking hydrogen water, are you basically giving that bacteria food so now it can grow and survive, right? That makes logical sense, but there's no clinical data to support that.

And there is also other logic to say that's not going to happen because typically there are already a lot of hydrogen gas in the stomach at very low concentrations because this bacteria has a hydrogenous enzyme.

So you're talking about a very like a nanomolar concentration. is all that is needed for it to survive just fine. And by providing more molecular hydrogen, you can now benefit the body systemically, but you're not going to increase the growth of the H.

pylori bacteria, because it already has more than hydrogen gas is necessary that it's possibly needed. And so much, so many data, animal and human studies have shown that drinking hydrogen water actually improves the microbiome and gut health, improving the colonocytes, and it improves with the immune system.

And, in turn, that could then get rid of the pathogenic bacteria and improve the system so that goes away. Anecdotally, there have been people who have reported that they used to have H.

pylori and then after drinking the hydrogen, they don't have it anymore. So there's that mechanism also, right? But again, like I said, mechanisms alone are not where the answers are.

We want to see clinical data. But I think hygiene has been shown to be safe in so many ways because it's already very natural. Like eating a healthy diet means you're going to make more hydrogen gas.

And so if people want try it, then they can try and they monitor for themselves if something's getting worse or better or something. So another thing is that we get exposed to a lot of EMF, right?

Does hydrogen have any kind of connection on benefiting the body from EML? Yeah, there's a couple studies that were published on this. It's kind an interesting area because the EMM idea has not been well accepted or well studied yet.

And so the mechanisms for how it's supposed to cause problems and what's really going on are so There's so many concepts, but there's nothing diagnostically replication-wise that can really dive into it to directly study this.

And so some of these ideas, though, like how the EMF could activate some the voltage-gated calcium channels, and that induces peroxynitrite formation, you know, nitrogen side of stress and other problems, hydrogen gas directly can help with that because hydrogen can regulate dysregulated calcium signaling as well as helps to reduce peroxy nitrate levels.

We can see lower levels of nitrotyrosine, which is a marker of peroxynitrite levels, And so we see a lot of mechanistic reasons why hydrogen gas would be able to directly help with this.

And then there was a kind of a case report clinical study with somebody who had an ENF and EMF type sensitivity. But by taking molecular hydrogen, it helped to resolve their extreme fatigue that they were having.

Everything about the mitochondrial dynamics and how molecular hygiene can help us that mechanistically again, everything makes sense. Understood. Tyler, you know, I was a firefighter paramedic for 12 years, obviously, got my gear here.

And I always try to make sure when any of the experts come here to the podcast, how can first responders like a fire fighter benefit from molecular hydrogen for the job?

Yeah, great question. So first off, with molecular hydrogen, it's going to protect your cells. It's kind of priming your cell so that you can handle more stress.

And so whether that's now you have this adrenaline rush and you've just got to push yourself really hard, you need

to have more energy, more stamina. You need do hard things that are hard on your self.

Hydrogen can give you some protection to handle that increased stress on your body and on yourselves, okay? Also, you're bound to get exposed to smoke, to pollutions, carcinogens, right?

And a lot of studies have really shown that hydrogen really helps to protect against these carcinogenic material, like smoke for example. Even like cigarette smoke.

There's a number of study showing that that alone, hydrogen can help protect the lungs and help to help the body in general from these types of toxins and carcinogens.

So by taking molecular hydrogen on a daily basis, because you never know what's going to happen later that day or in a week or whatever. So by taking molecular hydrogen, you're sort of priming your cells for protection so you can have higher level of mitochondrial function, higher resilience to stress, and also that antioxidant protection, right?

Because you are regulating your Nrf2 pathways so can be ready to handle assaults that happen. Yeah. And I would also think that there would be, how you were saying with the athletes, less of a possibility of fatigue while you're, you know, going inside of burning warehouse or burning building of some sort, right?

Yeah, exactly. Especially because some of that work is so prolonged. I mean, it's not right. It's probably not going to You know like like talking about VO2 max it doesn't just you know You can't take hydrogen water and they just have a much higher VO 2 max, right?

That's it's not going to work that way But over the long period of time it could help but it can also help with just this repeated bouts of exercise So you go up the stairs or whatever you're doing and now you've got to go again and then you have to Go again, and that by the time those last sets you tend to start going slower You're getting tired and everything but with molecular hydrogen you are able to maintain that level of performance at a high level For a longer period of time right right now first you spot there's like what I were here at the fire department We were off for 24 hours and then off of 48 hours.

There's a serious sleep deprivation How does hydrogen work for sleep? Yeah, so there's a couple studies. There was actually a study published using the hydrogen producing tablets.

Safety, Contraindications, and EMF Discussion

A lot of the studies now are actually using hydrogen-producing tablets just as a side note, just because they do provide a high and consistent dose of molecular hydrogen.

And so some of these studies that I'm referring to, you know, these tablets were used. And they're placebo controlled also, because they also have magnesium, which is good for you.

So it's like, well, that confounding variable just wasn't some of the magnesium or something. But you can easily control for that in the placebo group, right?

So the study I'm going to talk about now is a non-inferiority study comparing molecular hydrogen to caffeine. And basically after 24 hours of sleep deprivation, the molecular hydrogen group was able to perform pretty much as well as the caffeine group when it came to cognitive alertness and different cognitive tasks and so on.

And then there are also other changes like in brain colon levels and other parts of the brain when you look at it with the fMRI scans. But one of cool things, of course, molecular hygiene doesn't give you that crash because caffeine works as an adenosine antagonist.

And so adenosine is that molecule that kind of makes you feel tired, ready to go to sleep. And, so caffeine blocks that receptor and then you still get more and more adenosine build up and you can actually get receptors that are

kind being produced as well.

Then once the caffeine wears off, you'll feel really tired. It's a hard crash. Hydrogen works totally differently because it's working with your mitochondria, it is working on improving neuroinflammation and just helping your cells function optimally better anyways.

There is no crash with molecular hydrogen. I was also happy to be part of a study done at UCLA in mice where we put electrodes onto the brains of the mice and you did different studies of looking at the effects of sleep deprivation and how drinking hydrogen water could protect or modulate sleep.

And we found that it did modulated sleep consolidation in different aspects. So there seems to, yes, be benefits for sleep. So if you do have to have the sleep deprivation or you need to just have higher cognitive capacity when you are really tired or when it's time for you to go to sleep, you're able to better sleep consolidation in general.

Better deep sleep? Better REM cycle? All of that stuff. Yeah. The further you from homeostasis, the more molecular hydrogen seems help bring you back to homeo stasis and get more bang for your buck, so to speak.

OK. All right. That's good to know. You know, a lot of people are walking around, even like myself, the aura ring and, you know, trying to look and see how we can improve our readiness score every single day and our sleep score and everything else.

So just most curious about that. Yeah, people. But a lots of have said this, that when they go through the like travel, for example, like jet lag or just times with a Major sleep deprivation or really poor sleep problems or like alcohol use let's say and you compare those times with and without Molecular hydrogen and they'll say that molecular hydrogen really seems to help a lot but but hydrogen It's not it's a cure-all or something.

So it is not going to you know, you can't just do anything and then take hydrogen be better and And also, if you're already doing pretty good, so if your sleep score, whatever, you know, is in the 80s or 90s, or let's say, it's not always going to be, at 99. It's more mild.

So it just seems like the further you are, up to a certain point, I mean it can't resurrect you, but in a lot of ways, the farther you from homeostasis, that greater the potential benefits.

What are some of the myths out there about hydrogen water? We talked about some of them that's the same as alkaline water. Another one is that it somehow alters the water structure or that you can even alter water at all.

But if you did alter the structure, then it's no longer water and so that that is another myth. The misunderstanding of what hydrogen water is because they think water already Water already has hydrogen because it's H2O, so it sounds like a scam.

They need to realize we're talking about just water that contains solubilized or dissolved hydrogen gas inside of it. The idea is the same as hydrogen peroxide.

You can just take hydrogen and peroxide and get the thing as molecular hydrogen. But they're two totally separate and different chemical species in every way you can imagine.

Almost the opposite, right? Oxygen, antioxidant, right? Oxigen, hydrogen, they're totally different. Also, there's a major conspiracy of some sort that there is all this clinical research that proves that hydrogen is effective, but yet the FDA just won't approve it or something.

Me being involved in the research and being in a position that I am in, I can say that's not true. It's just that to approve a drug for a pharmaceutical by the FDA, it literally costs a billion dollars to do that.

And so if we want to have hydrogen approved, then somebody needs to pony up the money of a $1 billion to the study to see if it really has a level of clinical effectiveness that we see in these preliminary studies.

So no one's going to do that because it's a huge investment. And for what? You can't patent molecular hydrogen. Most of the research that's been done on hydrogen is government funded, you know, like by government grants.

But they're small, right? $250,000, you know, half a million dollars. That's not going to get you very far when you're talking about hundreds of millions of dollars and a total of billions of dollar to really get something to the level of evidence that is needed to government approval like the FTE approval.

But there is interest in all these areas. That's why the government has literally given money. And the Government does give hundreds of millions of dollars to study these other like alternative therapies, acupuncture even and other things, because that's what the people want.

So my hope is that people will learn about molecular hydrogen, put it on the radar, and express interest on this. If there's an interest, if there enough interest of molecular research, then and only then, Well, there'd be enough funds from the government, because who else is going to fund this, in order to do these major clinical studies.

And once, and only once we have the level of clinical evidence that really shows that yes, if you take molecular hydrogen, if you have like cardiac arrest or if have COVID or you this disease or he have cancer, if he had whatever it is, and if were to take molecular hydrogen, it's going to help you by you recover this much faster or prevent you from having these side effects of chemotherapy or radiotherapy or all these things that we see in the clinical studies, these early clinical of a couple hundred people at the largest so far.

If we can see that same thing with a thousand people, then we get the FDA is going to give approval for that specific condition. And I think eventually that will happen because that translation from animal research to human research is quite impressive.

There's a lot of things out there, molecules, nutraceuticals, drugs, supplements, and so on, that can do amazing things in vitro and cell culture work, but it doesn't work at all in animals.

Then sometimes it does work in And then, but the thing that do work on animals often don't ever work in humans. But here we're talking about something that shows great promise in vitro, great promised in animal studies, and still showing some pretty decent promise and human clinical studies.

So this is why I think we really need to And I appreciate you helping get this message out there. We need to have more education and awareness about this.

And this has probably answered one of your questions. How come more people don't know about it? It's because the science started first. The science on molecular hydrogen and all this research started.

Then the industry is like, oh, look, there's science here. Let's see if we can develop this, as opposed to what sometimes appears with other kinds of products out someone has an idea, they throw a product and they start marketing it and making claims and all this stuff, and then eventually the science starts being done on that.

Funded by the industry, funded by their company, right? And then people learn about it because it's industry-sponsored, industry funded, people are going on podcasts and going to conferences selling their product.

Well, who was doing that with molecular hydrogen? I've been doing that in molecular hydrogen since 2013 and I have not been selling a product. I just been talking and educating about molecular hydrogens.

And so it is interesting because soon this year I am going to start promoting a hydrogen inhalation device that I worked on for research. It's the only way that people can deliver a therapeutic and safe dose of molecular hydrogen.

First Responders, Sleep, and Practical Use

So now I'm really excited because there is an opportunity where I can be behind a product that I helped to develop

and file the patent on and all of this to deliver molecular hydrogen in a way that we do in the clinical studies where every inhalation is therapeutic, there's no risk for fumability, and it delivers a precise targeted dose of molecular And we did this specifically for research, but it's gonna be commercialized for people who, like yourself or anybody who actually wants to use this on their own, if they want to, they can do that.

And this was already developed? You already have it? Yeah, yeah, it was, It's going to probably launch in the fall. Oh, nice. Amazing. So it is coming out really soon.

Yeah. But we're already having a lot of researchers who are finally, They can use it. Because see, in Japan and other countries, and like when I did my PhD research we, We had to get a tank of gas made special with the exact percentage of hydrogen gas we want, like say 2.3% hydrogen in gas or 3% in hydrogen and gas.

And then all the air that was inhaled would come from this tank. Because you couldn't use anything higher than 4.6% of the hydrogen because that's explosive.

You can't blow up the laboratory or you can blow your patient. We laugh because of how ridiculous that is. But that is actually happening. Oh, really?

There are clinics where people have been inhaling hydrogen gas and oxygen, oxygen gas, oxyhydrogen, and there's an initial source and they have a nasal cannula in and something happens and it fractures their face.

No, but that's scary. If you want to if you. Want to put an end to molecular hydrogen. Yeah, that that. That's the way to. Put the end. To it, because, you know, people.

Have to be careful with that 100% hydrogen is very flammable. Wow. And so here we have a potentially amazing therapeutic, and it could be totally destroyed because a misuse, because we're like, ah, it's not that bad.

Oh, that's safe. You know, I use it. I don't have problem or something. Is it hydrogen with the Hindenburg? Yeah, 100%. Yeah, we have to be really careful with this.

And so, in the hospitals and clinics, you can't even get IRB approval to do these clinical studies unless you're able to use only a concentration below the flammability level.

Fortunately, You don't have be very high for it to therapeutic. Only a 1-4% concentration is very therapeutic, In fact, sometimes 2% is more effective than 4%. But the problem is when people use like nasal cannulas, when they take a breath like that, all the outside air dilutes the concentration down.

So now they are likely not even getting a therapeutic dose of hydrogen. But because it's pure hydrogen or an oxy hydrogen mixture, it is flammable. And so you're getting like potentially a flammable mixture with no benefit.

That's like the worst thing that you would want. And, so finally, with this unit, people can do research with it in the laboratory, animal research, clinical research cell culture research.

You can give a precise targeted dose of hydrogen exactly where you want it to be. There's no risk for flummability. So this will be really helpful, I think, to advance molecular hydrogen research moving forward.

The non-rebreather mask? Yeah, exactly. With the reservoir bag. Yeah. It has a reservoir inflatable bag so that every inhalation you take comes directly from that bag inside.

So that even if you just take a really big breath or whatever, it just comes from the bag and it's not going to get diluted. You know exactly how much hydrogen gas you're getting.

And when you exhale out, just goes out the one-way valve of the mask. Do you ever see like in conventional medicine, like, in the ER, them utilizing like a bag valve mass, a BVM, while resuscitating someone in cardiac arrest, but with hydrogen instead?

Do see that ever happening in future? Oh, In the future, yeah, I think it might. It's possible that it Like I said, that one study on cardiac arrest that was published in The Lancet, it really is an impressive study finding, and it's so easy to administer.

And the sooner you administer it, the better. It would probably be better if people were inhaling hydrogen gas before they had the cardiac arrests. Right, right.

Very interesting. So, all right, now let's get down to what's your delivery method of choice for you when it comes to molecular hydrogen? So right now I'd probably say the hydrogen water.

I often just like to use the Hydrogen tablets. There's a lot of them on the market. They're all pretty much the same concept. But the thing I like about the tablets is it provides a high concentration, high dose of molecular hydrogen.

Um, I think the water hydrogen, water bottles and things that are out there, the hygiene of flasks, for example, some of these are great products. You don't know all the longevity of them and then there can just be issues.

Of course, if the company is reputable, you've done your research, then you can do that. Now, there are some like you go on Amazon, and you buy like a hydrogen, a water bottle for like 10 bucks or 20 bucks.

That's like probably not. Yeah, probably when it's super cheap like that, And I'm not saying the cheapest is always is bad, right? But there is some truth to that.

And so you have to make sure it's the right membrane, that the concentration is as high enough for it to even be therapeutic, how long it is going to last for.

There's a number of things about that, so I would be cautious about just running on to Amazon and grabbing the cheapest thing or the one that has, well, this has good reviews, so therefore that doesn't really mean anything.

There's great reviews on products that are totally placebo, right? I mean, they can maybe guide you, but it's not the end all be all. I would recommend that if somebody wants to try hydrogen water products, that they should ensure that it has the H2 analytic or certified to IHSA criteria, the International Hygiene Standards Association, because that way it's actually been tested and it provides at least the similar doses that are used in human clinical studies.

And so that's one way to kind of guide you on that. And there is an article on our Molecular Hygiene Institute that has like seven considerations or something for people when they want to look at a hydrogen product, like what type of things to consider.

But like I said, our nonprofit, we don't… endorse or represent or whatever, no affiliation with any hydrogen company. Our focus is advancing the research, education, awareness of hydrogen as a medical gas.

The research. So when it comes to hydrogen water, yeah, those are great. You can do that. And then there's just, you just asked for me personally, that's what I like to do.

I don't pay for the hydrogen tablets either because we did a lot of clinical research so I have a Leftover, right? It would be difficult if you had a large family, let's say, and you're trying to give a hydrogen tablet to everybody.

Maybe that could be expensive if don't have the means for that. But I also like the tablets because they provide bioavailable magnesium and most of us are deficient in magnesium.

Yeah, magnesium's important. That's one I've heard a lot of functional medicine doctors say. One supplement that you should take is magnesium Yeah, most people are deficient and correcting deficiency is always going to do much more than any, I don't know, red light therapy additional thing you could possibly do, right?

So, yeah, so I like that. And then, of course, when it comes to inhalation, Yeah. I would say that the product that will be coming out soon in inhaleh2.com is the website.

Yeah, inhaleh2.com. And this is not the only product that will be therapeutic, of course. There are other products on the market. We use some of those in clinical studies.

But in general, the big studies, we use like a tank of hydrogen gas to ensure a precise, therapeutic safe concentration of molecular hydrogen. This machine will allow everybody to do that.

So my other question with the different bottles that are out there, the hydrogen bottles. When people are drinking it, are you just sipping it little by little over two hours, or should you actually take, when it converts that water, I'm trying to say infuses the gas into the water.

Should you drink the whole flask? Yeah, in my opinion, it's probably best to drink it the entire flasks. Right away. Yeah. Because a couple of reasons.

One, once you make the hydrogen water And as soon as you open the lid, now the hydrogen gas is starting to go out. Just like when you have a carbonated beverage, you opened the lids, the gas started to leave.

So you want to drink that while the gasses still in there. And if you're not moving around, I mean, if have like an hour, right? You have plenty of time to do it, but the sooner you drink it the better still, Right?

you wanna get all that molecular hydrogen inside of your body. So you get a greater benefit having it all in your stomach? That's the other part, yeah.

Because hydrogen gas, as I said, you see hydrogen starting to escape the lungs within two minutes. Okay. And it goes back to baseline within a half an hour to an Basically, the rate of hydrogen gas entering the body is equal to the rates of the hydrogen leaving the cell.

Therefore, it never increases. Because it reaches equilibrium, right? One comes in, one goes out. There's no increase. You need, you know, a million to come in and only one goes out, like at that rate basically.

Now you have an increase in cellular concentration and then you start having a therapeutic effect because you surpassed the therapeutic threshold. So it's probably better to drink it all at once instead of sipping it throughout the day.

Is there any, you know, like colon cancer is really huge. Is your any benefit? You know you start looking at a lot of the holistic people they're doing coffee enemas, they doing wheatgrass enemus.

is anyone doing hydrogen molecular hydrogen water enemous? I know people are doing that and I don't know about the clinical effects or outcome of that.

I now that we have done and others have studies with hydrogen water on colon cancer. Others did that, some pretty impressive results. We followed it up and we used hydrogen tablets and it was an animal study.

But we also compared it to 5-FU which is a chemotherapy drug and found that hydrogen was in a lot of ways just as effective and in some cases more effective.

than the drug was, and the combination was the most effective, but that hydrogen actually prevented a lot of the negative or toxic side effects from the drugs.

Product Selection, Delivery Methods, and Future Research

Oh, wow. Wow. Amazing, amazing. Tyler, you know, as as we start wrapping up here, Ben, there's one thing that's happening right now. There's a huge movement called Make America Healthy Again.

And a lot of the stuff that we talked about today, it's about making people well, right? How do you see everything that you're doing taking part in this whole movement?

And I ask you because I've seen you at the events, so how do see molecular hydrogen making America healthy again? I think molecular hydrogen holds a very special place in this entire area.

You know, that you talked about how you felt like hydrogen was being kept a secret and like where, how come we're not always talking about this and hydrogen, it's just, this amazing, humble molecule in the sense that it literally is the ancestor of all the elements.

It's what powers the sun and fusion to create helium. It powers a sun, the stars, it was the first created in the Big Bang. Hydrogen was always there even when we talk about from the scientific idea of The genesis of life from the deep sea hydrothermal vents, hydrogen was an energy source that allowed the first microorganisms to be created because hydrogen gas was that energy, that fuel, the evolution of the life or the idea of prokaryotes or bacteria into eukaryote plant and animal cells, hydrogen gas is always involved with that.

And then we developed this symbiotic relationship with healthy micro bacteria, microbiome in our body that produces hydrogen and gas. So it's always been there.

Just now, we're starting to really recognize that hydrogen is like the front and center of everything. It's just this mild molecule that works to restore homeostasis of the cells.

And we see from the clinical studies that hydrogen has the potential to radically revolutionize medical healthcare, where there's no contraindications with other types of therapies.

as far as we know, is something that's naturally there, that safe, it's even been shown to be rich in the untouched waters, hydrogen gas is there in these healing waters.

Molecular hydrogen is their. In all these mystical and legends, molecular hydrogen always seems to there. And here again, just science is catching up and realizing that hydrogen plays an important role in our life.

The more hydrogen gas we naturally produce by having a healthy diet, the healthier we live. I think hydrogen as a philosophical molecule as well, in the sense that not only does it have these medical applications, but hydrogen has this way of bringing peace.

And I have said before that Many wars have been fought over water, but I think that Peace real peace will be found over hydrogen Wow Amazing, man. So what RFK jr.

What are your thoughts about him? Well, I'm excited that somebody is willing to make changes, to radically talk about things and have the conversations.

And he has my support to, make these conversations, and I want that to happen and to participate. I wanna be part of these conversation and use my expertise, my skills and my knowledge to help advance things as much as I can.

I do have concerns about how this has polarized things so much where it becomes the Republican-type movement and, you know, Democrat, Republican, instead of a movement of health where we were all united.

It really should be nonpartisan, right? It should not be partisan. Some of the best scientists there are who don't like what RFK is doing is concerning they should be part of this conversation.

Because otherwise we're just going to get too many social media influencers talking about help instead of the people who are dedicated all their life to researching this one little thing and they actually do have the answer.

And I just want there to be more conversations so that we can solve this issue because in reality we all are on the same team. Agree, I agree 100% So dr.

LeBaron If there's one person out there that truly truly resonates With your message today. What is that one thing you can leave them off with? Because we're talking about molecular hydrogen.

I would say that molecular Hydrogen Represents a a molecule that can potentially radically revolutionize healthcare, our wellness, bring us back to homeostasis.

And we need more awareness. We need education because we more research to demonstrate this. It represents the molecule of peace. Working together, is a way that we can accomplish the medical benefits of molecular hydrogen and world peace.

Absolutely. I love that. And if people want to find you, where do they find? Yeah, so for all things molecular hydrogen, molecularhydrogeninstitute.org.

Again, this is a science-based nonprofit focused on their research, education, and awareness of hydrogen as a medical gas. And on social media, just Molecular Hydrogen Institute.

On Instagram, H2MHI. Of course, you can also follow me. I post a lot of my research as well, as some training videos, exercise things, other things I'm interested in just at Tyler W.

LeBaron. And yeah, people are welcome to follow me, connect, and just help us spread this message. Amazing, amazing. Doc, it was a pleasure having you on the podcast.

This was very informative. And I think this is what people need. Thank you. Awesome. Guys, you guys heard it. This is not just a talker. this is just someone who's on social media trying to get the views and the likes.

THIS is a scientist. This is not snake oil. There's science behind this. And as you can see, it doesn't matter if you're an executive, It doesn' matter, if your an athlete, and it does matter If you are an actual sick person.

Right? There is benefits to this for everyone. You should implement it into your life. Learn more about it. Make sure you look at all the links down below.

Follow his page. make sure to subscribe. Share this with all your friends and family. and we'll see you for the next one.